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Drug Abuse Risk and Protective Factors among Black, Urban Adolescent Girls: A Group Randomized Trial of Computer-Delivered, Mother-Daughter Intervention

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Abstract

A group randomized design tested a mother-daughter intervention aimed to increase protective factors in a community sample of Black, urban adolescent girls. Girls and their mothers at two community agencies were pretested and, by agency, randomized to either an intervention arm or to a control arm. Intervention arm girls and their mothers received a program for improving mother-daughter rapport. Posttest data collected 3 weeks after program delivery revealed that intervention arm mothers and daughters improved more than control arm mothers and daughters on measures of communication and closeness. At 3-month follow-up, intervention arm mothers relative to control arm mothers continued to report better communication with and closeness to their daughters. Girls and mothers in the intervention arm rated the computer program favorably on parameters of enjoyment, comfort, relevance, usefulness of information, improvements to their relationship with each other, and whether they would recommend it to friends.

American girls are using tobacco, alcohol, illicit drugs, and controlled prescription drugs at rates surpassing those of their male counterparts (Johnston, O'Malley, Bachman, & Schulenberg, 2004,2005;National Center on Addiction and Substance Abuse at Columbia University, 2005). Once girls use substances, they are more apt than boys to become dependent, and they fare more poorly in treatment (Moochan & Schroeder, 2004;Rowe, Liddle, Greenbaum, & Henderson, 2004). Girls also suffer disproportionately from such consequences of drug use as poor nutrition, exposure to unprotected sex and STDs, pregnancy, and domestic violence (U.S. Department of Health and Human Services, 1994). Gender-specific approaches to drug abuse prevention among adolescent girls are clearly needed.

These approaches must recognize girls' differential risks for substance abuse. Girls, more than boys, report using substances to control their weight, gain peer approval, and please dating partners (Tomeo, Field, Berkey, Colditz, & Frazier, 1999). Low self-esteem and poor self-concept are common risk factors for substance use among girls. Family-related factors disproportionately affect girls' substance use. Parental bonds are associated with lower drug use among all children, but poor attachment to parents correlates more strongly with girls' substance use than with boys' use (Johnson & Marcos, 1988). Low parental monitoring and an unstructured home environment are linked more with substance use among girls than among boys (Murray, Swan, Bewley, & Johnson, 1993). Negative parental attitudes toward drugs correlate with girls' abstinence from substance use (Peterson, Hawkins, Abbott, & Catalano, 1994), as do parental control and supervision, strong family ties, and positive social supports (Alegria et al., 2004). Black girls seem particularly protected by parental control; yet by late

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adolescence, these girls can experience parental derogation, less supervision, and family substance abuse problems (Vega & Gil, 1998).

Investigators are beginning to examine prevention programs for girls. Elliot et al. (2002), for example, found that relative to untreated controls, girls who received gender-specific intervention increased their knowledge about the effects of substance use, decreased their use of harmful drugs, and increased their intentions to avoid substances. Another prevention program, aimed at poor minority girls, reduced the incidence and onset of drinking (Weiss & Nicholson, 1998). And, a gender-specific mass-media campaign was followed by a 40% reduction in girls' weekly smoking, with effects persisting at 4-year follow-up (Worden et al., 1996).

Addressing parent influences, family programs for preventing drug abuse have also been developed and tested (Spath, Redmond, & Shin, 2001). Of these, the most efficacious engage parents and children together (Kumpfer, Molgaard, & Spath, 1996; McDonald & Sayger, 1998). Illustrative are programs that support caregivers' behavior management skills and that build parent-child relationships (Dishion, Andrews, Kavanagh, & Soberman, 1996; Kazdin, 1993). Still, such barriers as cost, qualified intervention agents, scheduling, and logistics preclude access to family interventions for most at-risk youth and their parents. Offering promise to reduce such barriers are nascent technologies that can cheaply and reliably deliver prevention programming.

Computer-mediated intervention is one such technology. Empirical data support the promise of substance abuse prevention programs delivered by computer (Bosworth, Espelage, & DuBay, 1998; Schinke, Schwinn, Di Noia, & Cole, 2004). In 1998, 37% of American homes had computers and 19% used the Internet; 5 years later, these rates were 62% and 55%, respectively (U.S. Department of Commerce, 2004). Because single-mother headed households and Black and Latino families account for the most rapid growth in computer and Internet use and because high-speed connectivity is overtaking dial-up access in American homes, the future of computer interventions is bright for those who can profit most from it (Digital Divide Network, 2002; Nielsen/NetRatings, 2004).

This study tested an intervention to strengthen familial protective factors to help Black adolescent girls reduce their substance abuse risks. Study hypotheses were: a mother-daughter intervention program will improve girls' levels of communication with and closeness to their mothers and will improve mothers' levels of communication with and closeness to their daughters.

Methods

Settings and Participants—The study was conducted at two New York City youth services agencies located in geographically separate, but socio-demographically similar, poor neighborhoods. Through announcements posted at the agencies, 86 African- and Caribbean-American adolescent girls and their mothers were enrolled in the study. Girls assented to and gained parental permission to participate, and mothers gave their informed consent. Girls' ages ranged from 9 to 12 years, with a mean age of 10.4 years ($SD = 1.13$). Most mothers (76%) were heads of single-parent households; 55% mothers reported household incomes below the Federal poverty line. About three-quarters (77%) of girls and their mothers had personal computers at home.

Procedure—Randomly, one site was selected as the intervention arm (42 mother-daughter pairs), with the other site serving as a control arm (44 mother-daughter pairs). Sites were compared on participants' demographic background, household composition, and socioeconomic status. According to parametric and nonparametric analyses, sites did not differ

on these characteristics. Sites also provided comparable social welfare programs, were similarly staffed, and served roughly the same numbers and types of client populations. Consenting girls and mothers were pretested, and those in the intervention arm received intervention. Participants in both arms completed posttest and follow-up measurements, respectively, 3 weeks and 3 months following intervention.

Measures—Demographic and tracking information. At pretest, girls and mothers reported their ages, addresses, other contact information, and background information including their household composition and experience with and ownership of personal computers. To assist with tracking for posttest and follow-up measurements, each participant gave the addresses and telephone numbers for two friends not in her household.

Communication. At each measurement, participants answered a 38-item questionnaire about recent mother-daughter communication patterns (Add Health, 2003). Likert-scaled items asked participants to rate the extent to which mothers guided daughters' decisions and behavior regarding such areas as curfew times, friendships, dating, clothing choices, television watching, bedtimes, family meals, educational plans, religious participation, and education and to rate their discussions about personal problems, recreational choices, and involvement in family events, activities, and rituals. This questionnaire has been tested with a national sample of girls in grades 7 through 12 and their mothers (Sieving et al., 2001). Its alpha reliability ranges from 0.81 to 0.85.

Closeness. Also at every measurement, participants answered questions about their openness, interest, affection, comfort, closeness, and confidence with each other (Dickerson & Crase, 2005). Likert items on the measure have been tested with diverse samples of girls aged 10 to 18 years and their mothers. Alpha reliability is 0.89. Intervention Program

Grounded in family interaction theory, the program aimed to enhance the quality of the mother-daughter relationship (Brook, Brook, Gordon, Whiteman, & Cohen, 1990). Each of five intervention modules focused on rapport building as a foundation of positive communication, interpersonal relationships, and respect between girls and their mothers. Programmed onto a CD-ROM, intervention content was delivered through animated graphics and voice-over narration. Each module was introduced and demonstrated by characters portraying an urban Black adolescent girl and her mother. A Black actress narrated the modules. At the beginning of each module, participants watched typical domestic situations involving communication and mother-daughter relationships and saw how these situations could be improved. Participants then engaged in exercises designed to integrate the content into their relationship.

Illustrative exercises covered in the program addressed the importance of mothers and daughters listening to each other, spending time together, understanding one another's personality, negotiating for mutually agreeable outcomes, and giving one another gifts of time, compliments, and personal favors. For example, in the gift giving exercise, mothers and daughters identified compliments they could give one another. One party would turn her back to the screen while the other party used the mouse to drag five "gifts" - in the form of praise statements - to a wrapped box icon. The first party then turned around and clicked on the wrapped box to reveal and hear, one by one, each chosen compliment. Following the activity, mothers and daughters shared with one another how the gift exchanges made them feel, changed their perceptions of one another, and could become part of their lives.

During intervention program delivery, mother-daughter dyads were provided with a personal computer in a private area. Seated next to one another, girls and their mothers completed each module independently, yet with assistance from research staff to trouble-shoot as necessary.

Intervention fidelity was monitored by trained observers and controls programmed into the modules. Program controls required participants to complete each exercise within a prescribed time period and would not let participants advance to a new module until the prior module was accurately finished. Standing several feet behind the participants and facing the computer screen, research assistant observers watched two dyads of mothers and daughters at a time, and unobtrusively monitored their interactions with the program and with each other. In particular, observers noted whether both participants were sharing equally responsibilities for advancing the program, were engaging in the modules appropriately, and were finishing certain exercises according to preset time periods visually depicted by a timer shown on the computer screen.

Intervention arm participants completed process measures following their receipt of the program. Anonymously, girls and mothers rated the value of and their comfort with the intervention modules, detailed what they would change about the program, and indicated whether they would recommend it to their friends.

Results

Fidelity Checks—By virtue of controls built into the program, all intervention arm participants completed all modules. Observations of mother-daughter dyads indicated that each intervention arm participant complied with instructions, that girls and mothers shared equally in advancing the program, and that participants remained on task. On two occasions, research assistants needed to remind participants to complete an exercise within the specified time frame.

Outcome Findings—Mean scores and standard deviations for girls and mothers in both arms on communication and closeness measures appear in Table 1. Pretest scores did not differ between arms for girls or for mothers on either measure. Repeated measures ANOVA on outcome data revealed an arm X time interaction on girls' communication scores, $F(1, 83) = 3.87, p < .05$. By ANCOVA, with pretest scores as covariates, following their receipt of the program, girls in the intervention arm more than control arm girls reported improved communication with their mothers at posttest, $F(1, 84) = 4.05, p < .04$. Repeated measures ANOVA on girls' closeness measurement scores showed an arm X time interaction, $F(1, 82) = 9.21, p < .003$. Relative to control girls and at posttest, girls who received intervention were closer to their mothers, $F(1, 82) = 9.51, p < .003$.

Repeated measures ANOVA on mothers' communication measurement scores was significant for an arm X time interaction, $F(1, 81) = 9.78, p < .002$. At posttest, after participating in the CD-ROM program, and compared to control arm mothers, intervention arm mothers reported more positive patterns of communication with their daughters, $F(1, 82) = 9.72, p < .003$. Repeated measures ANOVA on mothers' scores from the closeness measure showed an arm X time interaction, $F(1, 82) = 9.93, p < .002$. Intervention mothers were closer to their daughters relative to control mothers at posttest, $F(1, 83) = 10.03, p < .002$.

At 3-month follow-up, communication and closeness score differences between intervention arm girls and control arm girls failed to reach significance. At follow-up and relative to control arm mothers, intervention arm mothers reported more positive communications with their daughters, $F(1, 81) = 5.89, p < .017$. On the 3-month follow-up measure of perceived closeness to their daughters, mothers who had earlier received intervention continued to improve relative to control mothers, $F(1, 82) = 6.68, p < .012$.

Process Findings—Participants rated the program favorably on several parameters (Table 2). Girls and mothers did not differ in their opinions of: a) whether the program improved their relationship or was useful for their relationship; b) their enjoyment of the program; and c) their comfort in receiving and navigating the program via CD-ROM. More mothers than daughters

reported that they would recommend the program to others, Kruskal-Wallis $X^2(1) = 7.53, p < .006$.

Asked about their favorite intervention component, 43% of the girls identified the gift giving exercise, 29% said they most enjoyed content that focused on spending time with their mothers, and 19% identified the personality assessment exercise as most enjoyable. Mothers' responses to the same question revealed that 37% favored the personality assessment, 28% said that they most enjoyed the gift giving exercise, and 24% identified spending time with their daughters as their favorite content. Asked what they would change about the program, 48% of girls and 60% of mothers said "Nothing."

Discussion

Study findings lend modest support to the potential of a computer-delivered, mother-daughter intervention to strengthen certain protective factors among Black adolescent girls that are associated with reduced risks for substance abuse. The study suggests that a brief, focused intervention program can positively affect mother-daughter communication and closeness - both of which can protect girls against early use of tobacco, alcohol, and drugs. That mothers maintained their gains from the program at 3-month follow-up enhances its potential to improve mother-daughter communication, respect, and understanding. This improvement may nurture and sustain channels through which mothers can influence their daughters and through which daughters can share confidences, raise problems, and ask for guidance.

By building or rekindling the parent-child bond, family approaches can tap powerful and readily accessed resources. When those approaches appeal expressly to one gender, adolescents who might not gravitate toward substance abuse prevention programs can be reached and engaged. Parents too may be more inclined to take part in intervention aimed at one parent and child gender. Surprisingly in this study, mothers gave even higher ratings than their daughters as to whether they would recommend the intervention program to friends. Indeed, mothers - but not girls - continued to demonstrate gains in communication and closeness at 3-month, suggesting that they derived greater benefit from the program. Delivering intervention via a CD-ROM module, moreover, may have achieved a level of fidelity, mother-daughter engagement, and cost-savings not possible with traditional prevention programs.

The study has weaknesses. Focused on building rapport, the intervention program had narrow objectives, limited scope, and employed relatively uncomplicated computer programming. Outcome measures assessed communication and closeness variables only - not the ultimate outcomes of substance abuse behavior. The study sample, albeit representing at-risk urban youth, was small and comprised solely of Black Americans. These limitations make the study preliminary and more heuristic than definitive.

The study addressed three under-researched areas in the emerging science of drug abuse prevention: gender-specific approaches, parent involvement, and computer-mediated intervention. Prevention approaches specific to adolescent girls are warranted and timely. Girls face particular risks, can draw upon special and significant protective factors, and have their own important reasons for avoiding problems with tobacco, alcohol, and drugs. Involving parents in prevention programming is supported by data and the literature, and is logical. Parents can extend intervention effects into youths' homes and provide continuity to translate prevention knowledge, concepts, and skills into their children's everyday realities. Computer-mediated interventions for preventing drug abuse offer several benefits: easy access, wide availability, low cost, high fidelity, individual tailoring, and end-user appeal and engagement.

The study's data lay the foundation for additional work to advance the science of substance abuse prevention program design and delivery. Because the study engaged only girls and

mothers, the design cannot rule out the possibility that the intervention program would similarly impact adolescent boys and fathers. Future experiments might profitably isolate gender-specific and parent-involvement foci of such prevention programs. Likewise, because the study's all-Black sample does not permit conclusions about outcome effects with members of other ethnic-racial groups, further research could determine whether the program is useful for youths and parents from White, Hispanic, Asian, and other backgrounds. Equally intriguing are unanswered questions about the impact of computer-delivered prevention programs aimed at parents alone - given that nearly all tests of such modes of intervention delivery have exclusively engaged youth. Perhaps data reported here will stimulate new research on innovative approaches to prevention programming.

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Table 1
Pretest, Posttest, and Follow-up Scores on Daughters' and Mothers' Outcome Variables

	Pretest		Posttest		Follow-up	
	Intervention (<i>n</i> = 42)	Control (<i>n</i> = 44)	Intervention (<i>n</i> = 42)	Control (<i>n</i> = 44)	Intervention (<i>n</i> = 42)	Control (<i>n</i> = 44)
Outcome Variables: Daughters	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Communication with mother	4.51 (1.22)	4.58 (1.41)	4.70 (1.41)	4.31 (1.33)	4.79 (1.41)	4.52 (1.27)
Closeness to mother	4.92 (1.32)	5.31 (0.83)	5.45 (0.75)	5.11 (1.13)	5.58 (0.90)	5.19 (1.18)
Outcome Variables: Mothers						
Communication with daughter	3.39 (1.48)	3.61 (1.43)	4.05 (1.43)	3.48 (1.58)	4.58 (1.36)	3.13 (1.56)
Closeness to daughter	4.04 (1.18)	4.61 (1.06)	4.45 (0.99)	4.45 (1.13)	4.93 (.93)	4.48 (.85)

Table 2
CD-ROM Program Ratings by Intervention Arm Daughters and Mothers

Rated parameter ^a	Daughters (<i>n</i> = 42)		Mothers (<i>n</i> = 42)	
	M	(SD)	M	(SD)
Program improved mother-daughter relationship	5.46	(1.01)	5.38	(1.01)
Learned information useful for mother-daughter relationship	5.30	(1.43)	5.81	(1.44)
Enjoyed intervention program	5.74	(0.80)	5.83	(0.44)
Program relevant to mother-daughter relationship ^b	—	—	5.41	(1.04)
Would recommend program to friends	5.61	(1.00)	5.98	(0.15)
Comfortable receiving program via CD-ROM	5.72	(0.83)	5.83	(0.66)
Comfortable navigating program	5.70	(0.70)	5.64	(0.91)

^a Note. All parameters rated on 6-point scale where 6 = “Strongly Agree” and 1 = “Strongly Disagree.”

^b This item did not appear on girls’ post-intervention questionnaire.