Childhood Behavior Problems Linked to Sexual Risk Taking in Young Adulthood: A Birth Cohort Study

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ABSTRACT

Objective: To study whether behavioral and emotional problems during childhood predicted early sexual debut, risky sex at age 21 years, and sexually transmitted infections up to age 21 years. Some possible mediational pathways were also explored. **Method:** Participants were enrolled in the Dunedin Multidisciplinary Health and Development Study (n = 1,037), a prospective, longitudinal study of a New Zealand birth cohort born in 1972–1973. Data obtained at ages 5, 7, 9, 11, 13, 15, and 21 years were used. Adjustment was made for gender, socioeconomic status, parenting factors, and residence changes. **Results:** High levels of antisocial behavior between age 5 and 11 years were associated with increased odds of early sexual debut (adjusted odds ratio [AOR] 2.17, 95% confidence [CI] 1.34–3.54) and risky sex (AOR 1.88, 95% CI 1.04–3.40). No relationship was observed between hyperactivity and later sexual health outcomes. In contrast, high levels of anxiety were associated with reduced odds of risky sex (AOR 0.45, 95% CI 0.25–0.80) and sexually transmitted infections (AOR 0.34, 95% CI 0.17–0.70). Involvement with delinquent peers explained some of the association between antisocial behavior and early sexual debut and risky sex. A poor relationship with parents also explained some of the association between antisocial behavior and early sexual debut. **Conclusions:** The findings demonstrate links between behavioral and emotional problems occurring early in life and later deleterious sexual health outcomes. Targeting antisocial behavior and teaching accurate appraisals of danger during childhood may help mitigate these negative consequences. *J. Am. Acad. Child Adolesc. Psychiatry*, 2007;46(10):1272–1279.

Key Words: antisocial, anxiety, risky sex, early sexual debut, sexually transmitted infections.

Studies among high-risk samples as well as cross-sectional general population studies show an association between mental and sexual health outcomes (e.g., Capaldi et al., 2002; Dishion, 2000; Donenberg et al., 2001; Lowry et al., 1994; Ramrakha et al., 2000; Stiffman et al., 1992; Tubman et al., 2003; Vener and Stewart, 1974). Some have interpreted these associations to suggest that poor mental health leads to high-risk sexual behaviors as well as sexually transmitted infections (STIs) and unwanted pregnancies (e.g., Capaldi et al., 2002; Kessler et al., 1997; Lehrer et al., 2006). Yet few rigorous examinations of these associations have been conducted using longitudinal prospective designs to establish temporality, or what may mediate relationships, if in fact they exist. To address these issues, we investigated the relationship between childhood behavioral and emotional problems and later sexual behavior and outcome in the Dunedin Multidisciplinary Health and Development Study, a community-based birth cohort.

Previous findings suggest that childhood and adolescent behavioral problems may be associated with specific sexual risk outcomes. For example,

Accepted May 3, 2007.

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Work on this article was supported by grants from the NIMH (MH49414 and MH45070). The authors thank the Health Research Council of New Zealand for its long-term funding of the Dunedin Study. The authors thank Richie Poulton, Director of the Dunedin Study, for valuable comments on earlier drafts of this article. The authors are indebted to Phil Silva, founder of the study, and the study members and their families for their long-term involvement.

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DOI: 10.1097/chi.0b013e3180f6340e

Woodward and Fergusson (1999) found that conduct problems at age 8 years were associated with increased rates of pregnancy by age 18 years. Females who scored in the top 10% for conduct problems were 5.3 times more likely to be pregnant by age 18 years compared with the lowest 50% on this measure. Furthermore, in the Dunedin Study, conduct disorder at age 15 years was linked to more lifetime sexual partners, high rates of STIs, early pregnancy, cohabitation with multiple partners by age 21 years (Bardone et al., 1996, 1998) and early sex (i.e., before age 16 years; Paul et al., 2000). With the exception of one weak association between adolescent depression and early pregnancy (Bardone et al., 1996), these findings point to the strong relationship between externalizing disorders and risky sexual behavior. Nevertheless, cross-sectional findings from this study at age 21 years also suggest a relationship with disorders from the internalizing spectrum (Ramrakha et al., 2000), which is consistent with the results of another population-based study that found associations with psychiatric disorder more generally (Tubman et al., 2003).

Methodological limitations in previous research have prevented strong conclusions about the nature of the association between psychiatric disorders and sexual health outcomes. Limitations include use of nonstandardized measures of psychiatric disorder, measurement of a restricted range of disorders, cross-sectional, retrospective designs, and overreliance on clinic or high-risk samples. The present study aimed to address these limitations by examining sexual outcomes for those with childhood problems, assessed prospectively on multiple occasions between the ages of 5 and 11 years. Specifically, we tested whether a range of early behavioral problems between the ages of 5 and 11 years were associated with the likelihood of engaging in sexual intercourse before age 16 years, risky sexual behavior at age 21 years, and STIs by age 21 years. Furthermore, where associations were found, we investigated whether these were mediated by involvement with delinquent peers or a poor relationship with parents during adolescence.

METHOD

Participants

Participants were members of the Dunedin Study, which has investigated the health and behavior of a cohort born during a 1-year period between April 1, 1972 and March 31, 1973 in Dunedin, a city of approximately 120,000 on New Zealand's South Island. The cohort was established at age 3 years when the children were traced for follow-up and 91% (n = 1,037) of the eligible children (i.e., those still resident in the province; n = 1,139) participated in the assessment. The study members were assessed at 2-year intervals until age 15 and thereafter at ages 18 and 21. The numbers seen at each assessment phase are as follows: age 5, n = 991/1,037 (96% of living sample); age 7, 954/1,035 (92%); age 9, 955/1,035 (92%); age 11, 925/1,033 (90%); age 13, 850/1031 (82%); age 15, 976/1,029 (95%); age 18, 993/1,027 (97%); and age 21, 992/1,020 (97%). Ethical approval was obtained from the Otago Ethics Committee and confidentiality was ensured for each component of the assessment.

Measures

Childhood Behavior. At the age 5-, 7-, 9-, and 11-year assessments, parents and teachers were asked to complete the Rutter Child Scales (Rutter et al., 1970). These scales consist of the 31-item parent and 26-item teacher scales about the child's behavior, with the parents responding to additional questions about behaviors occurring in the home. The items are scored on a 3-point scale: 0 (does not apply), 1 (applies somewhat), and 2 (certainly applies). These items were used to form subscales measuring antisocial behavior defined as fighting, bullying, irritability, not being liked, disobedience, and destructiveness (e.g., frequently fights or is extremely quarrelsome with other children); hyperactivity defined as restlessness, squirminess, poor concentration, inability to settle (e.g., restless, has difficulty staying seated for long), and anxiety (worry/fearful) defined as worry, fearfulness, being miserable, fussy, and solitary (e.g., often worried, worries about many things). Reliability and validity of this scale in the Dunedin Study has been described by McGee et al., 1985. The intraclass correlation coefficients across the four assessment phases were as follows: for antisocial, parents = 0.84, teachers = 0.77; for hyperactivity, parents = 0.82, teachers = 0.80; and for anxiety, parents = 0.80, teachers = 0.55. An intraclass correlation coefficient of 0.55 (anxiety for teachers) is regarded as fair to good reliability and >0.75 (for all other measures) excellent (Fleiss, 1986). A single index was generated for each child by averaging the parent and teacher reports across the four assessments. Aggregated scores were used because they are more stable and representative than single reports (Rushton et al., 1993) and also because parents and teachers provide complementary information as informants (Loeber et al., 1990).

Sexual Health Outcomes. Sexual behavior was assessed at age 21 years with a questionnaire based on the 1990 British National Survey of Sexual Attitudes and Lifestyles (Johnson et al., 1994). Questions were presented by computer, with an interviewer present who could not see the study members' responses, but was available to assist. The following measures were used to assess sexual health outcomes:

1. Early Sexual Intercourse: Study members were asked about their age at first intercourse (hereafter "early sexual debut"). Study members who had sexual intercourse before age 16 years were considered to have had early sexual debut. This cutoff was chosen because age 16 is the legal age for consent for sexual intercourse in New Zealand. Of the sample, 32.9% (27.5% males and 31.7% females) reported having sex before 16 years.
2. Risky Sexual Behavior: At age 21 years, those who reported having sexual intercourse with three or more different partners

in the past year and "never or only sometimes" using a condom were defined as engaging in risky sexual behavior (hereafter "risky sex"). A total of 246 (29.5%) study members reported three or more partners in the past year, and 551 (65.9%) reported condom use as either "never" or "sometimes" in the past year. A combination of both factors were used to create the risky sex variable. Condom use reduces the risk of STIs (Holmes et al., 2004) and there is a marked increase in the incidence of sexually transmitted infections in those who have had three or more partners in the previous 12 months in this cohort (Dickson et al., 1996).

3. Cumulative Incidence of STIs: Study members were introduced to questions about STIs with the statement: "There are some diseases, or infections, that can be passed on during sex. These are called sexually transmitted diseases or STDs." Common examples were given, and participants who responded positively were questioned on how often this had occurred in their life (recurrent episodes of the same infection were treated as one disease).

Confounders. The following measures were identified from a review of the literature as potential confounders in the relationship between early behavior and later sexual behavior:

- Sex: Adjustment for sex was made to account for the sex differences in the prevalence of mental health problems and risky sexual behavior.
- Socioeconomic Status: The socioeconomic status of the study members' families was measured using the Elley and Irving (1976) scale, which codes occupations into six categories based on education and income, ranging from unskilled labor (scored 6) to professional (scored 1). The average of the measurements obtained from birth to 15 years of the highest socioeconomic status of either parent was used.
- Teen Mother: Study members whose mothers were younger than 20 years of age at the birth of their first child were defined as having a teen mother.
- Single Parent, Parental Changes, and Residence Changes: Questions about changes to family structure (e.g., separation, parent death, parent's new partner moving in, living with single parent or relatives, in foster care) and residence changes were used to assess the number of years spent in a single-parent household and the number of parental and residential changes experienced by each study member.
- Religion: At age 11 years, study members were asked about religious activities, e.g., participation at Sunday school, attendance at church, and at any church youth group.

Mediators. The following measures were identified from a review of the literature as potential mediators (i.e., explanatory factors) between early behavior and later sexual behavior:

- Peer Delinquency: Affiliation with delinquent peers is a significant predictor of adolescent sexual risk behavior. Studies have shown that peer influence partially mediated the influence of externalizing problems on sexual risk taking and in particular the association between conduct problems and risky sex (Donenberg et al., 2001; Fergusson and Woodward, 2000). Involvement with delinquent peers at ages 13 and 15 years was measured using 10 items from the Revised Behavior Problem checklist (e.g., steals in company with others; Quay and Petersen, 1987).
- Relationship With Parents: Relationship with parents has also been associated with sexual risk taking. For example, a study by Fergusson and Woodward (2000) found that a poor relationship with parents was a mediating factor in the association between conduct problems and risky sex. The relationship with parents was measured using a 12-item version of the Inventory of Parent and Peer Attachment (Armsden and Greenberg, 1987). Items are rated on a 4-point scale, 1 (almost never/never) to 4 (almost always/always) and cover three main areas: communication (e.g., "I tell my parents about my problems and troubles"), trust ("My parents respect my feelings"), and alienation ("Talking over my problems with my parents makes me feel ashamed or foolish"). Combined scores from ages 13 and 15 were used. The reliability and validity of this scale are described elsewhere (Nada-Raja et al., 1992).

Data Analysis

To ensure no temporal overlap between the predictor and the outcome measures, those who reported sexual intercourse before age 11 years ($n = 6$) were excluded from the analyses. Unadjusted and adjusted logistic regression was used to examine the relationship between childhood behavior and later sexual health outcomes. The Rutter scales (antisocial, hyperactive, and anxiety) were divided into quartiles and the lowest quartile was used as the reference group. Odds ratios and 95% confidence intervals (CIs) are reported. Adjusted analyses included sex, socioeconomic status, teen mother, single parent, parental changes, residence changes, and religion in the model. Two-tailed tests were used and p values $<.05$ were considered statistically significant. Total sample size in the analyses varied between 824 and 927. Sensitivity analyses revealed that missing data did not affect the observed associations.

Mediation was assessed in two ways: First, following Baron and Kenny (1986), a variable was considered to be a mediator if it was significantly related to both predictor and outcome and if its inclusion in the model reduced the significance of the predictor. Thus, we fitted logistic regression models with and without the potential mediator and considered the change in odds ratio and statistical significance of the predictor (Rutter scales). Because the method of Baron and Kenny does not apply as well to logistic regression as linear regression (MacKinnon and Dwyer, 1993), we also used a second method, the Sobel test (Sobel, 1982). This amounted to conducting a formal test of the significance of change in the probability of the outcome attributable to the mediator. Second, in addition to adjusting for sex to take into account its potentially confounding role, we also tested for interaction by sex with each of the predictor variables.

RESULTS

Descriptive statistics for the childhood behavioral measures are presented in Table 1. The associations between childhood behavior problems and subsequent sexual health outcomes are presented in Table 2. In adjusted analyses, the high antisocial children had approximately two times the odds of having early sexual debut and engaging in risky sex as compared to the low group. Those with low to medium antisocial scores also had approximately two times the odds of engaging in risky sex. There was no significant association between

TABLE 1
Numbers and Percentage in the Rutter Child Scale Quartiles With the Sexual Outcomes

			Early Sexual Debut[a]		Sexually Transmitted Infections[a]		Risky Sexual Behavior[a]	
			Total *n* = 268 (32.4%)	Female *n* = 142 (34.1%)	Total *n* = 151 (18.3%)	Female *n* = 69 (14.1%)	Total *n* = 104 (12.6%)	Female *n* = 70 (16.8%)
Rutter Child Scales	*N*	Female, *n*	*n* (%)	Female, *n* (%)[b]	*n*, (%)[b]	Female, *n*(%)[b]	*n* (%)[b]	Female, *n* (%)[b]
Antisocial								
Low	208	132	51 (24.5)	37 (28.0)	24 (11.5)	12 (9.1)	27 (13.0)	21 (15.9)
Low-medium	207	108	61 (29.5)	36 (33.3)	41 (19.8)	18 (16.7)	30 (14.6)	25 (23.6)
Medium-high	206	101	64 (31.1)	34 (33.7)	39 (18.9)	18 (17.8)	19 (9.2)	10 (9.9)
High	204	74	92 (45.1)	35 (47.3)	47 (23.3)	11 (15.1)	28 (14.0)	14 (19.2)
Hyperactivity								
Low	180	124	45 (25.0)	36 (29.0)	27 (15.0)	20 (16.1)	29 (16.1)	24 (19.4)
Low-medium	208	115	63 (30.3)	41 (35.7)	41 (19.7)	19 (16.5)	27 (13.0)	21 (18.4)
Medium-high	227	105	84 (37.0)	39 (37.1)	40 (17.6)	14 (13.3)	29 (12.8)	17 (16.2)
High	203	68	74 (36.5)	24 (35.3)	41 (20.2)	5 (7.4)	18 (9.0)	7 (10.4)
Anxiety								
Low	194	79	64 (33.0)	30 (38.0)	49 (25.3)	20 (25.3)	33 (17.2)	17 (21.5)
Low-medium	230	123	75 (32.6)	44 (35.8)	43 (18.7)	16 (13.0)	25 (10.9)	20 (16.3)
Medium-high	209	110	70 (33.5)	33 (30.0)	33 (15.8)	13 (11.8)	27 (13.0)	20 (18.3)
High	185	100	57 (30.8)	33 (33.0)	24 (13.0)	9 (9.0)	18 (9.8)	12 (12.1)

Note: Excluded are those who reported having sexual intercourse before age 11 years (*n* = 6).
[a] The numbers reflect total available data for the Rutter Child Scales and sexual outcomes.
[b] The percentages are for the row values (i.e., the denominators are the two left-most columns).

hyperactivity and any of the sexual health outcomes following adjustment for all potential confounders. In contrast, anxious children had significantly reduced odds of engaging in risky sex and reporting STIs. In other words, higher levels of anxiety were associated with fewer negative sexual health outcomes later in life.

Tests for interactions by gender showed that the associations between childhood behavior and risky sex outcomes were not moderated by gender.

Mediation Results

In the first set of mediational analyses, involvement with delinquent peers emerged as a potential mediator of the associations between antisocial behavior and early sexual debut and risky sex, and a poor relationship with parents as a potential mediator of antisocial behavior and early sexual debut (data not shown). Neither factor emerged as potential mediators for the significant associations found with anxiety. We then tested whether there was a change in the odds ratios (and significance level) with the inclusion of the potential mediator in the model.

For early sexual debut, adjustment for involvement with delinquent peers reduced the odds of children with high antisocial scores (compared to low) engaging in early sexual debut by 25%, from 2.17 to 1.62 (95% CI 0.97–2.72), with the association no longer statistically significant. Similarly, the Sobel test showed that peer delinquency significantly decreased the probability of early sexual debut from .050 to .027 for each increase in antisocial quartile ($p < .001$), indicating a mediational role for peer delinquency. Adjustment for poor relationship with parents resulted in 9% reduction in the odds of children with high antisocial scores engaging in early sexual debut, from 2.17 to 1.97 (95% CI 1.19–3.27), although the association remained significant. The Sobel test confirmed that parental relationship significantly affected the association between antisocial and early sexual debut, decreasing the probability of early sexual debut from .049 to .040 ($p = .003$) for each increase in antisocial quartile.

In relation to risky sex, adjustment for peer delinquency reduced the odds of children with high antisocial scores engaging in risky sex by 19%, from 1.88 to 1.52 (95% CI 0.82–2.80), with the association no longer statistically significant. A mediational role for peer delinquency was confirmed by the Sobel test. That is, for each increase in antisocial quartile, the inclusion

TABLE 2

Odds Ratios (and 95% Confidence Intervals) for the Association Between Childhood Behavior (Between 5 and 11 Years) and Sexual Outcomes

	Early Sexual Debut			Risky Sexual Behavior			Sexually Transmitted Infections		
Rutter Child Scales	Unadjusted	Adjusted for Sex	Adjusted for All Confounders[a]	Unadjusted	Adjusted for Sex	Adjusted for All Confounders[a]	Unadjusted	Adjusted for Sex	Adjusted for All Confounders[a]
Antisocial									
Low	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Low-medium	1.29 (0.83 – 1.99)	1.33 (0.86–2.06)	1.33 (0.82– 2.15)	1.89 (1.10– 3.27)*	1.80 (1.04–3.12)*	1.92 (1.08– 3.40)*	1.15 (0.66 –2.01)	1.27 (0.72–2.23)	1.20 (0.65–2.24)
Medium-high	1.39 (0.90–2.14)	1.45 (0.94–2.25)	1.38 (0.86–2.23)	1.79 (1.03– 3.10)*	1.68 (0.96– 2.92)	1.58 (0.88– 2.84)	0.68 (0.37 –1.27)	0.76 (0.41–1.42)	0.73 (0.37– 1.44)
High	2.53 (1.66 – 3.85)*	2.76 (1.80– 4.25)*	2.17 (1.34–3.54)*	2.31 (1.35 –3.95)*	2.04 (1.18–3.52)*	1.88 (1.04–3.40)*	1.09 (0.62 –1.93)	1.37 (0.76–2.46)	0.91 (0.46– 1.82)
Hyperactivity									
Low	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Low-medium	1.30 (0.83–2.04)	1.35 (0.86–2.12)	1.19 (0.73–1.94)	1.39 (0.82– 2.37)	1.29 (0.75–2.21)	1.48 (0.83–2.64)	0.78 (0.44– 1.38)	0.85 (0.48–1.52)	0.95 (0.50–1.80)
Medium-high	1.76 (1.14–2.71)*	1.87 (1.21–2.90)*	1.52 (0.94–2.47)	1.21 (0.71–2.07)	1.07 (0.62– 1.84)	1.24 (0.69–2.42)	0.76 (0.44– 1.33)	0.89 (0.50–1.57)	1.06 (0.56–2.00)
High	1.72 (1.11–2.68)*	1.89 (1.19–2.98)*	1.31 (0.78–2.20)	1.43 (0.84 –2.45)	1.18 (0.68–2.06)	1.39 (0.75–2.57)	0.52 (0.28– 0.97)*	0.66 (0.35–1.26)	0.56 (0.26–1.22)
Anxiety									
Low	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Low-medium	0.98 (0.65–1.48)	0.96 (0.64–1.45)	0.86 (0.54–1.35)	0.68 (0.43– 1.08)	0.72 (0.45–1.16)	0.71 (0.43– 1.18)	0.59 (0.34– 1.03)	0.52 (0.30– 0.92)*	0.46 (0.24–0.86)*
Medium-high	1.02 (0.68 –1.55)	1.01 (0.66– 1.53)	0.78 (0.49– 1.24)	0.56 (0.34– 0.91)*	0.59 (0.36– 0.96)*	0.60 (0.35– 1.03)	0.72 (0.41– 1.25)	0.65 (0.37– 1.13)	0.57 (0.30– 1.06)
High	0.91 (0.59 –1.39)	0.89 (0.57–1.37)	0.70 (0.43– 1.14)	0.44 (0.26 –0.76)*	0.47 (0.27– 0.81)*	0.45 (0.25– 0.80)*	0.53 (0.28 –0.97)*	0.47 (0.25– 0.87)*	0.34 (0.17– 0.70)*

Note: Excluded are those who reported sexual intercourse before age 11 years ($n = 6$). Sample size varied between 824 and 927. Sensitivity analyses revealed that missing data did not affect the observed associations.

[a] Adjusted for the following potential confounding variables: gender, socioeconomic status, teen mother, single parent, parental changes, residence changes, and religion.

* Significant at $p < .05$.

of peer delinquency decreased the probability of having risky sex from .022 to .012, $p < .001$.

DISCUSSION

Our findings show that higher levels of childhood antisocial behavior between ages 5 and 11 years were associated with an increased likelihood of early sexual debut and high-risk sexual behavior by age 21 years. This is consistent with research demonstrating an association in adolescence (e.g., Capaldi et al., 1996; Fergusson and Woodward, 2000) and cross-sectionally in young adulthood within the same cohort (Ramrakha et al., 2000), but suggests that this relationship emerges earlier in the life course. In contrast, childhood hyperactivity was unrelated to any of the sexual outcomes that we measured. Higher levels of childhood anxiety were associated with a significant decrease in the likelihood of engaging in risky sexual behavior and contracting STIs by age 21 years. In particular, it was the lowest level of anxiety that was associated with the greatest risk of subsequent risky sexual behavior and acquisition of STIs. Whereas involvement with delinquent peers and, to a lesser extent, poor relationship with parents partially mediated the association between childhood antisocial behavior and early sexual debut and risky sex, they did not mediate the childhood anxiety–sexual outcome relationship. Although there are sex differences in the childhood behavior scores and sexual outcomes, there were no sex differences in the observed associations between the two (i.e., interactions of the risk factor and sex were not significant).

To our knowledge, this is the first study to examine this range of associations from early childhood to young adulthood, a peak period for sexual experimentation (Centers for Disease Control and Prevention, 1998). More important, this study was able to establish temporality by showing that the behavioral problems measured between ages 5 and 11 years preceded the onset of sexual behavior and were associated with risky sexual health outcomes in young adulthood.

The scales used in this study do not represent diagnosable conditions; nevertheless, they reflect dimensions of disturbed behavior (Elander and Rutter, 1996). Involvement with delinquent peers during adolescence may exacerbate this association, confirming studies showing the important influence of peers on adolescents' behavior. Furthermore, a loving and supportive relationship with parents may serve to weaken the influence of delinquent peers. This study adds to the body of evidence highlighting the importance of positive relationships with parents and parental supervision of children's behavior.

It is interesting to note that a strong and consistent relationship between childhood behavioral measures and later sexual outcomes was observed for low levels of childhood anxiety. Because some previous research suggests that high levels of antisocial behavior are associated with low levels of anxiety (e.g., Walker et al., 1991), we examined the overlap between these two groups to ensure that our measure of low anxiety was not simply a marker for high levels of antisocial behavior. The comparison between the lowest quartile anxiety group and the highest quartile antisocial group showed only an 11% overlap between the two groups. Moreover, the antisocial and anxiety scales were positively rather than negatively correlated ($r = 0.31$). Furthermore, unlike childhood antisocial behavior, there was no association between low childhood anxiety and early sexual debut. This suggests that these two measures were largely independent of one another.

One possible explanation for this association is informed by work from the anxiety disorders literature in which several theorists have emphasized the adaptive and survival relevance of anxiety and fear (Marks and Nesse, 1994; Poulton and Menzies, 2002). Most relevant for the present findings, Marks and Nesse (1994) posit the existence of hypoanxiety (i.e., too little anxiety) and make a strong case that hypoanxiety is a disorder that awaits formal description, although it is likely to be clinically relevant. They draw parallels with physical conditions in which pain sensation is all but absent, and high rates of injury result. In support, earlier findings from the Dunedin Study found that low levels of (height) fear were associated with more injurious falls in childhood (Poulton et al., 1998). Thus, theory and some preliminary evidence support the notion that low levels of anxiety/fear can have negative consequences. Data from this study showed that the negative consequences may also include risky sexual behavior (and its outcome, STIs).

Limitations

This study has limitations that should be taken into account when interpreting the data. First, the children

themselves did not report their own behavior between 5 and 11 years, whereas it is now known that children can be a good source of information, particularly for internalizing problems such as anxiety (Costello et al., 2003). Second, the age 21 measure of risky sexual behavior applied to the previous 12 months only and STIs were self-reported. Third, sexual behavior data were not collected prospectively before age 18. Fourth, we were only able to establish temporality but could not establish causation in a naturalistic study.

Clinical Implications

In this study antisocial behavior demonstrated as early as age 5 years was associated with important negative sexual outcomes in later life. Similarly, low levels of childhood anxiety were associated with later sexual risk taking and STIs. Both findings point to the potential value of early intervention and raise the hope of prevention for some of these deleterious outcomes. With regard to antisocial behavior, therapeutic nihilism has been replaced recently by guarded optimism with new evidence about the efficacy of early interventions for antisocial behavior (National Institutes of Health, 2004). It may be that improved sexual and reproductive health can be added to the long list of benefits that accrue from reductions in antisocial behavior. The relationship with low levels of anxiety (i.e., not only hypoanxiety), if replicated, suggests some interesting early intervention possibilities.

Our results, although preliminary, suggest that the target population comprises a significant proportion of youths; hence, any intervention efforts would need to be easily delivered to a wide audience. Intervention was not a focus of this study; however, in terms of content, strategies that are proven to promote rational appraisals of danger or risk-taking behavior may prove beneficial. One approach involves use of cognitive-behavioral techniques for teaching rational risk assessments. Previous research has shown that interactive programs aimed at adolescents engaging in risk-taking behavior have been effective (Tobler, 2000). This type of approach may be easily incorporated into school health education curricula delivered by computer-based programs containing contemporary storylines to which children can relate (e.g., *www.climateschools.tv*). Finally, focusing on delinquent peer networks, improving parental relationships, and targeting credible sexual health messages to adolescents may help reduce negative sexual outcomes in young adulthood.

Disclosure: The authors have no financial relationships to disclose.

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Eating in Larger Groups Increases Food Consumption Julie C. Lumeng, Katherine H. Hillman

Objective: To determine whether children's food consumption is increased by the size of the group of children in which they are eating. *Design:* Crossover study. *Setting:* University based preschool. *Participants:* 54 children, aged 2.5–6.5 years. *Interventions:* Each child ate a standardised snack in a group of three children, and in a group of nine children. *Main outcome measures:* Amount each individual child consumed, in grams. *Results:* Amount eaten and snack duration were correlated (r = 0.71). The association between group size and amount eaten differed in the short (<11.4 min) versus the long (≥11.4 min) snacks (p = 0.02 for the interaction between group size and snack duration). During short snacks, there was no effect of group size on amount eaten (16.7 (SD 11) g eaten in small groups vs 15.1 (6.6) g eaten in large groups, p = 0.42). During long snacks, large group size increased the amount eaten (34.5 (16) vs 26.5 (13.8), p = 0.02). The group size effect was partially explained by a shorter latency to begin eating, a faster eating rate and reduced social interaction in larger groups. *Conclusions:* Children consumed 30% more food when eating in a group of nine children than when eating in a group of three children during longer snacks. Social facilitation of food consumption operates in preschool-aged children. The group size effect merits consideration in creating eating behaviour interventions. **Arch Dis Child** 2007;92:384–387.