Predicting Sexual Initiation in a Prospective Cohort Study of Adolescents

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Objective: To determine whether a new scale measuring beliefs about postponing sexual initiation (PSI) predicts sexual initiation and whether the association between PSI and sexual initiation is mediated by intention to initiate sexual intercourse.

Design: Prospective cohort study.


Participants: A total of 11,448 adolescents aged 12 to 17 years who reported in 1999 that they had never had sexual intercourse.

Main Exposure: Beliefs and attitudes about PSI measured in 1999 (12-item scale, Cronbach’s α = 0.86). Higher PSI scale scores indicated stronger beliefs about postponing sex.

Outcome Measure: Sexual intercourse reported on the 2000 survey.

Results: The mean (SD) age of participants was 14.3 (1.5) years, and 94.4% were white. Of the participants, 7.5% of boys and 10.1% of girls initiated sexual intercourse between 1999 and 2000. The PSI scale score was inversely associated with intention to initiate sex and with sexual initiation in boys and girls (P < .001 for both). Intention to initiate sex was positively associated with sexual initiation (P < .001). In multivariate models, PSI scale scores were inversely associated with sexual intercourse initiation in boys (odds ratio, 0.90 for a 1-U increase in PSI scale score; 95% confidence interval, 0.87-0.93; P < .001) and girls (odds ratio, 0.91; 95% confidence interval, 0.89-0.93; P < .001). The strength of the association decreased when intention to initiate sexual intercourse was added to both models.

Conclusion: A new scale measuring beliefs and attitudes about PSI predicted sexual intercourse initiation in the next year, and intention to initiate sex mediated this association.


In the United States, 1 in 3 adolescents reports having had sexual intercourse by ninth grade, and almost 2 in 3 have had sexual intercourse by the end of high school.1 Early sexual intercourse initiation is associated with multiple sexual partners, which is a risk factor for acquisition of sexually transmitted infections, and lack of contraceptive use, which increases the risk for unplanned pregnancy.2,4 Increasing the proportion of adolescents who have never had intercourse is one of the 21 critical objectives for adolescent health in the United States, as outlined in Healthy Youth 2010.5 A greater understanding of the trajectories that lead to sexual intercourse initiation would be helpful in developing evidence-based interventions designed to postpone sexual activity in adolescents. Previous research has shown that individual, family, and community characteristics influence adolescent sexual intercourse initiation. After reviewing more than 400 studies on antecedents of sexual behavior in teenagers, Kirby6 and Kirby et al7 singled out adolescents’ beliefs, attitudes, and skills regarding sex as the factors most strongly associated with sexual intercourse initiation and potentially most amenable to change. For example, adolescents who have more permissive attitudes toward sex are more likely to have had sexual intercourse and adolescents who would like friends to perceive them as abstinent are less likely to have had sexual intercourse. However, little is understood about the mechanisms by which sexual beliefs, attitudes, and skills lead to sexual intercourse initiation.

To explore the mechanisms through which beliefs about sexual intercourse initiation impact sexual behaviors, we first developed and validated a scale to measure beliefs about postponing sexual initiation (PSI) based on theories of health behavior, including the Theory of Planned Behavior and Social Cognitive Theory.8

The aims of this study were as follows: (1) to determine whether beliefs about PSI predict sexual intercourse initiation in a national sample of adolescents and (2) to determine whether intention to initiate sexual intercourse mediates the association between beliefs and behaviors (ie, whether intention...
is a mechanism through which beliefs about PSI lead to sexual intercourse initiation).

METHODS

STUDY SAMPLE

The Growing Up Today Study (GUTS) is an ongoing longitudinal cohort study of US adolescents that was established in 1996 by recruiting children aged 9 to 14 years of women participating in the Nurses’ Health Study II, a longitudinal cohort study of more than 116,000 registered nurses. Initially, 34,174 nurses were contacted by letter and asked to provide contact information for their children and consent to their participation in GUTS. Questionnaires were then mailed to their children, and 9039 girls and 7843 boys returned completed questionnaires, indicating their assent to participate. Questionnaires are mailed annually to participants, with response rates varying from 81% to 87% for girls and from 67% to 81% for boys between 1997 and 1999.8 In 1999, in addition to questions on weight, height, dietary intake, and physical activity that had been included on earlier questionnaires, the PSI scale and new questions on sexual intentions and behavior were added to the annual survey. The GUTS was approved by the institutional review boards at Harvard School of Public Health and Brigham and Women’s Hospital. This study was also approved by the institutional review boards at Brigham and Women’s Hospital and Cincinnati Children’s Hospital Medical Center.

SURVEY MEASURES

The PSI scale is a 12-item theory-based scale based on Social Cognitive Theory10 and the Theory of Planned Behavior11 that was developed to measure adolescents’ beliefs and attitudes about postponing sexual intercourse. It has previously demonstrated good internal consistency reliability (Cronbach α=0.86 for girls and boys combined), content validity, factorial validity, and construct validity.1 Only those participants who indicated that they had not had sexual intercourse were asked to respond to the following item: “Many teenagers have decided not to have sexual intercourse yet. Please read the following list of reasons why teenagers have not had sexual intercourse, and mark how important each is for you.” The 12 reasons listed were each scored on a 3-point scale from 0 to 2, from “not important/does not apply” to “somewhat important” to “very important,” for a total possible scale score ranging from 0 to 24.1 The scale included from 2 to 5 reasons for each of 4 factors: (1) observational learning or control over initiation (ie, my partner does not want to have sex, my friends are not having sex, I do not know how to get birth control, no one has asked me, and I have not met the right person), (2) expectations regarding negative consequences (ie, I do not want to get pregnant or get someone pregnant and I do not want a sexually transmitted disease), (3) normative beliefs (ie, my parents are against it and my physician or nurse is against it), and (4) expectancies (ie, it is against my beliefs to have sex before marriage, I do not want a bad reputation, and I am not ready). A higher scale score indicated more positive beliefs about postponing intercourse. The 4 PSI subscales were determined by factor analysis and were in accord with the theoretical basis of the scale. Observational learning (learning that occurs by watching others’ behaviors), expectancies (values that an individual attributes to a behavior), and expectations about negative consequences are constructs from Social Cognitive Theory, whereas perceived control over behavior and normative beliefs (beliefs about how others would perceive a behavior) are constructs derived from the Theory of Planned Behavior.11

Intention to initiate sexual intercourse in 1999 was assessed using a 5-item Likert-type scale in response to the question, “How likely is it that you will have sexual intercourse in the next year?” This item was scored from 0 to 4, from “definitely will not” to “definitely will.” Participants rated their own Tanner stage using diagrams depicting pubic hair growth. Self-assessment of Tanner staging has been previously demonstrated to be feasible.2 We used age- and gender-specific comparisons to mean Tanner stage expressed in SD units relative to other GUTS participants to develop a variable for “early” (<–1 SD), “on time” (–1 to 1 SD), and “late” (>1 SD) developers.

Participants were asked to respond to the following question on the 1999 and 2000 GUTS surveys: “Have you ever had sexual intercourse?” Those who responded no in 1999 but yes in 2000 were classified as having initiated sexual intercourse.

ANALYSIS

All analyses were stratified by gender and conducted with SAS statistical software, version 8.2.10 We used univariate statistics and multivariate models to examine the relationships among PSI scale scores, intention to have intercourse, and sexual intercourse initiation. We used multivariate models to examine intention as a potential mediator of the association between PSI beliefs and sexual intercourse initiation (Figure 1). All multivariate models controlled for age and pubertal stage. All P values reported are 2-sided, with P<.05 considered statistically significant.

A variable functioning as a mediator explains the relationship between the independent variable and the dependent variable; it lies in the causal pathway. In contrast to a confounding variable, a mediator is considered to be the mechanism through which the independent variable leads to the dependent variable. In a mediational model, the independent variable is causally associated with the proposed mediator and the proposed mediator is causally associated with the dependent variable. To assess whether intention to initiate sexual intercourse mediates the association between PSI scale score (the independent variable) and sexual intercourse initiation (the dependent variable), we followed these steps, according to the method proposed by Baron and Kenny.11 First, we evaluated whether the PSI scale score was inversely and significantly associated with sexual intercourse initiation, whether the PSI scale score was inversely associated with intention to initiate intercourse, and whether intention to initiate intercourse was positively associated with sexual initiation. We then estimated a logistic regression model in which PSI scale score was the predictor variable and sexual intercourse initiation was the outcome variable. If all 3 of the listed associations were significant, and if the β coefficient (effect size) decreased and became nonsignificant when intention was included in the regression model in which the PSI scale score was the independent variable and sexual intercourse initiation was the dependent variable, then intention is...
RESULTS

In 1999, 12,414 participants completed the annual GUTS questionnaire. Most (92.2% [6486 girls and 4962 boys]) indicated that they had never had sexual intercourse and, therefore, were eligible to complete the PSI scale. A total of 7661 participants, 4662 girls (71.9% of those eligible) and 2999 boys (60.4% of those eligible) completed the PSI scale in 1999 and the follow-up survey in 2000 and were, therefore, eligible for the analysis. The mean age of participants in 1999 was 14.3 years (SD, 1.5 years), with ages ranging from 12 to 17 years. The sample was 94.4% white.

Of the 7661 participants included in the analyses, 7.5% of boys and 10.1% of girls initiated sexual intercourse between 1999 and 2000. Mean PSI scale scores were significantly lower in those who initiated intercourse compared with those who did not (Table 1). There were statistically significant differences between initiators and noninitiators for each of the PSI subscales, except for factor 2 (expectations regarding negative consequences of intercourse, such as pregnancy and sexually transmitted disease acquisition) (Table 1). Intention to initiate sex was higher in boys and girls who did, compared with those who did not, initiate sex (P < .001 for both) (Figure 2 and Figure 3). In boys and girls, PSI scale scores were inversely associated with intention to initiate sex (Spearman r = −0.31 for boys and girls combined) (Figure 4). In the multivariate models, which controlled for age and pubertal stage, a higher PSI scale score was inversely associated with sexual intercourse initiation in boys and girls, as shown in Table 2. Intention was a strong predictor of sexual intercourse initiation. Participants who indicated they definitely will not have intercourse in the next year were 98% less likely to have intercourse than those who reported they definitely will have intercourse in the next year (odds ratio, 0.02; 95% confidence interval, 0.01-0.06 for boys; 0.01-0.07 for girls), as shown in Table 2.

The association between PSI scale score and sexual intercourse initiation was attenuated when intention to initiate intercourse was added to these models. The coefficient decreased but remained significant when intention was included in the regression model, then intention is considered to be a partial mediator of the association.15

### Table 1. Beliefs and Attitudes About PSI and Intention to Initiate Sexual Intercourse in 1999 for Boys and Girls Who Initiated vs Did Not Initiate Intercourse in 2000

<table>
<thead>
<tr>
<th>Variable</th>
<th>Boys (n = 2999)</th>
<th></th>
<th></th>
<th></th>
<th>Girls (n = 4662)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initiators</td>
<td>Noninitiators</td>
<td>P Value</td>
<td>Initiators</td>
<td>Noninitiators</td>
<td>P Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score(^b)</td>
<td>10 (4)</td>
<td>14 (6)</td>
<td>&lt;.001</td>
<td>12 (4)</td>
<td>15 (5)</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscale score(^c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1 (observational learning or control)</td>
<td>4 (2)</td>
<td>5 (3)</td>
<td>&lt;.001</td>
<td>4 (3)</td>
<td>5 (3)</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (negative consequences)</td>
<td>3 (1)</td>
<td>4 (1)</td>
<td>.26</td>
<td>4 (1)</td>
<td>4 (1)</td>
<td>.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 (normative beliefs)</td>
<td>1 (1)</td>
<td>2 (1)</td>
<td>&lt;.001</td>
<td>2 (1)</td>
<td>2 (1)</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4 (expectancies)</td>
<td>2 (2)</td>
<td>3 (2)</td>
<td>&lt;.001</td>
<td>3 (2)</td>
<td>4 (2)</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention to initiate sex</td>
<td>2 (1)</td>
<td>1 (1)</td>
<td>&lt;.001</td>
<td>1 (1)</td>
<td>0 (1)</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: PSI, postponing sexual initiation.
\(^a\) Data are given as mean (SD).
\(^b\) Possible score ranges from 0 to 24.
\(^c\) Possible score ranges for each factor are as follows: factor 1, 0 to 10; factor 2, 0 to 4; factor 3, 0 to 4; and factor 4, 0 to 6.
\(^d\) Possible score ranges from 0 to 4.

![Figure 2. Intention to initiate sexual intercourse in 1999 for boys who did vs those who did not initiate sexual intercourse in 2000 (P < .001).](https://poa70075f2)

![Figure 3. Intention to initiate sexual intercourse in 1999 for girls who did vs those who did not initiate sexual intercourse in 2000 (P < .001).](https://poa70075f3)
efficiency decreased by 64% for boys and 78% for girls, supporting our hypothesis that intention mediates the association between PSI beliefs and sexual intercourse initiation. Intention seems to be a complete mediator of the association in girls and a partial mediator in boys.

In this sample of adolescents, beliefs and attitudes about PSI were associated with intention to initiate sexual intercourse at baseline and predicted sexual intercourse initiation 1 year later. Intention seems to mediate the association between PSI beliefs and initiation (ie, intention is a mechanism through which beliefs about PSI impact sexual intercourse initiation). This finding is consistent with our theoretical model.

To our knowledge, our study represents the first prospective analysis of these associations in a large national sample including early adolescents and is the first to use a mediational model to examine the associations between PSI beliefs, intention to initiate sexual intercourse, and sexual initiation. Our findings build on previous regional studies and studies of older adolescents that have shown that beliefs and attitudes about sexual behavior are highly predictive of sexual intercourse initiation. Some of these studies measured concepts derived from the Theory of Planned Behavior (attitudes and social norms) and Social Cognitive Theory (self-efficacy). Carvajal et al20 and Santelli et al21 found that individual positive attitudes and perceived peer norms about abstinence were key predictors of delayed sexual intercourse initiation in adolescents. O’Donnell et al22 demonstrated that not only are those with more positive individual attitudes and social norms toward intercourse more likely to have sex but those with stronger normative beliefs about peer sexual involvement are more likely to have sex at earlier ages. Kinsman et al23 and Stanton et al24 demonstrated that beliefs, including peer norms and perception of positive consequences of intercourse, are associated longitudinally with sexual intention and that intention is associated with sexual intercourse initiation.

Perceived negative consequences of intercourse (pregnancy and sexually transmitted diseases) were not predictive of sexual intercourse initiation behavior in this sample. This stands in contrast to data from the cross-sectional Minnesota Student Survey and the longitudinal Add Health Study, in which perceived costs of intercourse were associated with delayed initiation.21,22 There are several potential explanations for this discrepancy. The sample in the Add Health Study did not include participants younger than 15 years. There are more questions about negative consequences of intercourse, and the questions are more detailed with regard to the potential interpersonal ramifications of intercourse than the questions in the PSI scale. The Minnesota Student Survey questions were more similar to our questions than those in the Add Health Study, and their sample did include younger adolescents (ninth graders), which leads us to suspect there is another explanation: we may be seeing a ceiling effect in our data. The GUTS participants were almost unanimously fearful of negative consequences of intercourse. The mean scores on this subscale in boys and girls were all greater than 3 (of a possible 4), with narrow standard deviations. All of our participants are the children of nurses and, therefore, they may have more education about pregnancy and sexually transmitted diseases than the average adolescent.

Instilling fear of negative consequences of sexual intercourse is one of the traditional roles of sexual education curricula. Research is needed to determine which specific beliefs about the negative consequences of intercourse are most important in deterring teenagers from having intercourse, recognizing that these may change over time as adolescents develop. In addition, our data are consistent with previous literature that suggests that there are other domains that are important: peers’ and authority figures’ sexual norms, perceived control over initiation, and personal ex-

**Table 2. Multivariate Models Predicting Sexual Initiation in Boys and Girls, Unadjusted and Adjusted for Intention to Initiate Sexual Intercourse**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data for Boys</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI (1-U increase)</td>
<td>-.11</td>
<td>0.90 (0.87-0.93)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI (1-U increase)</td>
<td>-.04</td>
<td>0.97 (0.93-1.00)</td>
<td>.05</td>
</tr>
<tr>
<td>Intention (vs definitely will)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will not</td>
<td>NA</td>
<td>0.02 (0.01-0.06)</td>
<td>NA</td>
</tr>
<tr>
<td>Probably will not</td>
<td>NA</td>
<td>0.07 (0.03-0.17)</td>
<td>NA</td>
</tr>
<tr>
<td>Not sure</td>
<td>NA</td>
<td>0.22 (0.09-0.51)</td>
<td>NA</td>
</tr>
<tr>
<td>Probably will</td>
<td>NA</td>
<td>0.49 (0.19-1.30)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Data for Girls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI (1-U increase)</td>
<td>-.09</td>
<td>0.91 (0.89-0.93)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model 2</td>
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</tr>
<tr>
<td>PSI (1-U increase)</td>
<td>-.02</td>
<td>0.98 (0.95-1.00)</td>
<td>.11</td>
</tr>
<tr>
<td>Intention (vs definitely will)</td>
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</tr>
<tr>
<td>Will not</td>
<td>NA</td>
<td>0.02 (0.01-0.07)</td>
<td>NA</td>
</tr>
<tr>
<td>Probably will not</td>
<td>NA</td>
<td>0.11 (0.04-0.34)</td>
<td>NA</td>
</tr>
<tr>
<td>Not sure</td>
<td>NA</td>
<td>0.21 (0.07-0.65)</td>
<td>NA</td>
</tr>
<tr>
<td>Probably will</td>
<td>NA</td>
<td>1.20 (0.36-4.20)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: NA, data not applicable; PSI, postponing sexual initiation.

All models are adjusted for age and pubertal stage.

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pectrances. There are potential limitations to our findings. Our data were acquired at 2 time points (1999 and 2000). Beliefs and intention were measured at the same time point. Ideally, to test mediation, we would have measured beliefs, intention, and behavior over 3 time points to assess whether PSI scale scores predicted subsequent intention, which in turn predicted subsequent behavior. Also, the lack of diversity in our study population may limit generalizability. The sample was more than 90% white and, because participants' mothers are nurses, less educated and lower socioeconomic groups are underrepresented.

Strengths of our study include the large sample size and the longitudinal design. To our knowledge, this is the largest prospective analysis on this topic, which includes information about young adolescents, a critical population for studying the early measurable determinants of sexual behavior. Another strength is our use of mediation analysis to explore the relationships among beliefs and attitudes, intention, and behavior. One implication of this study for the pediatrician is that, when an adolescent reports at his or her annual physical that he or she is not sexually active, it may be valuable to ask how likely it is that he or she will have sexual intercourse in the next year, because intention proved to be a good predictor of sexual intercourse initiation behavior in the next year. The PSI scale may also be useful to researchers and educators seeking to measure potentially modifiable sexual beliefs and attitudes among adolescents before they initiate sexual intercourse. Using a validated scale to measure the known antecedents of sexual intercourse will be important in the evaluation of sexual education curricula. Further research is needed to determine how best to modify adolescents' PSI beliefs and sexual intercourse intention.

In conclusion, the PSI scale is a useful measure of adolescents' beliefs and attitudes about sexual intercourse initiation and predicts their behavior at 1-year follow-up. These beliefs and attitudes seem to influence intention to initiate intercourse, which in turn influences behavior, consistent with existing theories of individual health behavior. The PSI scale may be of use in a clinical and research setting. Whether the modification of the beliefs and attitudes on the PSI scale can reduce intention to have sexual intercourse and delay the onset of sexual intercourse in adolescents will be important future research.

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Author Contributions: Drs Gray and Huang had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Gray, Austin, Huang, Frazier, and Kahn. Acquisition of data: Gray, Austin, Huang, Frazier, Field, and Kahn. Analysis and interpretation of data: Gray, Austin, Huang, Field, and Kahn. Drafting of the manuscript: Gray and Huang. Critical revision of the manuscript for important intellectual content: Gray, Austin, Frazier, Field, and Kahn. Statistical analysis: Gray and Huang. Obtained funding: Frazier. Administrative, technical, and material support: Gray and Field. Study supervision: Austin, Field, and Kahn.

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REFERENCES


