Predictive Relationship Between Adolescent Oral and Vaginal Sex

Results From a Prospective, Longitudinal Study

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Objectives: To (1) identify the temporal order between oral and vaginal sex onset; (2) test whether oral sex or vaginal sex is a risk or protective factor for the other; and (3) determine whether the relationship between oral and vaginal sex varies across time.

Design: Prospective, longitudinal study with 6-month assessments conducted between 2002 and 2005.

Setting: Self-administered surveys completed during class time.

Participants: At baseline, 627 ninth grade high school students from 2 northern California schools were included in the study.

Main Outcome Measure: Oral and vaginal sex onset.

Results: Among sexually active adolescents, most initiated vaginal sex after or within the same 6-month period of oral sex initiation. Adolescents who initiated oral sex at the end of ninth grade had a 50% chance of initiating vaginal sex by the end of 11th grade. In comparison, adolescents who delayed until the end of 11th grade had a 16% chance of initiating vaginal sex by the end of 11th grade.

Conclusions: The first 2 years of high school may be a critical age period for adolescents’ vulnerability to vaginal sex initiation via oral sex behaviors. Comprehensive evidenced-based interventions and provision of preventive services aimed toward reducing sexual risk should be expanded to include the role oral sex plays in adolescent sex behavior.
evidence that adolescents view and experience fewer negative consequences associated with oral sex, compared with vaginal sex.\textsuperscript{1,10-13} Given these contrasting views and research findings, it remains unclear whether oral sex is a risk factor for or protective factor against vaginal sex initiation during adolescence.

Our inability to address the directional relationship between oral and vaginal sex is due to methodological limitations in the literature. In particular, investigation as to whether oral sex increases or decreases the likelihood of vaginal sex onset (or vice versa) requires prospective, longitudinal methods and analyses.\textsuperscript{14} Previous work is either based on cross-sectional data or cross-sectional analyses of longitudinal data.\textsuperscript{15,16} Also, the relationship between oral and vaginal sex may vary across development. Indeed, some data suggest that the relationship between oral and vaginal sex incidence depends on the age at which adolescents first engage in sex.\textsuperscript{9}

The current study will address these limitations by using prospective, longitudinal data collected over the first 3 years of high school to examine the relationship between oral and vaginal sex. We test whether oral sex and vaginal sex co-occur or if one behavior precedes the other. Once the temporal order has been established, we test whether oral or vaginal sex is a risk or protective factor for the other. Last, we examine whether the relationship between oral and vaginal sex varies across time.

METHODS

The current study is part of a larger investigation on adolescent sexual behaviors and perceptions. Data were collected every 6 months from the start of ninth grade to the end of 11th grade. Data collection occurred between 2002 and 2005. The study was approved by the university's institutional review board.

PARTICIPANTS

Participants were recruited from 2 California public high schools. Researchers introduced the study to all students in a mandatory ninth grade class. After the introduction, students took consent packets home to discuss with their parents. Initially, 1180 students received consent packets, of whom 665 students (56\%) returned signed parental consent forms and signed their own assent forms. A total of 637 adolescents (96\% of the eligible sample) completed surveys in the first wave of data collection, with 627 reporting on sex behaviors. The retention rate for subsequent data collection waves was good: 380 (92\% of the sample at wave 1) retained at wave 2; 520 (82\%), at wave 3; 516 (81\%), at wave 4; 489 (77\%), at wave 5; and 472 (74\%), at wave 6. Reports of parental education, employment, and religiosity did not vary according to the number of surveys participants completed. Participants were demographically similar to the overall population of students in their school.

SAMPLE CHARACTERISTICS

In the autumn of ninth grade, adolescents were 14 years of age (SD, 0.47 years); 57\% of the sample was female. Participants reported diverse ethnic backgrounds, including 39\% white, 16\% Latino, 22\% Asian or Pacific Islander, 3\% black, 20\% multiethnic or other ethnicity, and 0.3\% declining to respond. Participants’ report of their mothers’ education varied (4-year college degree or higher, 17\%; some college education or 2-year degree, 18\%; high school degree, 12\%; did not graduate from high school or less, 8\%; unknown/no information, 46\%).

SEXUAL HISTORY CHARACTERISTICS

At each wave, participants reported on the number of times they had ever engaged in oral or vaginal sex. The response choices ranged from “none” to “5 or more times.” Responses were coded dichotomously, with 0 = no occurrence; 1 = occurrence. In addition, a variable was created that reflects if and when the participant first reported vaginal or oral sex. This variable was coded as 0 = never reported/no occurrence and 1 = first report was at time 1 (beginning of ninth grade) to 6 = first report was at time 6 (end of 11th grade).

PLAN OF ANALYSES

We calculated the frequency of each behavioral occurrence at each wave, including the number of adolescents who (1) did not engage in oral or vaginal sex, (2) engaged in oral but not vaginal sex, (3) engaged in vaginal but not oral sex, and (4) engaged in both behaviors. These data were used to identify the temporal order of oral and vaginal sex, with analyses conducted on all 627 participants. Once the temporal order was established, we used discrete-time survival analysis to test whether one behavior (eg, oral sex) increased or decreased the likelihood of the other behavior (eg, vaginal sex) at each period of assessment. Since analyses were designed to describe whether and/or when initiation occurred, analyses were conducted on the 560 participants who did not engage in vaginal sex prior to the first assessment. Discrete-time survival analysis is a statistical technique based on logistic regression.\textsuperscript{17-20} Logistic regression was conducted on data that had been restructured into a person-period format, with the data amounting to 2364 records for the 560 participants. This technique is commonly used in longitudinal analyses to investigate risks of onset, since once onset has occurred, the participant should no longer be included in the base rate assessments in subsequent waves. This data analytic strategy allowed us to focus on the first report of each behavior across periods. Participants remained in the analysis for each time wave until (1) they reported the behavior, (2) they dropped out of the study (censored), or (3) the study concluded. Therefore, once a participant reported oral sex, information about oral or vaginal sex was not needed for subsequent waves. The advantage of using this statistical technique is that all 560 participants were retained for analyses. The vast majority of participants remained until they reported sexual behaviors; only 2 participants dropped out of the study before the last assessment period and before reporting sexual behavior. The results were reported in 2 ways. First, we reported hazard rates, which can be interpreted as probabilities of initiating vaginal sex at that particular point, given initiation had not occurred previously. Second, we reported survival rates, which can be interpreted as the probability that an individual will have abstained from vaginal sex up to that interval. The hazard function is an interval-specific estimate; the survival function is based on cumulative survival rates from previous intervals.

Initial analyses showed that gender was not a significant predictor of vaginal sex initiation (odds ratio, 0.87; 95\% confidence interval, 0.63-1.20). Moreover, subsequent analyses demonstrated that the results did not differ by race/ethnic group. That is, the trajectory of vaginal sex initiation based on oral sex initiation was not significantly different for the 2 largest nonwhite ethnic groups, which were Asian American and Hispanic participants (adjusted odds ratio, 1.19; 95\% confidence...
interval, 0.72-1.96 and adjusted odds ratio, 1.29; 95% confidence interval, 0.80-2.10, respectively). Consequently, the discrete-time survival model only included time and time of oral sex initiation as predictors of vaginal sex initiation. All analyses were conducted using the discrete-time survival analysis module (msdthaz) in intercooled Stata version 11.0.

RESULTS

RATES OF INITIATION OF ORAL AND VAGINAL SEX FROM NINTH TO 11TH GRADE

Table 1 is a life table that presents the number of participants who initiated oral or vaginal sex during the study. Of the 627 participants, 113 initiated oral sex and 71 initiated vaginal sex prior to the ninth grade. Among adolescents who initiated either oral or vaginal sex during the study, most initiated oral sex before or within the same 6-month period of their first report of vaginal sex (Table 2). Although more initiates engaged in oral and vaginal sex within the same interval, more than twice as many participants initiated oral sex before vaginal sex across all points. Since the data suggest that oral sex initiation precedes vaginal sex initiation and not the reverse, subsequent analyses treat oral sex as an independent variable and vaginal sex initiation as the outcome variable.

VAGINAL SEX INITIATION ACROSS TIME: FITTED BASELINE (TIME ONLY) MODEL

We first tested a time-only model to obtain a baseline model of vaginal sex initiation across intervals. Probabilities of vaginal sex initiation at each point (hazard rates) are presented in Table 3 and Figure A. Probabilities of remaining a vaginal sex abstainer (survival rates) are presented in Table 4 and Figure, B. The log likelihood statistic for the baseline model was −696.14. Although most adolescents abstained from vaginal sex, vaginal sex initiation became more prevalent as time increased. Without considering oral sex initiation (baseline), the probability of initiating vaginal sex was 9% at the end of ninth grade and increased to 24% by the end of 11th grade. The baseline probabilities of remaining vaginal sex abstainers were 91% and 40% for ninth and 11th grades, respectively.

ORAL SEX INITIATION INCREASES THE LIKELIHOOD OF VAGINAL SEX INITIATION

To examine the relationship between oral sex and vaginal sex initiation, we tested a nested model that included time indicators as well as time of oral sex initiation. Oral sex initiation was entered as 6 dummy-coded variables, 1 for each data collection wave, indicating
whether oral sex initiation occurred at that point. Treating oral sex initiation as a separate variable allowed us to obtain separate estimates for oral sex initiation at each interval. Oral sex initiation at the end of ninth grade, beginning and end of 10th grade, and the end of 11th grade significantly predicted vaginal sex onset (Table 5). Oral sex initiation before the ninth grade and start of 11th grade were not significant predictors of vaginal sex initiation. The log likelihood statistic for this model was \(-539.44\). The deviance between the baseline and oral sex initiation model was significant \((P < .001)\), suggesting the oral sex initiation model was a significantly improved model.

Adolescents who initiated oral sex at the end of ninth grade represented the group with the highest risk of vaginal sex initiation during high school. These adolescents had a 25% chance of initiating vaginal sex at the end of ninth grade and a 50% chance by the end of 11th grade (Table 3). As a group, adolescents who initiate oral sex at the end of ninth grade had a 9% chance of abstaining from vaginal sex by the end of 11th grade (Table 4).

Adolescents at lowest risk of initiating vaginal sex were adolescents who never engaged in oral sex, with a 7% chance of initiating vaginal sex (Table 3) and 80% chance of abstaining from vaginal sex by the end of 11th grade (Table 4). Adolescents who abstained from oral sex until the end of 11th grade were also less likely to initiate vaginal sex, compared with the baseline model. These adolescents had a 6% and 16% chance of initiating vaginal sex at the end of ninth grade and end of 11th grade, respectively (Table 3). These adolescents had a 57% chance of remaining vaginal sex abstainers by the end of the study (Table 4).

**COMMENT**

To our knowledge, this is the first study to track adolescents from ninth grade through 11th grade to determine whether engagement in oral sex increases one’s risk of having vaginal sex in the near future, or whether oral sex is protective against early onset of vaginal sex. Previous studies have attempted to explore the relationship between oral sex and vaginal sex but were limited by their use of cross-sectional methods in which they often relied on retrospective assessments of oral and vaginal sexual behavior.

The current prospective, longitudinal investigation uncovered 3 primary findings. First, most sexually active adolescents initiate both vaginal and oral sex within the same 6-month period. Second, between oral or vaginal sex, oral sex usually occurs first. It is possible that many adolescents engage in oral sex before vaginal sex in an effort to reduce sex-related risks, such as pregnancy and STIs. Indeed, some evidence suggests that the majority

| Table 3. Fitted Hazard Rates of Vaginal Sex Initiation by Oral Sex Initiation |
|----------------|----------------|----------------|----------------|----------------|----------------|
|                | End Ninth Grade | Start 10th Grade | End 10th Grade | Start 11th Grade | End 11th Grade |
| Oral sex initiation before ninth grade | 12 | 18 | 20 | 24 | 30 |
| Oral sex initiation end of ninth grade | 25 | 34 | 37 | 43 | 50 |
| Oral sex initiation start of 10th grade | 22 | 31 | 34 | 40 | 47 |
| Oral sex initiation end of 10th grade | 15 | 21 | 24 | 28 | 35 |
| Oral sex initiation start of 11th grade | 10 | 15 | 17 | 21 | 26 |
| Oral sex initiation end of 11th grade | 6 | 9 | 10 | 13 | 16 |
| No initiation | 2 | 4 | 4 | 5 | 7 |
| Baseline, function based on time | 9 | 14 | 16 | 19 | 24 |
of adolescents do not consider oral sex as sexual behavior, thereby excluding oral sex as a personal risk factor for pregnancy and STIs.8,13,22 Third, oral sex onset between the start of ninth grade and the end of 10th grade significantly increases an adolescent’s likelihood of engaging in vaginal intercourse. One explanation for this period of vulnerability to vaginal sex via oral sex may be traced to a heightened importance and influence of peer relationships during this developmental period.23,24

Conversely, oral sex abstinence and delay until the end of 11th grade appears to be a protective factor against early vaginal sex initiation. These adolescents have a 57% chance of refraining from vaginal sex. A key to sexual risk-reduction interventions could be to delay adolescent oral sex initiation until the latter half of high school. Future studies may contribute to intervention efforts by identifying psychosocial and developmental factors that may moderate the relationship between oral and vaginal sex.

The finding that oral sex initiation before the ninth grade and at the start of 11th grade does not predict vaginal sex initiation can be interpreted in several ways. One possibility is that adolescents who initiate oral sex before ninth grade fall into 2 groups. For one group, oral sex initiation before high school increases the risk of vaginal intercourse; for others, oral sex may be used to postpone vaginal sex initiation. This possibility should be tested in future studies.

Despite literature suggesting that sexual behavior varies by gender and ethnicity,25,26 the current study found that the relationship between oral and vaginal sex initiation did not differ between males and females or among Hispanic, Asian, or white adolescents. One possible explanation is that research on gender and ethnic differences focuses on incidence rates, frequency of behaviors, age at onset, or psychosocial factors that influence risky sex behaviors.25,27 In this regard, gender and ethnic groups may vary in some aspects of a sexual behavior, but the pattern between oral and vaginal sex onset is similar across groups.

The reported findings have important implications for our understanding of adolescent sexual behavior. First, until now, there has been very little attention focused on sexually based antecedents of vaginal sex onset. Much of the work on adolescent sexual behavior has focused on biological development, peer networks, psychosocial factors, and media.28-31 The current results suggest that oral sex initiation may be a natural antecedent to vaginal intercourse within a normal sexual developmental trajectory.

Second, despite adolescents’ belief that oral sex is not sexual behavior or is less risky, these results suggest that oral sex may indirectly increase sex-related risks through its relationship with vaginal intercourse. This is a particular concern because epidemiological data show that births to mothers aged 15 to 19 years significantly increased in 2006 and 2007.34,35 Moreover, there is increasing concern about adolescent STI since approximately 50% of new STI cases occur among people aged 15 to 24 years.36 In this regard, understanding adolescent sexual behavior is of utmost importance.

Third, the reported findings have important implications for creating evidence-based sex education interventions. Although most health education practices promote discussion about sexual behavior and protective measures, the focus is usually on vaginal sex. Clinicians and researchers typically focus on reducing sexual risk through abstinence or safer sex methods. This concentration ignores the potential variation in (1) the progression in sexual onset, (2) types of sexual behaviors, (3) the relationship between these behaviors, and (4) motivational factors underlying these behaviors. These efforts widely ignore oral sex, perhaps because oral sex is associated with lower proximal risks of STI. However, as the current study demonstrates, oral sex appears to be a risk factor for vaginal sex. It is imperative that health

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### Table 4. Fitted Survival Rates of Vaginal Sex Initiation by Oral Sex Initiation

<table>
<thead>
<tr>
<th></th>
<th>End Ninth Grade</th>
<th>Start 10th Grade</th>
<th>End 10th Grade</th>
<th>Start 11th Grade</th>
<th>End 11th Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral sex initiation before ninth grade</td>
<td>88</td>
<td>72</td>
<td>58</td>
<td>44</td>
<td>31</td>
</tr>
<tr>
<td>Oral sex initiation end of ninth grade</td>
<td>75</td>
<td>49</td>
<td>31</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Oral sex initiation start of 10th grade</td>
<td>78</td>
<td>54</td>
<td>36</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Oral sex initiation end of 10th grade</td>
<td>85</td>
<td>67</td>
<td>51</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Oral sex initiation start of 11th grade</td>
<td>90</td>
<td>76</td>
<td>63</td>
<td>50</td>
<td>37</td>
</tr>
<tr>
<td>Oral sex initiation end of 11th grade</td>
<td>94</td>
<td>86</td>
<td>77</td>
<td>67</td>
<td>57</td>
</tr>
<tr>
<td>No initiation</td>
<td>98</td>
<td>94</td>
<td>91</td>
<td>86</td>
<td>80</td>
</tr>
<tr>
<td>Baseline, function based on time</td>
<td>91</td>
<td>78</td>
<td>66</td>
<td>53</td>
<td>40</td>
</tr>
</tbody>
</table>

### Table 5. Predictors of Vaginal Sex Initiation

<table>
<thead>
<tr>
<th>Interval</th>
<th>Odds Ratio (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval 1 (end of ninth grade)</td>
<td>0.10 (0.07-0.15)</td>
</tr>
<tr>
<td>Interval 2 (start of 10th grade)</td>
<td>0.16 (0.12-0.23)</td>
</tr>
<tr>
<td>Interval 3 (end of 10th grade)</td>
<td>0.18 (0.13-0.26)</td>
</tr>
<tr>
<td>Interval 4 (start of 11th grade)</td>
<td>0.24 (0.16-0.34)</td>
</tr>
<tr>
<td>Interval 5 (end of 11th grade)</td>
<td>0.32 (0.22-0.47)</td>
</tr>
<tr>
<td>Oral sex initiation at before ninth grade</td>
<td>1.33 (0.94-1.88)</td>
</tr>
<tr>
<td>Oral sex initiation at end of ninth grade</td>
<td>3.19 (2.16-4.73)</td>
</tr>
<tr>
<td>Oral sex initiation at start of 10th grade</td>
<td>2.75 (1.92-3.92)</td>
</tr>
<tr>
<td>Oral sex initiation at end of 10th grade</td>
<td>1.66 (1.13-2.45)</td>
</tr>
<tr>
<td>Oral sex initiation at start of 11th grade</td>
<td>1.09 (0.73-1.63)</td>
</tr>
<tr>
<td>Oral sex initiation at end of 11th grade</td>
<td>0.60 (0.38-0.97)</td>
</tr>
</tbody>
</table>

a Results of the full logistic regression model with vaginal sex onset as the outcome variable. Time and time of oral sex initiation were entered as dichotomous predictors.

b P < .05.
care providers include discussions of oral sex. These discussions should not only focus on oral sex-related risks of STI, but also the relationship of oral sex to other sexual behaviors, as well as positive and negative consequences, and physical and socioemotional ramifications of sex behaviors.\(^1\),\(^12\)

Since the focus of the current study was to examine the temporal order and relationship between oral and vaginal sex, nuances within and between these 2 sexual behaviors remain ambiguous. It is unclear whether partners remain consistent between oral and vaginal sex episodes. Information about partners and type of relationships may warrant additional examination.\(^37\)

Although the aim of the study was primarily to examine the relationship between oral and vaginal sex, the current results may vary according to characteristics of the adolescent and their social environment. For example, the relationship between oral and vaginal sex may be influenced by the type of commitment adolescents may have with their partner.\(^9\),\(^38\),\(^39\) Moreover, although the current study did not find ethnicity to be a significant factor, we were not able to test whether trajectories were similar for African American adolescents. Since previous studies have demonstrated the influence of psychosocial variables and race/ethnicity on sexual behavior,\(^15\) future studies should focus on variations in the relationship between oral and vaginal sex.

Considering that a large proportion of adolescents initiated both oral and vaginal sex within the same 6-month interval, it is unclear whether initiation occurred simultaneously or during different episodes. There is a need for future prospective, longitudinal studies to use earlier and more frequent assessment of adolescent sex behaviors.

## CONCLUSIONS

This prospective, longitudinal study of adolescent sexual behavior provides some of the first evidence that oral sex initiation appears to increase the likelihood of vaginal sex onset. This pattern of sexual behavior may be a normative trajectory, giving researchers and health practitioners a better glimpse of adolescent sexual development.

Moreover, these findings suggest that most interventions aimed toward reducing sexual risk need to expand traditional messages about abstinence or safer sex methods, which typically ignore the role oral sex plays in adolescent sex behavior. The results from this study highlight the importance of oral sex when considering a comprehensive evidence-based approach to adolescent sex education and interventions.

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### Author Contributions:
Both Drs Song and Halpern-Felsher had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analyses. Study concept and design: Song and Halpern-Felsher. Acquisition of data: Halpern-Felsher. Analysis and interpretation of data: Song and Halpern-Felsher. Drafting of the manuscript: Song and Halpern-Felsher. Critical revision of the manuscript for important intellectual content: Song and Halpern-Felsher. Statistical analysis: Song. Obtained funding: Halpern-Felsher. Administrative, technical, and material support: Song and Halpern-Felsher. Study supervision: Halpern-Felsher.

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