# Physical And Sexual Activity During Pregnancy Are Not Associated With The Onset Of Labor And Mode Of Delivery In Low Risk Term Nulliparous Women

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**Citation**

N Fox, S Gelber, S Chasen. *Physical And Sexual Activity During Pregnancy Are Not Associated With The Onset Of Labor And Mode Of Delivery In Low Risk Term Nulliparous Women*. The Internet Journal of Gynecology and Obstetrics. 2006 Volume 8 Number 1.

**Abstract**

Background Many pregnant women and their providers believe that there is an association between physical or sexual activity during pregnancy and the onset of spontaneous labor or mode of delivery. There are little data supporting this belief.

Methods Case-control study of 425 primiparous women in the immediate postpartum period using an anonymous questionnaire.

Results Increased physical or sexual activity in the third trimester and at the very end of pregnancy were not associated with an increased rate of spontaneous labor by 40 weeks, an increased rate of spontaneous labor overall or a decreased cesarean delivery rate. This was true for all labors, induced labors only and spontaneous labors only. There was no association between maternal activity and labor outcomes even after controlling for perceived contractions.

Conclusions This large case control study suggests in low risk term nulliparous women that maternal activity during pregnancy, either physical or sexual, is not associated with an earlier onset of spontaneous labor or with a decreased cesarean delivery rate.

## INTRODUCTION

Many pregnant women and their physicians believe that their activity during pregnancy influences the timing of spontaneous labor. [1] This belief could cause many pregnant women to change their activity levels during pregnancy in order to hasten or delay the onset of labor. [2] Additionally, many women may believe that their activity during the few days prior to spontaneous or induced labor could influence their mode of delivery. Specifically, many women increase their physical or sexual activity at term to decrease the rate of cesarean delivery. [3] Many providers have similar beliefs, causing them to recommend various strategies regarding the frequency and timing of physical and sexual activity to their pregnant patients. Despite this widespread belief, there are little data supporting an association between activity (physical or sexual) and either the spontaneous onset of labor or mode of delivery. There are multiple observational studies showing conflicting results. [4] However, some of these studies were underpowered, lacked a control group, did not separately analyze coitus and orgasm, did not take into account the type of labor (induced or spontaneous) when analyzing cesarean delivery rates, or did not take into account gestational age at the onset of labor or induction of labor. We performed this study to determine if there is an association between physical or sexual activity with the onset of spontaneous labor and/or with mode of delivery. Our null hypothesis was that the frequency of physical and sexual activity does not correlate with the spontaneous onset of labor and/or mode of delivery in nulliparous women.

## STUDY DESIGN

## COLLECTION OF DATA

We performed a case-control study on women in the immediate postpartum period in one institution. Any woman who delivered her first child and was admitted to one of our postpartum units was eligible for inclusion. The patients' obstetricians did not assist in recruitment, and all of the patients on the unit were eligible for inclusion. Patients were

not eligible if they had prior deliveries, were admitted to our antepartum unit after delivery due to maternal or neonatal complications, or could not understand our questionnaire. We excluded women with prior deliveries as their outcome in that pregnancy may have altered their activity during this pregnancy. All subjects were approached by one investigator (NSF) and offered an anonymous questionnaire to complete (Figure 1).

**Figure 1**

Figure 1: Study Questionnaire

**Please answer the following questions regarding yourself:**

1. How old are you? _____
2. What was the date of your delivery? _____
3. What was your due date? _____
4. Which of the following best describes your delivery (choose one)?
   - _____ A. Labor started on its own and I had a vaginal delivery
   - _____ B. Labor started on its own and I had a cesarean section
   - _____ C. Labor was induced and I had a vaginal delivery
   - _____ D. Labor was induced and I had a cesarean section
   - _____ E. I had no labor and had a cesarean section

**Please answer the following questions about the 48 HOUR TIME PERIOD PRIOR TO YOUR ADMISSION TO LABOR AND DELIVERY (choose the single best answer):**

1. How often were you experiencing contractions?
   No contractions ≤1 per hour 2-4 per hour >4 per hour
2. How many hours per day were you on your feet?
   0-1 2-4 5-8 9 or more
3. How many times in these 2 days did you perform strenuous physical activity ("work-out") for 20 minutes or more?
   0 1 2 3 or more
4. How many times in these 2 days did you have vaginal sexual intercourse?
   0 1 2 3 or more
5. How many times in these 2 days did you achieve orgasm (either related to or not related to intercourse)?
   0 1 2 3 or more

**Please answer the following questions about the time period from TWO WEEKS PRIOR TO YOUR DELIVERY UNTIL TWO DAYS PRIOR TO YOUR ADMISSION TO LABOR AND DELIVERY (choose the single best answer):**

6. On average, how often were you experiencing contractions during this time period?
   No contractions ≤1 per hour 2-4 per hour >4 per hour
7. On average, how many hours per day were you on your feet during this time period
   0-1 2-4 5-8 9 or more
8. How many times in this time period did you perform strenuous physical activity ("work-out") for 20 minutes or more?
   0 1 or 2 3 or 4 5 or more
9. How many times in this time period did you have vaginal sexual intercourse?
   0 1 or 2 3 or 4 5 or more
10. How many times in this time period did you achieve orgasm (either related to or not related to intercourse)?
    0 1 or 2 3 or 4 5 or more

**Please answer the following questions about the time period from THE BEGINNING OF THE THIRD TRIMESTER (24 weeks pregnant) UNTIL TWO WEEKS PRIOR TO YOUR ADMISSION TO THE HOSPITAL (choose the single best answer):**

11. On average, how often were you experiencing contractions during this time period?
    No contractions ≤1 per hour 2-4 per hour >4 per hour
12. On average, how many hours per day were you on your feet during this time period?
    0-1 2-4 5-8 9 or more
13. How often did you perform strenuous physical activity ("work-out") for 20 minutes or more during this time period?
    - _____Never
    - _____Every two to four weeks
    - _____Every week
    - _____More than once per week
14. How often did you have vaginal sexual intercourse during this time period?
    - _____Never
    - _____Every two to four weeks
    - _____Every week
    - _____More than once per week
15. How often did you achieve orgasm during this time period (either related to or not related to intercourse)?
    - _____Never
    - _____Every two to four weeks
    - _____Every week
    - _____More than once per week

Subjects who consented were given a blank questionnaire and instructions to return it completed to an anonymous collection box located on the postpartum unit. The subjects completed the questionnaire in private. Due to the sensitive nature of the questions and privacy concerns, the only demographics asked for in the questionnaire were the subject's age, date of delivery, and original due date. While more detailed clinical and demographic information would have been informative, we believed that this study design emphasizing strict anonymity would increase participation and increase the accuracy of responses to sensitive questions. The questionnaire asked the subject to categorize her delivery into one of 5 possibilities and to describe her level of activity for each of 3 separate time periods: the 48 hour time period prior to admission to labor and delivery, the two week period prior to this, and the time period starting at 24 weeks gestation and ending 2 weeks before admission to labor and delivery. Each of the multiple choice questions had 4 possible choices, but categorical cut-offs were defined a priori in order to define a "high-activity" group for each question (and are used in tables II and III). We planned on analyzing the responses both as categorical (high activity vs. normal activity) and ordinal variables (using the four possible responses to each question). Institutional Review Board approval was obtained prior to distributing questionnaires.

## SAMPLE SIZE CALCULATION

We calculated our sample size based on the outcome of spontaneous onset of labor by 40 weeks, excluding subjects who underwent an induction of labor or planned cesarean delivery before 40 weeks. We believe this outcome is more informative as it is not influenced by the induction patterns of individual providers. Therefore, only subjects who were "allowed" to go to 40 weeks gestation were included in the primary analysis. Prior studies report approximately 25% of subjects engaging in "high-activity" during the third trimester. [4,7] In order to have 80% power to detect a doubled proportion of subjects reporting "high activity" from 25% to 50% in those experiencing spontaneous labor by 40 weeks, with an alpha error of 0.05, we estimated that 330 subjects would be needed. Therefore, we recruited subjects until we had approximately 330 subjects whose pregnancies were allowed to go to 40 weeks or more (i.e. excluding any subjects who had an induction of labor or planned cesarean delivery before 40 weeks). The secondary outcome was mode of delivery.

## STATISTICAL ANALYSIS

Chi square analysis was used for categorical and ordinal variables. Student t-test was used for analysis of continuous variables (SPSS 12.0 for Windows copyright 1989-2003, Chicago).

## RESULTS

788 questionnaires were distributed over a 9-month period between February and October 2006. 425 (54%) were completed and returned, and 331 subjects were eligible for the primary analysis (154 with spontaneous labor by 40 weeks, 177 without spontaneous labor by 40 weeks,

excluding those who underwent an induction of labor or elective cesarean delivery before 40 weeks). The mean age of the 425 respondents was 32 +/- 5 years and the mean gestational age at delivery was 39 4/7 weeks +/- 10 days (range 32 5/7 to 42 2/7 weeks). 18 (4%) delivered before 37 weeks (12 spontaneous labor, 6 indicated deliveries). Overall, 243 (57%) subjects had spontaneous labor (28% cesarean delivery rate), 136 (32%) subjects underwent an induction of labor (41% cesarean delivery rate), and 46 (11%) subjects underwent a cesarean delivery before labor. Table I lists the rate of spontaneous labor by week from 37 to 40 weeks, excluding subjects undergoing induction of labor or elective cesarean delivery before the start of that week (i.e. including only those subjects who were allowed to progress to the next week). Table I also lists the rate of spontaneous labor per week in subjects still pregnant, excluding those who underwent an induction of labor or elective cesarean delivery during that week. About half of subjects allowed to remain pregnant underwent spontaneous labor by 40 weeks. Of all subjects pregnant after 40 weeks, about half who waited went into spontaneous labor by 41 weeks.

### Figure 2

Table 1: Rate of spontaneous labor per week.

| | Cumulative Rate of Spontaneous Labor | Rate of Spontaneous Labor Per Week |
|---|---|---|
| Total | 243/425 (57.2%) | |
| Before 37 weeks | 12/419 (2.9%) | |
| Before 38 weeks | 31/407 (7.6%) | 19/395 (4.8%) |
| Before 39 weeks | 68/382 (17.8%) | 37/351 (10.5%) |
| Before 40 weeks | 154/331 (46.5%) | 86/263 (32.7%) |
| Before 41 weeks | 222/284 (78.2%) | 68/130 (52.3%) |

* Subjects with an induction of labor or planned cesarean delivery during the preceding week were removed from the denominator.

Table II compares the reported levels of activity between subjects who did and did not have spontaneous labor by 40 weeks, excluding subjects who underwent induction of labor or elective cesarean delivery before 40 weeks (primary outcome). Not surprisingly, subjects who had spontaneous labor by 40 weeks were more likely to report subjective contractions in the 2 days before admission to labor and delivery. Otherwise, there were no differences in reported activity between the 2 groups in any of the 3 time periods, other than decreased vaginal sexual intercourse in the 2 days before admission to labor and delivery and decreased daily activity in the third trimester both being associated with an increased rate of spontaneous labor by 40 weeks. When analyzing responses as ordinal variables, rather than categorical ones, there was no longer an association seen between decreased 3 rd trimester levels of daily activity and the onset of spontaneous labor by 40 weeks.

### Figure 3

Table 2: Comparison of responses based on spontaneous labor by 40 weeks or not*

| | No Spontaneous Labor by 40 Weeks (n=177) | Spontaneous Labor by 40 Weeks (n=154) | p |
|---|---|---|---|
| Mean Age | 32 +/-5 | 32 +/-5 | 0.62 |
| **Time Period #1 – 48 hours prior to admission to labor and delivery** | **% of Subjects** | **% of Subjects** | **OR (95% CI)** |
| Contraction frequency >4 / hour | 33.7 | 47.3 | **0.71 (0.55, 0.93)** |
| 5 or more hours per day on feet | 52.8 | 53.9 | 0.98 (0.8, 1.2) |
| 1 or more strenuous physical activity ** | 35.6 | 36.6 | 0.97 (0.73, 1.3) |
| 1 or more vaginal sexual intercourse | 24.4 | 11.74 | **2.1 (1.3, 3.5)** |
| 1 or more orgasm | 22.2 | 13.7 | 1.6 (1.0, 2.6) |
| **Time Period #2 – 2 weeks prior to delivery until 48 hours prior to admission to labor and delivery** | | | |
| Contraction frequency ≥2 / hour | 13.1 | 13.9 | 0.95 (0.55, 1.6) |
| 5 or more hours per day on feet | 68 | 63 | 1.1 (0.92, 1.3) |
| 1 or more strenuous physical activity ** | 51.1 | 49.7 | 1.0 (0.83, 1.3) |
| 1 or more Vaginal Sexual Intercourse | 44.3 | 38.2 | 1.2 (0.89, 1.5) |
| 1 or more orgasm | 45.7 | 36.2 | 1.3 (0.97, 1.6) |
| **Time Period #3 – Third trimester (24 weeks) until 2 weeks prior to delivery.** | | | |
| Contraction frequency ≥ 1/ hour | 25.9 | 26.7 | 0.96 (0.67, 1.4) |
| 9 or more hours per day on feet | 37.9 | 27 | **1.4 (1.01, 1.9)** |
| Strenuous physical activity** at least every week | 49.4 | 51.3 | 0.96 (0.77, 1.2) |
| Vaginal sexual intercourse at least every week | 27 | 23.7 | 1.1 (0.78, 1.7) |
| Orgasm at least every week | 29.9 | 25.3 | 1.2 (0.83, 1.7) |

*Patients who underwent an induction of labor or planned cesarean delivery before 40 weeks were not included in this analysis.
**Strenuous physical activity defined as 20 minutes or more of strenuous physical activity ("working-out").

We also compared the reported levels of activity between all 243 subjects who had spontaneous labor at any time and all 182 subjects who did not have spontaneous labor. Again, the subjects who had spontaneous labor were more likely to report subjective contractions during the 2 days prior to admission to labor and delivery. Otherwise, there were no statistically significant differences in reported activities between the 2 groups in any of the 3 time periods. This remained true when we analyzed the responses as ordinal, rather than categorical variables.

Table III lists the cesarean delivery rates broken down by reported levels of activity. We decided to analyze the overall population, as well as the population broken down by induced or spontaneous labor, as the cesarean delivery rate in our population was significantly higher in the subjects who had induced labor (40% vs. 28%). For this analysis, we excluded subjects who had a cesarean delivery before labor. Activity in the 2 days before admission to labor and delivery

was not associated with mode of delivery. This was true for all labors, spontaneous labors only, and induced labors only. This remained true when we analyzed the responses as ordinal variables, rather than categorical ones. In subjects with spontaneous labor, higher reported levels of strenuous physical activity in the 2 weeks before delivery was associated with an increased cesarean delivery rate. This was not true when we analyzed the responses as ordinal variables.

### Figure 4

Table 3: Cesarean rates based on level of activity at the end of pregnancy*

| | | CS % (p) | | |
|---|---|---|---|---|
| | | Overall (n=379) | Induced Labor (n=136) | Spontaneous Labor (n=243) |
| **Overall** | | 32.5% | 40.4% | 28% |
| **Time Period #1 – 48 hours prior to admission to labor and delivery** | | | | |
| Contraction frequency >4 /hour | YES | 30.6 | 37.5 | 29.7 |
| | NO | 33.6 | 41.9 | 25.6 |
| | | (0.57) | (0.79) | (0.56) |
| 5 or more hours per day on feet | YES | 32.4 | 36.8 | 30.1 |
| | NO | 32.4 | 43.3 | 25.5 |
| | | (1) | (0.49) | (0.47) |
| 1 or more strenuous physical activity** | YES | 31.8 | 39.5 | 27.9 |
| | NO | 32.9 | 40.9 | 28.2 |
| | | (0.91) | (1) | (1) |
| 1 or more vaginal sexual intercourse | YES | 32.9 | 34.4 | 31.6 |
| | NO | 32.4 | 42.7 | 27.3 |
| | | (1) | (0.54) | (0.56) |
| 1 or more orgasm | YES | 32.9 | 38.7 | 28.2 |
| | NO | 32.7 | 41.7 | 28.1 |
| | | (1) | (0.84) | (1) |
| **Time Period #2 – 2 weeks prior to delivery until 48 hours prior to admission to labor and delivery** | | | | |
| Contraction frequency >2 /hour | YES | 35 | 44 | 27.6 |
| | NO | 32.7 | 41.1 | 28.4 |
| | | (0.76) | (0.82) | (1) |
| 5 or more hours per day on feet | YES | 31 | 34.6 | 29.8 |
| | NO | 34.6 | 50 | 24.1 |
| | | (0.57) | (0.11) | (0.44) |
| 1 or more strenuous physical activity** | YES | **37.6** | 44.6 | **33.9** |
| | NO | **27.7** | 37.1 | **22** |
| | | **(.05)** | (0.39) | **(.05)** |
| 1 or more vaginal sexual intercourse | YES | 36.7 | 47.2 | 30.9 |
| | NO | 29.6 | 36.6 | 25.7 |
| | | (0.18) | (0.28) | (0.38) |
| 1 or more orgasm | YES | 37 | 45 | 31.9 |
| | NO | 29 | 36.5 | 25.2 |
| | | (0.17) | (0.38) | (0.3) |
| **Time Period #3 – Third trimester (24 weeks) until 2 weeks prior to delivery** | | | | |
| Contraction frequency ≥ 1/hour | YES | 38 | 45.9 | 33.3 |
| | NO | 30.6 | 38.9 | 26.1 |
| | | (0.21) | (0.56) | (0.33) |
| 9 or more hours per day on feet | YES | 29.8 | 38.3 | 24.7 |
| | NO | 33.3 | 40.7 | 29.4 |
| | | (0.56) | (0.86) | (0.54) |
| Strenuous physical activity** at least every week | YES | **37.6** | 48.5 | 31.4 |
| | NO | **26.6** | 32.3 | 23.5 |
| | | **(.03)** | (.08) | (0.19) |
| Vaginal sexual intercourse at least every week | YES | 32.2 | 41.9 | 27.1 |
| | NO | 32.5 | 40.2 | 28.2 |
| | | (1) | (1) | (1) |
| Orgasm at least every week | YES | 31.7 | 37.5 | 27.9 |
| | NO | 32.6 | 41.9 | 27.7 |
| | | (0.9) | (0.7) | (1) |

*Subjects who had a planned cesarean delivery before labor were excluded.
* Strenuous physical activity defined as 20 minutes or more of strenuous physical activity ("working-out").

Since maternal contractions frequently precede the onset of spontaneous labor (which had a lower cesarean delivery rate than induced labor) and could result in decreased maternal activity, multivariable analysis was performed to control for this potential confounding factor. We also controlled for maternal age in this analysis. Maternal physical and sexual activity during any of the three time periods were not independently associated with an increased rate of spontaneous labor by 40 weeks, or with spontaneous labor overall. Increased reported contractions in the 2 days prior to delivery was independently associated with an increased rate of spontaneous labor by 40 weeks and with spontaneous labor overall. Increased maternal physical or sexual activity during any of the three time periods was not independently associated with a decreased rate of cesarean delivery in either induced, spontaneous, or all labors. Increased reported contractions in the 2 days prior to delivery was not independently associated with mode of delivery in all labors, spontaneous labors only, or induced labors only.

## DISCUSSION

In this large case-control study, we did not find an association between increased activity during the third trimester of pregnancy and the onset of spontaneous labor or the mode of delivery. This was true both when we analyzed responses as categorical (high activity vs. regular activity) as well as ordinal variables. This was true when we looked at activity during the third trimester in general, as well as activity closer to delivery. Tan et al questioned 200 women at the end of pregnancy about their coital activity. [8] Their data indicate that coitus at term is associated with an increased rate of spontaneous labor. However, the subjects reporting coitus were more likely to be Malay, educated and working professionals. This could have influenced their results. There is scientific plausibility to coitus being associated with initiation of labor. Maternal orgasm has been associated with increased uterine contractions, [5] and semen contains prostaglandin E. [6] Yet, in our population, we did not find any association between orgasm or intercourse with the onset of spontaneous labor by 40 weeks, or the onset of spontaneous labor overall. Our data regarding sexual activity and the onset of spontaneous labor are consistent with the results of Schaffir, who prospectively questioned 93 women about their sexual activity at term. [6] He found no association between coitus and labor outcomes. Yost et al studied women at high risk for recurrent preterm birth and found that coitus during early pregnancy was not associated with an increased risk of recurrent preterm birth. [7] Sayle et al found that intercourse during late pregnancy was associated with a decreased incidence of preterm delivery. [5] Others have found similar results. [8] A Cochrane review [9] found only one prospective trial evaluating sexual activity and bishop score and concluded that the trial of 28 subjects was too small to draw any meaningful conclusions. They commented that it would be difficult to standardize sexual intercourse in a prospective fashion.

There have been few studies evaluating maternal physical activity and the onset of spontaneous labor at term or mode of delivery. Most studies have tried to correlate maternal working environment to birth outcomes. [10] In our study, we specifically inquired about general activity (hours per day on

feet) and strenuous physical activity. We also separately analyzed three time periods during the third trimester. This allows for more specific conclusions about the association with labor outcomes. For example, it is useful to study if increased physical activity in the few days prior to an induction of labor will increase the rate of vaginal delivery. This information could assist with patient counseling.

Due to the sensitive nature of the questions asked in our questionnaire and privacy concerns, we did not ask many detailed clinical or demographic questions. This is a limitation to the study as certain clinical situations may have influenced activity patterns, as well as pregnancy outcomes, thereby confounding the results. However, we believe our study design increased the response rate and the accuracy of the responses. We tried to minimize confounders by only including women who just delivered their first child, thereby excluding women with a history of preterm birth or placental insufficiency who may have been advised to alter their activity. We also used for our primary analysis spontaneous labor by 40 weeks, excluding women induced or delivered by elective cesarean prior to 40 weeks. This removed subjects with placenta previa and many multiple gestations - all of whom would likely have been told to reduce their activity - from the analysis. However, there probably were some women with multiple gestations or other high-risk conditions who were included in the analysis. Since they are more likely to go into spontaneous labor by 40 weeks, and less likely to have increased activity, their inclusion could bias the results.

We did not have enough women who delivered before 37 weeks to make any conclusions about increased activity and the risk of spontaneous preterm birth. Additionally, many of our patients who are high risk for spontaneous preterm birth (short cervix, vaginal bleeding, preterm contractions) and are admitted to out antepartum unit, are admitted to the antepartum unit after delivery as well. These women were not included in the study. A large observational study of over 39,000 women concluded that frequent sexual intercourse was not associated with an increased risk of preterm birth. [11]

Since this was an observational, and not an interventional study, it is possible that women who were performing more strenuous activity were doing so because they felt better. This could reflect less uterine activity, or less engagement of the fetus into the pelvis. This could bias our results such that women performing more activity were no more likely to go into spontaneous labor only because they were not contracting. We performed a regression analysis to control for perceived contractions, but there could still be other confounding factors involved (such as fetal position). Only a randomized, prospective trial could appropriately analyze if prescribed activity would increase the rate of spontaneous labor, or decrease the rate of cesarean delivery. Obviously, it would be very difficult to properly randomize women to different levels of physical and sexual activity. Therefore, we are left to rely on observational and retrospective data. Our results indicate that women should not be advised that increasing their activity will increase their chances of spontaneous labor, or decrease their chances of a cesarean delivery.

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