Breast-feeding mothers can exercise: results of a cohort study

Dada Su1, Yun Zhao1, Colin Binns1,*, Jane Scott2 and Wendy Oddy1
1School of Public Health, Curtin University, GPO Box U1987, Perth, Western Australia 6845, Australia:
2Division of Developmental Medicine, Human Nutrition Section, University of Glasgow, Glasgow, UK

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Abstract
Objectives: To study the relationship between exercise by the mother and breast-feeding initiation and duration, and its effect on infant growth.
Design: A cohort study of mothers and infants, recruited at birth. Infant feeding methods were recorded in detail and breast-feeding was categorised as ‘any’ or ‘full’. Exercise levels were categorised using the metabolic equivalent tasks approach based on details of physical activity recorded in questionnaires.
Setting: Perth, Western Australia.
Subjects: A total of 587 mothers were interviewed on seven occasions over a period of 12 months.
Results: There was no difference in the means of infant weight and length changes, indicating that exercise appeared to have no significant influence on infant growth up to 52 weeks after birth (P = 0.236 and 0.974, respectively). The mother’s level of exercise was not significantly associated with breast-feeding to 6 or 12 months. This applied to ‘full’ and ‘any’ categories of breast-feeding.
Conclusion: Exercise does not affect breast-feeding outcomes at the usual levels of activity undertaken by mothers. Breast-feeding and exercise are important for maintaining and promoting health, and this study provides reassurance to health professionals wishing to encourage mothers to continue both behaviours.

Keywords
Breast-feeding
Duration
Exercise
Health promotion

Exercise is an important part of health-promotion programmes because of its documented benefits in promoting health at all ages. In the nutrition field, the benefits of breast-feeding receive as much emphasis as exercise in general health promotion1,2.

There are numerous benefits of breast-feeding to the infant and the mother, which have been reviewed extensively1,3,4. Exercise brings many health benefits for cardiovascular and musculoskeletal health5,6. Energy expenditure provides the essential element in daily individual weight balance and recent research has shown the importance of exercise in the prevention of cancer7,8.

Because of the benefits of breast-feeding and of exercise, it is natural for mothers to want to do both. The effect of exercise on breast-milk composition and volume were reviewed by Clapp and Little in 1995, who noted that there had been occasional reports in the literature that physical activity had an adverse impact on breast-feeding performance9. Most concerns related to an increase in lactic acid in breast milk following exercise and its effect on taste to infants. However, subsequent studies have demonstrated that the quantity and quality of milk and infant growth are not adversely affected by moderate maternal exercise10,11. Where the mother’s diet is adequate, exercise has been shown not to affect the long-chain polyunsaturated acid content of breast milk12.

However it is a commonly held belief amongst mothers that exercise while breast-feeding can affect the taste of breast milk and this may affect their infant’s health. A literature search has not revealed any previous studies of breast-feeding and exercise in Australia.

An important question for mothers is ‘Can I continue (or recommence) to exercise and breast-feed?’ Mothers today have been educated about the overwhelmingly positive benefits of breast-feeding for their infants and at the same time they wish to exercise to regain their pre-pregnancy fitness level. Thus the objectives of the present study were to document the relationships between exercise by the mother and breast-feeding initiation and duration, and the effect on infant growth.

Methods

The second Perth Infant Feeding Study (PIFS II) was conducted between 2002 and 2004. Mothers were recruited from women delivering at two public hospitals in Perth, Western Australia. Women were eligible for the study if they had delivered a live infant free of serious health problems requiring transfer to Perth’s major maternity hospital for critical care13. A total of 870 mothers of newborn infants were contacted and 587 completed the baseline questionnaire while they were in hospital on their...
infant feeding practices and preferences. This represented 68% of the eligible mothers contacted; a high response rate for this type of survey, reducing the likelihood of a response bias. The mothers in the study were interviewed on seven occasions at regular intervals until their infants reached 12 months of age. There were no significant differences in the age and level of education of participants and non-participants, indicating that participants were representative of the population from which they were drawn. The categories of breast-feeding used in this study were ‘any breast-feeding’ and ‘full breastfeeding’. ‘Full breast-feeding’ includes infants who received only breast milk or breast milk plus small amounts of water, water-based drinks or fruit juice.

There are many ways in which exercise can be measured. Some are very restrictive such as the use of whole-body calorimetry, while modern studies use doubly labelled water, which is accurate and unobtrusive. However this method has the disadvantage of high cost and in this study the large sample size precluded its use. For that reason exercise was measured with a comprehensive questionnaire using the metabolic equivalent task (MET) approach. Logging physical activity and multiplying the nature and duration of these activities by their metabolic equivalents has been widely used to estimate activity thermogenesis.

Physical activity was assessed in terms of type, intensity and duration. The type of exercise included all occupational and leisure-time activities. Intensity was categorised as light, moderate (e.g. cycling on level ground), vigorous (e.g. moving heavy furniture, loading or unloading trucks, jogging, cycling up hill, swimming) or very vigorous (e.g. gardening, housework, cooking, walking, tai chi) or vigorous (e.g. moving heavy furniture, loading or unloading trucks, jogging, cycling up hill, swimming). The classification of tasks was based on the amount of energy a person expends in performing the activity. The questions used were developed for the Hawaiian Cancer Study and the National Health Survey and have been used in previous studies.

To measure duration, the weekly average time spent in each activity level was recorded. The overall physical activity exposure was then quantified in terms of MET, representing the number of kilocalories per hour each kilogram of body weight expended in activities. For this study energy expenditure was examined in quartiles in the period since the previous interview and then summed over the 6- or 12-month period.

The project was approved by the research ethics committee of the two participating hospitals and by the Human Research Ethics Committee of Curtin University. All mothers were given an information sheet about the study and those willing to participate gave their signed informed consent before being asked to complete the questionnaires.

The data were coded and analysed using the SPSS program (SPSS Inc.). Initially descriptive statistics were computed and differences between MET groups were examined using x² analysis. Cox regression analysis controlling for a variety of factors known to be associated with breast-feeding duration was used to model the time-to-event data and to determine which variables had an independent effect on the duration of breast-feeding (‘any’ and ‘full’) for those mothers who were breast-feeding at the time of discharge from hospital.

Results

The demographic factors of mothers and infants that might be expected to have an influence on undertaking exercise at a selected time point, week 4, are listed in Table 1. This time period was chosen as mothers would be unlikely to return to exercise before this time. The numbers and percentage of mothers who exercised at the four levels of MET-hours per week are given for each variable. The analysis of demographic variables showed that mother’s parity and infant birth weight were significantly associated with undertaking more exercise at week 4. The relationships between demographic factors and undertaking exercise were calculated for other time points (before pregnancy, week 10, 16, 22, 32, 40 and 52) and were similar to the results at week 4.

Exercise and breast-fed infant weight and length

Infant weight and length were used as proxy measures to assess the adequacy of breast-milk production. Non-parametric tests were used to explore the influence of exercise on infant weight and length. The means of weight and length changes between week 4 and week 52 of infants whose mothers were breast-feeding by each intensity level activity were compared. Figure 1 is a box-and-whisker plot of weight gain, with the box representing the interquartile range and the whiskers the range. There was no difference in the means of infant weight and length changes, indicating that exercise appeared to have no significant influence on infant growth up to 52 weeks after birth.

Influence of exercise on breast-feeding

The duration of ‘any breast-feeding’ and ‘full breastfeeding’ up to 12 months was estimated using the Kaplan–Meier survival method for different exercise levels (quartiles). The exercise intensity levels were measured by total MET-hours in a year (see Table 2). There was no difference in the duration of ‘any’ or ‘fully’ breast-feeding between each level of exercise intensity (P = 0.1275 and 0.2092, respectively). In addition, the determinants of ‘any breast-feeding’ and ‘full breastfeeding’ to 6 months were explored with multivariate analysis using Cox regression and the forward selection procedure. A summary of the results obtained from the Cox regression of ‘any breast-feeding’ to 6 months is shown in Table 2. Details of the variables associated with breast-feeding duration to 6 months have been published previously and are available online.
The analysis was repeated for ‘full breast-feeding’ duration up to 6 months and again for ‘any breast-feeding’ to 12 months, as 22% of the mothers in this study were still breast-feeding at 1 year. The amount of exercise undertaken by the mothers was not associated with ‘any breast-feeding’ or ‘full breast-feeding’ duration up to 6 months or up to 12 months. Specifically, mothers who had different levels of energy expenditure (MET-hours) were not found to be statistically different in their duration of any breast-feeding.

**Discussion**

Breast-feeding and exercise are both of major health interest to parents, particularly mothers. This analysis of data from the PIFS II indicated that there was no evidence to support the claim that exercise, especially moderate exercise, would have a negative impact on breast-feeding. None of the mothers in this study consistently reached levels of energy activity that would be associated with elite international athletes, so no information is available on the effects of extreme energy expenditure on breast-feeding performance.

**Effect of exercise on infant growth**

The study demonstrated that the level of exercise by breast-feeding mothers does not affect the growth of their infants in terms of weight and length. The lack of an impact on growth in breast-fed infants is a good indication that exercise has no effect on the quantity and quality of breast-milk production. Our results support those reported by Lovelady et al., who compared eight well-nourished exercising and eight sedentary women whose infants were 9–24 weeks old and exclusively breast-fed\(^{20}\). They demonstrated there was no difference between the groups in plasma hormones, milk energy, lipid, protein or lactose content. In addition they confirmed that milk volume was slightly though not significantly higher in the exercise group (839 vs. 776 g day\(^{-1}\)).

Some previous studies showed that lactic acid seemed to increase in the breast milk of women exercising at...
maximal intensity. Controversy exists as to whether this
short-term increase in lactic acid makes the breast milk less
acceptable to the nursing infant. While we did not
directly measure lactic acid or any other markers of taste in
breast milk, our finding that maternal exercise was not
associated with either infant growth or breast-feeding
duration would suggest that maternal exercise had no
adverse effect on the taste of breast milk.

We could locate no published papers on cohort studies
of the association between exercise and duration of breast-
feeding. The present study has indicated that breast-
feeding duration up to 6 and 12 months was not adversely
affected by exercise, regardless of the intensity. Studies
that include the duration of breast-feeding as a variable
show that there is an increasing dose–response in health
benefits, i.e. the longer the duration of breast-feeding, the
more health benefits are accrued by both mothers and
infants. The finding of the lack of a relationship between
exercise and duration of breast-feeding would suggest that
mothers can exercise without having any impact on
breast-feeding performance. This is important news for all
mothers and for all health professionals who communicate
health messages to mothers.

It is rare that studies with negative findings are so
significant for health promotion. In this case, the finding
that mothers can exercise and continue to breast-feed is
a significant finding. This should be the basis of
health-promotion programmes to mothers and fathers.

<table>
<thead>
<tr>
<th>Total MET-hours in 1 year</th>
<th>Crude RR</th>
<th>95% CI</th>
<th>Adjusted RR†‡</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>0–100</td>
<td>1.000</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>101–165</td>
<td>0.665</td>
<td>0.465–0.952</td>
<td>0.719</td>
<td>0.473–1.093</td>
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<tr>
<td>166–245</td>
<td>0.787</td>
<td>0.555–1.117</td>
<td>0.840</td>
<td>0.550–1.281</td>
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<tr>
<td>245+</td>
<td>0.807</td>
<td>0.571–1.140</td>
<td>0.947</td>
<td>0.628–1.428</td>
</tr>
</tbody>
</table>

MET – metabolic equivalent task; RR – relative risk; CI – confidence interval.

† Non-significant variables were sex, infant admitted to a special-care nursery, maternal marital status, demand feeding, parity, attendance at antenatal classes, maternal years of education, maternal country of birth, how many times mother had been sick in one year, maternal grandmother’s feeding preference, father’s feeding preference, age by which dummy was introduced, time at which infant feeding method decided, how many times mother had breast-feeding problems in one year, and total MET-hours spent for exercise in one year.

‡ All variables in the final model were variables for which, when excluded, the change in deviance compared with the corre-
sponding χ² test statistic on the relevant degrees of freedom was significant.

Conclusion

In the past it has been common practice to advise mothers
to restrict the amount of exercise they do while breast-
feeding, as it would affect the taste of their breast milk and
overall breast-milk production. This study shows that
mothers can exercise without having any impact on
breast-feeding performance. This is important news for all
mothers and for all health professionals who communicate
health messages to mothers.

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investigator, project design, data analysis, paper writing; J.S.
– associate investigator, data management, paper writing; W.O. – associate investigator, paper writing.

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References


