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Review

# Exercise during pregnancy: A review of patterns and determinants

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**Abstract**

The mental and physical health benefits of exercise during pregnancy highlight the importance of understanding the determinants of pregnant women's physical activity. This paper presents a review of the existing research on pregnancy and physical activity, in order to (a) summarize the existing body of literature since 1986 examining changes in physical activity during pregnancy, (b) summarize correlates and predictors of physical activity during pregnancy, and (c) present directions for future research. A literature search yielded 25 articles published from 1986 to 2009 in English peer-reviewed journals. The major findings were categorized into the following: (a) exercise patterns, (b) demographic correlates/predictors, (c) the influence of pre-pregnancy exercise on pregnancy exercise, (d) theory-based predictors and (f) other correlates of exercise (e.g. general health and safety concerns). Results indicated that pregnant women are less active than non-pregnant women and that pregnancy leads to a decrease in physical activity. Consistent demographic predictors of higher exercise participation during pregnancy include higher education and income, not having other children in the home, being white, and being more active prior to becoming pregnancy. Only a few studies used theoretical models to understand physical activity during pregnancy with varied results. The review outlines demographic and theory-based correlates/predictors that should be taken into consideration when developing interventions to increase physical activity among pregnant women.


*Keywords:* Exercise; Physical activity; Pregnancy; Determinants; Behavioral medicine; Health behavior

## Contents



## 1. Introduction

Despite the numerous physical and mental health benefits associated with regular exercise,[1,2] many people fail to engage in a sufficient amount of exercise.[3] Although numerous factors such as pursuing higher education and entering the workforce can disrupt or interfere with regular exercise,[4] pregnancy has been associated with the sharp decline in exercise among adult women.[5–7] Pregnancy is a time of social, psychological, behavioral and biological change.[8] As such, it is not surprising that it has been identified as a contributing factor to the decline in exercise behavior among women.

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Inactivity during pregnancy is cause for concern because prenatal women who do not engage in exercise forgo numerous health benefits. For example, exercise during pregnancy is associated with reduced risk of preeclampsia,[9–11] gestational diabetes[9,12,13] and preterm birth,[9,14] as well as improved pain tolerance, lower total weight gain and less fat mass gain, and improved self-image.[15] For these reasons, US exercise guidelines recommend that all healthy women should get at least 150 min of moderate-intensity aerobic activity a week during pregnancy.[16]

In a recent review of 31 pregnancy and exercise studies, Poudevigne and O'Connor concluded that as pregnancy progresses, exercise levels decrease.[17] Furthermore, the authors pointed out that the causes of exercise change during pregnancy appear to be numerous and complex. The purpose of the current study is to extend Poudevigne and O'Connor's work and review the existing literature to examine changes in exercise during pregnancy as well as identify correlates and predictors associated with changes in exercise and discuss avenues for future research.

## 2. Method

Inclusion criteria for this review are as follows: (a) studies had to include more than one assessment of exercise during pregnancy in order to assess change in exercise, (b) studies had to examine the relationship of at least one independent variable (determinant) with exercise, (c) studies had to be published in English and (d) data had to come from independent datasets (i.e., each study analyzed a unique dataset). Studies were excluded if they measured exercise but did not include any potential correlates. Searching involved all relevant databases subscribed to by the library of the University of Western Ontario as well as Internet search engines. To maximize the number of articles retrieved, no date restrictions were set. The databases searched included Medline (earliest-end 2009), PsycInfo (earliest-end 2009), PubMed (earliest-end 2009), and Scholars Portal (earliest-end 2009) and the Internet search engines were: www.scholar.google.com, www.google.com, and www.yahoo.com. Keywords used alone and in various combinations included *exercise, physical activity, pregnancy, prenatal, demographic predictors, psychosocial predictors* and *correlates*. This electronic search yielded 124 articles. All abstracts were then examined for the inclusion and exclusion criteria, and 23 articles were selected as suitable. To obtain additional studies, we reviewed the references cited in each of the eligible studies. This manual cross-referencing of references yielded an additional 15 studies, two of which met the inclusion criteria. Therefore, a total of 25 studies met the inclusion criteria, and all were published between the years of 1986 and 2009.

The first and second authors performed article selection and data extraction. Both authors read each study and independently summarized each study in table format (e.g., study design, sample size, measures and measurement time points). This procedure was undertaken to ensure that no important omissions occurred. Tables were then compared and synthesized into a single document. All studies included in this review are summarized in Table 1 refer to online supplementary information, which lists the author(s) and publication year, sample size, study design, correlates/predictors examined, exercise measure, and the results pertaining to changes in exercise and significant correlates/predictors.

Twenty-five studies examined exercise patterns and determinants during pregnancy. With the exception of one study that examined energy expenditure,[18] the remaining 24 studies focused on leisure-time exercise, hence our rationale for using the term exercise throughout this paper. Of the 25 studies, 13 were prospective cohort studies, six were single time-point cohort studies, one was a retrospective cohort study, four were cross-sectional and one was a case–control design. The populations sampled included pregnant women ($n = 19$), postpartum women ($n = 4$) and two studies included both pregnant and non-pregnant women. The four postpartum studies were included because they contained a retrospective measure of exercise during pregnancy. Study samples were predominantly white, however, a few studies included women from different ethnic backgrounds.[19,20] The 25 studies produced a total of 239,983 participants, with sample sizes ranging from 53 to 150,256. Participants ranged in age from 15 to 44, although some studies only reported mean age. All studies used a self-report measure of exercise and are summarized in Table 1 refer to online supplementary information.

## 3. Results

Data retrieved from the studies were categorized into the following result headings: (1) changes in exercise patterns, (2) demographic predictors of exercise during pregnancy, (3) the role of pre-pregnancy exercise, (4) theory-based predictors and (5) other correlates of exercise. Not all studies addressed all the headings and no other headings were identified. The findings for each heading are synthesized and presented concurrently.

Sixteen studies examined women's exercise during pregnancy. Thirteen examined changes from pre-pregnancy to pregnancy,[18,19,21–30] two compared exercise rates between pregnant and non-pregnant women,[31,32] and one examined only the prevalence rates of exercise during pregnancy.[33]

Of the 13 studies that examined changes in exercise from pre-pregnancy to pregnancy, 11 examined changes in participation in *any* exercise.[18,19,21–27,29,34] Eight of these 11 studies assessed pre-pregnancy exercise retrospectively and at one time point during pregnancy,[22,23,25–30] two measured exercise at two time-points during pregnancy,[18,19] two measured exercise at three time-points,[24,34] and one measured exercise at four different time-points during pregnancy.[21]

All studies that examined changes in *any* exercise (regardless of intensity or duration) reported decreases from