

An epidemiological study of physical activity patterns and weight gain in physically active and sedentary pregnant women in Tshwane, South Africa

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Abstract

Physical activity during pregnancy has been investigated for its potential benefits which includes weight control. Physical activity patterns of pregnant women in Tshwane, South Africa, were investigated using the EPIC–Norfolk Physical Activity Questionnaire (EPAQ-2) in an epidemiological cross-sectional study. Differences between recalled pre-pregnancy weight and pregnancy weight were used to determine weight gain. Weight gain was calculated to determine its association with the physical activity levels of pregnant women in their second and third trimesters and to assess how the progression of the pregnancy affects this variable. Of the 78 women who participated, 31 (39.7%) and 47 (60.3%) were in their second and third trimesters, respectively; 30.8%, 53.9% and 16.7% were classified as relatively inactive, active and very active respectively. The weight gain of 45.5% of the pregnant women was within the recommended range, while 28.6% and 26.0% were below and above the range respectively. Non-parametric statistics indicated no connection between the trimester and the women's activity level. Very active and relatively inactive pregnant women fall below and above the recommended weight-gain ranges, respectively ($p>0.10$). Of the pregnant women, 35 (53.9%) were relatively active and 35 (45.5%) fall within the recommended weight-gain ranges. In conclusion, no connection was established between the pregnancy trimester and the level of physical activity, while physical activity effectively controlled weight gain during pregnancy. This study was limited by its cross-sectional nature, therefore further longitudinal research is recommended.

Keywords: Pregnancy, physical activity patterns, weight gain.

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Introduction

It has been found that physical activity is important for health and wellbeing (Li, Culver & Ren, 2003; Dubnov, Brzezinski & Berry, 2003; Shin, Hur, Pender, Jang & Kim, 2004; Ignarro, Balestrieri & Napoli, 2006). However, recent limited international research focuses on the effect of physical activity on pregnant women (Sports Medicine Australia (SMA), 2008) and many benefits are cited for women

who have uncomplicated pregnancies (Wadsworth, 2007). Despite these benefits, pregnant women are cautious to continue participating in many physical activities (Royal College of Obstetricians and Gynaecologists (RCOG), 2006; Lumbers, 2002) and many of them reduce their activity levels as their pregnancies progress, while some choose not to be active at all (Dye & Oldenettel, 1996; Alderman, Zhao, Holt, Watts & Beresford, 1998; Ezmerli, 2000; Clarke & Gross, 2004; Evenson, Savitz & Huston, 2004). The decrease in physical activity has been attributed to concerns for the safety of the foetus (Dye & Oldenettel, 1996; Lumbers, 2002; Evenson *et al.*, 2004). Pregnant women need to be encouraged to be active during pregnancy in order to reap the potential health-related benefits of exercise (Wiswell, 1996; Brown, 2002; RCOG, 2006). Physical activity can be recommended after medical clearance and can give mothers-to-be the confidence to participate in moderate, low-impact activities without harming the foetus (Lumbers, 2002). However, very limited research has been conducted on the physical activity patterns of South African women.

Weight gain during pregnancy can be an important factor in the identification of long-term obesity (Rooney & Schauburger, 2002) and other health risks such as pre-eclampsia and adverse birth outcomes (Cedergren, 2006). In addition, Devine, Bove and Olson (2000) reported that women are very self-conscious and concerned about weight gained during pregnancy. Consequently, specific recommendations regarding weight gain during pregnancy have been published by the Institute of Medicine (Ochsenbein-Kölble, Roos, Gasser & Zimmermann, 2007) as well as the American Pregnancy Association (2008). The latter gives week-by-week weight-gain guidelines for the 40-week gestation period.

Body mass index (BMI) (Heyward, 2006) has been widely accepted as an inexpensive and reliable screening tool for cardiovascular diseases and for identifying at-risk obesity cases according to height-to-weight ratio (Cedergren, 2006).

Exercise has been shown to help control weight gain (Rooney & Schauburger, 2002) and general stress, and to improve the mood of the mother-to-be. It also prevents late gestational hypertension and other metabolic pregnancy syndromes (RCOG, 2006; Wadsworth, 2007). As current research on the effects of physical activity on weight gain during pregnancy in the South African setting is lacking, the purpose of this study is two-fold: firstly, to determine whether or not physical activity levels change as pregnancy progresses and, secondly, to examine the related weight-gain differences of physically active and sedentary pregnant women.

Methods and Material

Participants and study design

An analytical, cross-sectional and epidemiological study design was used (Thomas & Nelson, 2001). Ethical approval for conducting the study was obtained from the Ethics Committee of the Faculty of Humanities at the University of Pretoria, South Africa. Seventy-eight pregnant women in their second and third trimesters volunteered to participate in the study. They were recruited from the consultation rooms of a gynaecologist in Tshwane, South Africa and from prenatal classes in and around the Tshwane area. Only participants who complied with specific inclusion criteria (aged 22 to 38 years; BMI between 18.5 and 29.9 kg/m²) and exclusion criteria (suffering from diabetes mellitus, pre-eclampsia or hypertension; BMI < 18.5 kg/m² or > 30 kg/m², elite and national sport team members, heavy smokers -> 20 cigarettes per day or drinkers -> 2 drinks per day) participated in this study (ACOG, 2002).

After having been fully informed regarding the aim and benefits of the study, the participants completed and signed an informed consent form and also filled in the EPAQ-2 modified physical activity questionnaire (Epic Physical Activity Questionnaire; Medical Research Council, Copyright 2003-2008). The women's pre-pregnancy weights were obtained via recall, and their pregnancy weights were measured (in kg). Several studies have reported that recalled pre-pregnancy weight reflects actual weight in women (Wing, Epstein & Ossip, 1979, Stunkard & Albaum, 1981; Tomeo, Rich-Edwards, Michels, Berkey, Hunter, Frazier, Willett, & Buka, 1999). Weight gain was calculated by subtracting the recalled pre-pregnancy weight from the pregnancy weight.

Instrumentation

A modified physical activity questionnaire called the EPAQ-2 (Epic Physical Activity Questionnaire; Medical Research Council, Copyright 2003-2008) was used to assess the physical activity patterns of the pregnant women. Modifications were made to the questionnaire to improve its validity and reliability ($r = 0.75-0.78$) in a South African context and to make it more suitable for pregnant women (e.g. kilometres were substituted for miles, certain activities were removed or modified to suit the South African context, and the opportunity to complete the activity levels of a second job within the nine-month period was removed as, generally, women would not begin a new job during pregnancy) (Wareham, Jakes, Rennie, Mitchell, Hennings & Day, 2002). This questionnaire included questions on the physical activity participation patterns at home, at work and during recreation. The physical activity levels of the pregnant women were calculated by allocating a number of points according to estimated intensity of specific activity. More points were given if the

participant performed the activity more frequently and fewer points if the participant performed it less frequently. Three activity groups were used to describe physical activity levels:

1. Relatively inactive (below 30 physical activity points)
2. Relatively active (between 30 to 60 physical activity points)
3. Very active (over 60 physical activity points) (Wareham *et al.*, 2002).

BMI ranges for pre-pregnancy weight were taken from ACSM (American College of Sports Medicine, 2006). Women's weight gains were graded as being within the recommended range (1), below the recommended range (2) or above the recommended range (3). Weight-gain guidelines advocated by the American Pregnancy Association (2008) (see Table 1) were used to calculate recommended weight-gain for this study.

Table 1: Weight-gain guidelines during pregnancy (American Pregnancy Association, 2008)

Healthy weight before pregnancy (BMI = 18.5-24.9 k/m ²)	Underweight before pregnancy (BMI < 18.5-24.9 k/m ²)	Overweight before pregnancy (BMI = 25-29.9 kg/m ²)
1.36-2.27 kg during the first trimester	2.27-2.72 kg or more in your first trimester; this can also depend on how underweight you were before pregnancy and your health care provider's recommendations	≈ 0.45-0.90 kg in the first trimester
≈ 0.45-0.9 kg per week in the second trimester	0.45-0.90 kg per week in the second and third trimesters	≈ 0.45 kg per week during the last six months
≈ 0.45-0.90 kg per week in the third trimester		

Data analysis

Data were analysed by means of the Statistical Product and Service Solutions package. Descriptive statistics were calculated for all the measurements. The Chi-square test was used to determine whether or not the investigated associations existed between physical activity and weight gain at the 5% level of statistical significance.

Results

Sample

The sample consisted of 39.7% (n=31) second-trimester and 60.3% (n=47) third-trimester pregnant women. Table 2 summarises the sample groups' descriptive characteristics including ages, pre-pregnancy and pregnancy weights and BMI.

This sample excluded all pregnant women classified as heavy smokers or drinkers, those that suffered from hypertension or diabetes mellitus or were elite sports women as these factors could influence weight gain negatively (ACSM, 2006, Ochsenein-Kölble *et al.*, 2007). Two questions on the pregnant women's diet were also included as diet could influence the weight gained during pregnancy. These concerned portion sizes and the frequency of eating or snacking.

Table 2: Descriptive characteristics of participants

Variable	n	Minimum	Maximum	Mean	Std. deviation
Age	70	22	38	29.4	4.1
Weeks pregnant	78	16	38	28.1	6.2
Height (cm)	73	152.0	187.9	176.6	0.06
Pre-pregnancy weight (kg)	77	45.0	96.0	62.0	10.3
Pre-pregnancy BMI (kg/m ²)	72	18.6	29.7	22.6	2.6
Pregnancy weight (kg)	77	55.0	110.0	73.2	12.3
Pregnancy BMI (kg/m ²)	72	20.5	36.1	26.6	3.6
Weight gained (kg)	77	1.0	31.0	11.1	5.8

Only 53.9% of the women agreed that their portion sizes stayed relatively the same as before pregnancy, and 57.7% agreed that the number of times that they had something to eat during pregnancy remained the same as before pregnancy.

Questionnaire responses and analyses

Mode of transport

Most of the participants stated that they used their cars as a means of transport to travel to and from places other than their workplaces (<1 to >8 km). A total of 54.9% stated that they used the car for distances of less than one kilometre, while 45.1% said that they walked those distances. For the longer distances (1.5 to 8 km, and more than 8 km) the women almost exclusively used their cars (92.7% and 92.9%, respectively). Very few participants made use of public or company transport (less than 4% overall) and none of them rode a bicycle as a means of transport. When travelling to and from work, 92.4% always used their cars. Only 14.4% stated that they always (8.6%), usually (2.9%) or occasionally (2.9%) walked to work.

TV or video viewing (weekdays and weekends)

A large percentage of women (71.4%) watched TV up to two hours per day during the week, while the percentage declined to 51.3 per day over weekends.

Stair and ladder climbing

Some of the women (42.9% during the week and 51.3% over weekends) never climbed the stairs when they were at home; 32.5% climbed the stairs one to five times during a weekday, while only 19.2% climbed the stairs over the weekend. Only 24.7% (during the week) and 29.5% (over weekends) climbed the stairs more than one to five times per day when at home. More women reported climbing stairs at work: 58.2% stated that they climbed the stairs between one to five times daily day.

Activities in and around the home

Preparing food, cooking and washing up were the most prevalent home activities that the women engaged in, with 63.6% of them doing between two to three hours of these activities per day. Shopping for food and groceries, cleaning the house themselves and doing the laundry and ironing were the next most common activities the women engaged in, with 58.4%, 50% and 48.7% of them, respectively engaging in these tasks for less than one hour per day. Very few of the participants cared for the handicapped, the elderly or the disabled at home (2.6%).

Work duration and hours

All the respondents worked a mean number of 8.3 months (SD \pm 1.4) during their pregnancies. Few of the women worked less than eight out of their nine months of pregnancy. They worked a mean number of 39.07 hours (SD \pm 9.8) each week. This is in line with the normal eight hours per day that most people work, especially in the public sector.

Work activities

The most prevalent work-time activities were sedentary work (light work to <4.5 METs including activities such as walking, gardening and housework) (92.6%) and walking at work (60.3%). Much fewer women performed tasks while standing (30.6% for light work and 28.3% for light to moderate work- ≥ 4.5 to <7.5 METs). Common moderate intensity work included brisk walking, swimming and bicycling (Wareham *et al.*, 2002).

Recreational activities

Figure 1 outlines the most prevalent activities the respondents engaged in. Walking for pleasure was the most prevalent, followed by watering the garden with the hosepipe and home maintenance.

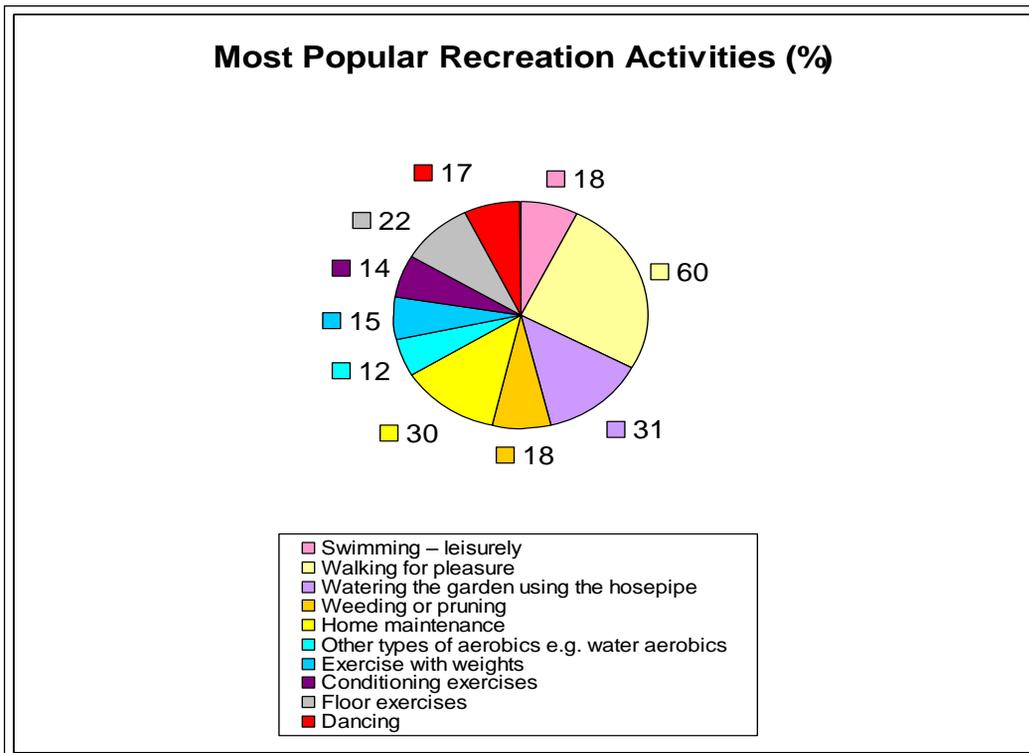


Figure 1: Recreational activities engaged in by the participants

The Chi-square analysis indicated no statistically significant relationship ($p > 0.05$) between the pregnancy trimester and the activity level of a pregnant woman. Figure 2 shows the percentages of women in each trimester that fell into the three different physical activity groups.

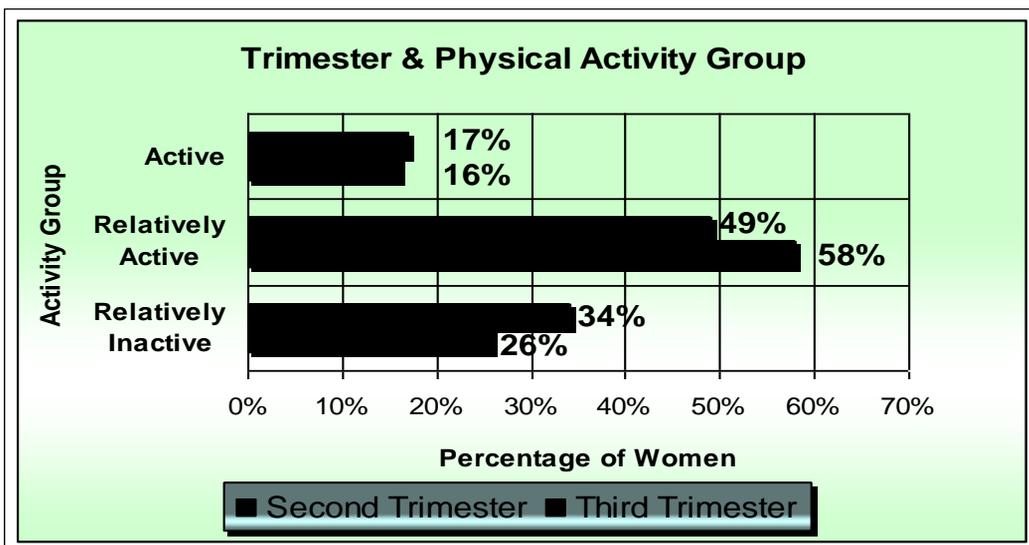


Figure 2: Percentages of women in each trimester and their physical activity groups

A statistically significant relationship ($p=0.03$) was found between the weight gained within the range and the women's activity levels. In the relatively inactive group more pregnant women were above the recommended weight-gain range, while in the very active group more women were below the recommended weight-gain range (Figure 3).

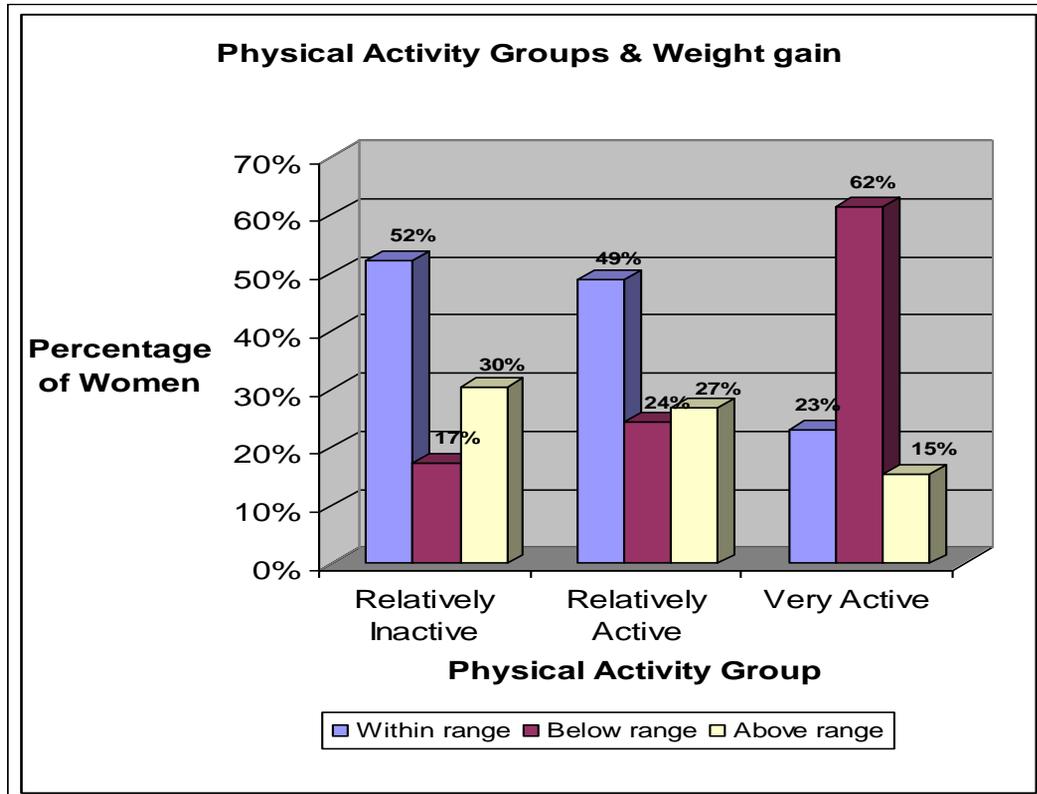


Figure 3: Weight gain relative to physical activity group

Discussion

This epidemiological study of 78 pregnant women in the Tshwane area indicated that 53.9% were relatively active, only 17% were very active, while the remaining 29% were relatively inactive. In addition, only 45.5% of the women were within the recommended weight-gain range (American Pregnancy Association, 2008).

No significant relationship was found in the sample between the trimester of pregnancy and a woman's physical activity level, thus meeting the first objective of this study, namely to determine whether or not physical activity levels changed as pregnancy progressed from the second trimester to the third trimester. This finding is in contrast to those reported in other studies (Ezmerli, 2000; Clarke & Gross, 2004; Duncombe, Wertheim, Skouteris, Paxton & Kelly, 2007).

Duncombe *et al.* (2007) reported that the amount and intensity of exercise decreased over the course of pregnancy because women were tired or unwell, too busy or uncomfortable in the later stages of pregnancy. Studies have also reported that many women stop exercising during pregnancy for safety reasons, possibly because health education programmes fail to correct inaccurate perceptions of the risks associated with physical activity during pregnancy (Ezmerli, 2000, Clarke & Gross, 2004). As all participants for this study were recruited from the practice of a gynaecologist who believes in the benefits of exercise and advocates that his patients attend pre-natal exercise classes during pregnancy, these perceptions may not have existed in this sample. The gynaecologist clearly highlighted the benefits of exercise during pregnancy thereby possibly decreasing the inaccurate perceptions associated with physical activity and pregnancy reported by Ezmerli (2000) and Clarke & Gross (2004) in this sample.

On examining the related weight-gain differences of physically active and sedentary pregnant women, this study showed that the women in the very active group tended to gain less weight than the women in the relatively inactive group (CI: 90%). More women in the very active group fall below the recommended range and more women in the relatively inactive group fall above this range. A total of 57.1% of the participants in the relatively active group were within the recommended range for weight gain during pregnancy. These findings support those of studies that have found that physical activity assists in controlling excess weight gain during pregnancy and far outweighs the risk involved with exercise (Mittelmark, Dorey & Kirschbaum, 1991; RCOG, 2006; Ezmerli, 2000; Brown, 2002; Rooney & Schauburger, 2002). As excess pregnancy weight gain and failure to lose this additional weight after pregnancy have been identified as predictors of long-term obesity (Rooney & Schauburger, 2002), exercise offers a possible solution to the long-term control of obesity (including weight gain during pregnancy).

The idea that exercise is a possible solution for the long-term control of weight gain is further reinforced by the RCOG's (2006) statement that excess weight gain during pregnancy is the adverse effect of leading a sedentary lifestyle during this time, and that pregnant women, if cleared medically, can continue to exercise during pregnancy. Rice and Fort (1991) disagree with all of the above findings. They showed no statistically significant differences in maternal weight gain between the active (n=12) and sedentary (n=11) groups of pregnant women. These findings may be attributed to the small samples used in Rice and Fort's (1991) study.

It appears that walking is the most preferred physical activity for pregnant women. This is supported by the current study in which 76.9% of the participants engaged in walking. Floor exercises were also popular (n=22; 28.2%). In an American study (n=9 953), 43% of the pregnant participants also reported walking as the leading activity, followed by swimming (12%) and aerobics (12%) (Zhang & Savitz, 1996).

Evenson *et al.* (2004), using leisure time physical activity telephone interviews to collect physical activity data, found that the most popular activity among pregnant women was walking, followed by indoor conditioning (which included aerobics, home exercises and weight lifting).

Conclusion

Physical activity has been shown to be an important factor in managing long-term weight control before, during and after pregnancy (Mittelmark *et al.*, 1991; Rooney & Schauburger, 2002). The current study supports this finding and concludes that leading a moderately active lifestyle during pregnancy can have definite weight-control benefits. Adopting a sedentary lifestyle, on the other hand, is unlikely to bring about these benefits, as evidenced by the study's finding that more women who were relatively inactive tended to be above the recommended weight-gain ranges (American Pregnancy Association, 2008) than the relatively active or very active women in the study. Being very active, however, did not appear to elicit weight-control benefits either, as the women in this category tended to fall under the recommended weight-gain by the American Pregnancy Association (2008). This study does not support other research findings that physical activity patterns decline as pregnancy progresses (Duncombe *et al.*, 2007). The cross-sectional nature of this study may have contributed to the difference in the results, therefore the relationship shown to exist in this study between weight gain and physical activity levels needs to be clarified.

In conclusion, healthy pregnant women should be advised to be physically active during their pregnancies to reap the exercise benefit of weight-gain control and possibly prevent the development of post-natal obesity.

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