Medicina Sportiva
Med Sport 15 (2): 44-50, 2011
DOI: 10.2478/v10036-011-0008-y

PHYSICAL ACTIVITY PATTERNS AND DAILY STEPS IN BRAZILIAN PREGNANT WOMEN'S SAMPLE

Paula Costa Teixeira[1 (A,B,C,D,E,F,)], Melanie Poudevigne[2 (D,E,F)], Sandra Marcela Mahecha Matsudo[1 (A,C,D,G)], Victor Keihan Rodrigues Matsudo[1 (A,C,D,G)]

[1] Physical Fitness Research Laboratory of Sao Caetano do Sul - CELAFISCS, Sao Paulo, Brazil
[2] Clayton State University, Department of Natural Sciences, Health & Fitness Management, Morrow, GA, USA

Abstract

Purpose: to analyze the physical activity (PA) level of pregnant women (PW) according to their gestational trimester and to evaluate multiple measurements of PA.

Methods: 122 PW, 26.5 ± 5.5 years old, and between the 4th and 37th week of pregnancy participated. PA was evaluated by levels of frequency and intensity, duration of walking, and moderate and vigorous PA; and based on the calculation in METs, determined by IPAQ and a pedometer. Data analysis was done by the Kruskall-Wallis, significance level of $P<.05$.

Results: a significant decrease was found in the duration of moderate PA in the second-trimester group when compared to the duration of the first and the third trimester groups. There were no differences in walking (4.8 days/week) and moderate PA frequency (3.1 days/week) on average across trimesters. When considering the weekly number of steps, PW had in the first trimester taken an average of 10,789.0 ± 5,676.8 steps, in the second trimester 6,812.1 ± 4,092.4 steps, and in the third trimester 6,746.8 ± 3,572.0 steps. There was no significant difference in the weekly total number of steps between trimesters.

Conclusion: the PA level of PW, using IPAQ or pedometer, was similar regardless of the trimester of the pregnancy.

Key words: *pregnancy, physical activity, pedometer, activity assessment*

Introduction

The importance of physical activity (PA) in every individual's life is already well documented in the literature. In Brazil, researches about PA level suggest that Brazilian have low PA level. However, a time trend study in PA in the state of São Paulo (the Brazilian's biggest city) showed that PA levels are increasing, and these trends were mainly explained by increases in walking and moderate-intensity PA [1,2].

The American College of Sports Medicine (ACSM) and the Center for Diseases Control (CDC) recommend all individuals to practice at least 30 minutes of moderate PA per day, in a continuous or cumulative way, aerobic and resistance exercise, on most days of the week [3]. In 2002, the American College of Obstetricians and Gynecologists (ACOG) have endorsed that the ACSM recommendation can also be followed by pregnant women (PW), as long as there are no contraindications to exercise [4].

The literature review shows that PW who were physically active during pregnancy were at a lower risk of developing diseases, such as diabetes or pregnancy-induced hypertension, as well as going into premature labor [5-9]. PA during pregnancy also prevents from unhealthy weight gain [5]. Moreira et al. [6] evaluated the association between weight gain in pregnancy and obesity in children, and found that the children of those PW who gained an excessive weight during pregnancy (≥ 16 kg) presented a higher risk of develop obesity during infancy; a sedentary lifestyle was also found to contribute to the worsening of this condition.

The measurement of PA levels in PW has been a challenge but the general PA patterns during pregnancy presents a tendency to decline due to factors such as: excessive weight gain, backache and edema, which may hinder locomotion [5].

There are a number of pregnancy-induced physiological and psychological changes that can lead a PW to set barriers against exercise. Pregnancy can be associated with increased symptoms of anxiety, fatigue, weight gain, distortion of the body image [10] and sometimes depression. Yet, paradoxically, these problems can be attenuated by the practice of PA, as suggested in studies with non-pregnant women [11].

Pregnancy is an event that leads to a decrease in PA [12]. Chasan-Taber et al. [13] conducted a prospective cohort study from 2000 to 2004 among healthy Latina prenatal care patients in a public clinic and midwifery practice and found that physical activity decreased from prepregnancy to pregnancy. Fell et al. [12] also found this decrease comparing PA during early pregnancy to the year before pregnancy.

Melzer et al. [14] examined the relation between recommended levels of PA during pregnancy and pregnancy outcomes. They conducted an observational study in 44 healthy women in late pregnancy. Active women, who engaged in >/=30 minutes of moderate PA per day, had significantly better fitness and lower sleeping heart

rate compared to the inactive and the risk for operative delivery was lower in active women compared to inactive.

Some studies have already been developed with the objective of assessing PA during pregnancy [5,15-17]. Tools such as questionnaires and accelerometers may be used in order to determine this behavior [18,19]. The socioeconomic and cultural differences restrict the usage of some questionnaires which were created in developed countries because they investigate PA in leisure time or recreational sports which are rarely practiced by women low socioeconomic level's, who predominantly are occupied with housechores PA [20].

Pedometer is a valid option for assessing PA in research [21]. The first study that used pedometer to measure PA in PW was conducted by Ogita et al. [22]. Body activity were measured in 140 PW for each week of gestation and the results showed decreases in walking from 25th and later from 36th week of gestation. A study conducted by Poudevigne & O'Connor [23] compared levels of PA during the second and third trimesters in PW and non-pregnant women. They used two types of questionnaires and a monitor sensor. Only one of the questionnaires showed a significant positive and moderate correlation with the monitor sensor (r= 0.41) and the number of movements registered by accelerometry using the MTI between the 1st and 3rd trimesters of pregnancy dropped by 23%.

To determine the usefulness method of measurement of PA in PW, Lindseth and Vari [15] compared the self-reported exercise diary to the pedometer. The results showed that 6-day pedometer counts in pregnancy correlated significantly (r = .49, P < .02) with the women's minutes of exercise self-reported in their diaries on the same days.

Studies measuring PA level in Brazil have been increasing. It is important to assess PA and check if PW are following the recommendations to develop all the benefits that PA can afford. Thus, the purpose of the present study was to analyze the PA level by trimester of pregnancy and to multiples measurements of PA using correlations in Brazilian pregnant women.

Materials and methods

Sample

The sample consisted of PW who were at least in their fourth week of pregnancy, aged 16 to 40 years, and who had no medical restriction to PA. One hundred and twenty four PW were recruited, of which 30.3% (n=37) did not agree to use a pedometer and 1.6% (n=2) had medical restrictions against it. Among the PW who did accept to wear the pedometer, 22% (n=28) ended up not using the device since they were close to labor. The final sample was composed of 57 PW who used the device (Figure 1).

The study subjects were assisted by the public prenatal program from the city of Sao Caetano do Sul in Sao Paulo State. All of the recruited PW participated in meetings that included education sessions on pregnancy, promoted by the Healthcare Surveillance Office of São Caetano do Sul; they were informed about the

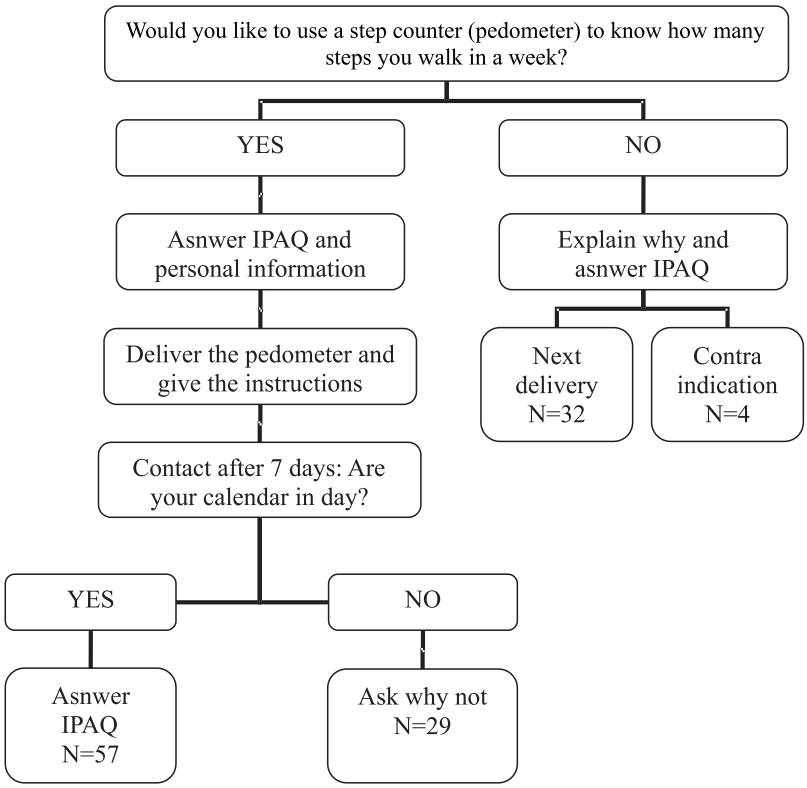

Fig.1. *Recruitment sample*

objective of the study and signed the informed consent.

Data Collection

In order to determine the PA level for each gestational trimester, the shorter version of the International Physical Activity Questionnaire (IPAQ), short form was applied in face to face interview. The IPAQ contains questions regarding the frequency and duration of walking, as well as moderate-intensity PA, including daily routine activities – house chores, occupational and leisure [24]. IPAQ's validity (0.46 - 0.75) and reliability (rho=0.69 - 0.71 $P<.01$) in Brazil were similar and acceptable compared to other physical activity instruments. The questionnaire was answered twice by those who agreed on using the device at baseline and seven days later.

The analysis of the IPAQ results were conducted according to the consensus between CELAFISCS and the Center of Diseases Control (CDC), considering the criteria of frequency (days/weeks) and duration (minutes/day), and dividing respondents into four categories [25]:

- Sedentary: did not practice any physical activity for at least 10 continuous minutes during a week.
- Irregularly active: practiced physical activity, though not enough to be considered active, since the total frequency and duration of the different types of activities (walk + moderate + vigorous) did not meet the minimum recommendation.
- Active: followed the recommendations
  a) Vigorous: ≥ 3 days/week and 20 minutes per session and/or
  b) Moderate or walk: ≥ 5 days/week and ≥ 30 minutes per session and/or
  c) Any activity that totaled: ≥ 5 days/week and ≥ 150 minutes/week (walk + moderate + vigorous)
- Very active: followed the recommendations
  a) Vigorous: ≥ 5 days/week and 30 minutes per session and/or
  b) Vigorous ≥ 3 days/week and ≥ 20 minutes per session + moderate and/or walk: ≥ 5 days/week and ≥ 30 minutes per session.

Total energy expenditure in a week was calculated in metabolic units (MET), by multiplying the frequency and duration of each type of PA by a value that varies according to intensity – 3.3 for walking; 4.0 for moderate-intensity PA; and 8.0 for vigorous.

After receiving the PW consents, the following de-

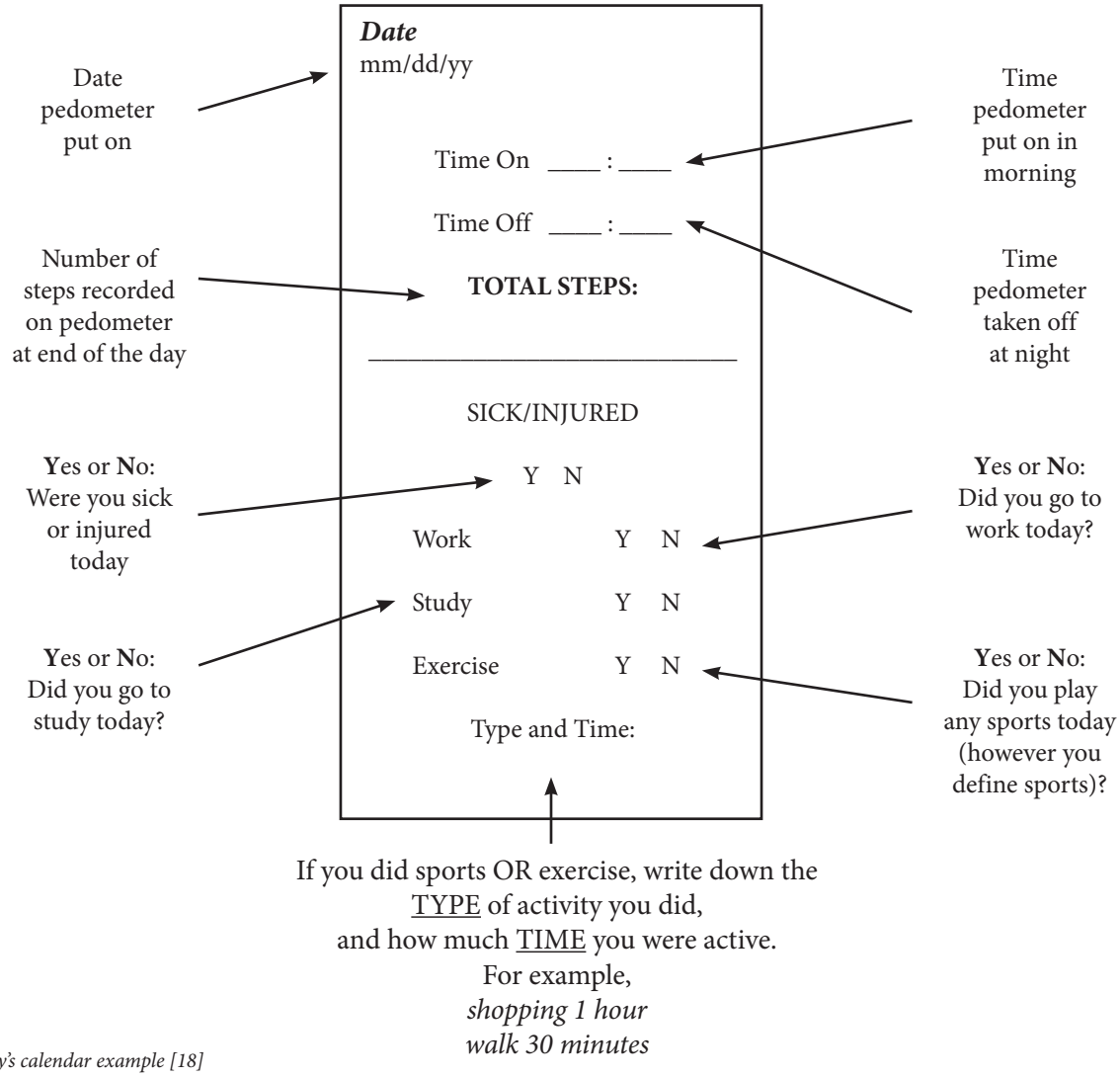

Fig. 2. *Day's calendar example [18]*

mographic information were: pregnancy week, weight before pregnancy and at the time of the interview, body height, parity, place of birth, ethnicity, marital status, educational level, occupation, family income, smoking habits, PA before pregnancy, last menstruation date and expected delivery date.

In order to quantify the number of steps, a Yamax Digiwalker (model SW-200, Japan) pedometer was used. The protocol for the pedometer use was proposed by Tudor-Locke et al. [18], and consisted of using the pedometer attached to clothes, so that the device remained at the waistline, leveled with the iliac crest, for seven consecutive days. Besides the pedometer, the PW were given written instructions on its use and a seven-day diary to record the dates and time the device was worn, the time it was taken off and the total number of steps recorded during each day. The PW also had to answer four objective questions every day of the 7 days (Figure 2). In the event of a positive answer, the type and duration of the activity was requested [18]. The PW were told to not restart the device's step-counter every day so that the total number of steps taken during the week could be recorded on the seventh (last day) the device was used.

Data analysis

Mean and standard deviation of the frequency and duration of the physical activities described in the IPAQ, the total number of steps and METs were calculated according to each trimester of gestation. The Kruskall-Wallis analysis was used to compare the three gestation trimesters. The variables for each trimester were compared using the Friedman and Mann-Whitney U analyses, to determine potential differences. Pearson's correlations were also used to verify the association between the number of steps and the total weekly energy expenditure, in METs. The significance level used was set at 0.05.

Results

The sample aged from 16 to 40 years old, comprised 47.4% of primiparae, 44% of which were from Sao Caetano do Sul, 26% from Sao Paulo State and 28% from other states, mainly from the Northeast, Brazil. Fifty five percent reported being married, 27% were non-legally partnered and 15% were single. Forty two percent were Caucasian, 16% were from African descendants and the remaining 42% were from Asian origin or mixed races. Forty seven percent of the PW completed high school and 5% completed university. Fifty-one percent were unemployed. Sixty-seven percent of the PW were sedentary before their pregnancy. Table 1 shows characteristics of the PW who answered the IPAQ.

The IPAQ results for the 122 PW are shown in Table 2. The PW in the second trimester did significantly less moderate-intensity PA when compared to the PW in the first and third trimesters. The second trimester PW presented significantly lower moderate-intensity PA ($P<.05$) duration than the first and third trimesters'.

Fifty-seven PW wore the pedometer. The number of steps during the seven days of the week was ana-

Table 1. *Characteristics of the sample*

	1st Trimester (N=18) x ± s	2nd Trimester (N=45) x ± s	3rd Trimester (N=59) x ± s
Age (years)	27.5 ± 4.8	27.7 ± 5.2	25.3 ± 5.8
Gestation (weeks)	8.8 ± 2.8	20.2 ± 4.0	31.2 ± 3.4
Parity	1.6 ± 0.8	2.0 ± 1.0	1.6 ± 0.7
Stature (meters)	1.60 ± 0.1	1.63 ± 0.1	1.58 ± 0.1
Pre-pregnancy body weight (kg)	63.8 ± 9.1	66.0 ± 13.7	58.3 ± 14.3
BMI pre-pregnancy (kg/m^2)	24.6 ± 2.4	25.2 ± 4.8	23.1 ± 5.0

Table 2. *Frequency (FREQ in day/week) and duration (DUR in min/day) of walking, moderate, vigorous, and METs total PA in PW according to gestational period (x ± s) (N=122)*

Physical Activity type	1st Trimester (N=18)		2nd Trimester (N=45)		3rd Trimester (N=59)	
	FREQ	DUR	FREQ	DUR	FREQ	DUR
Walking	5.1±2.0	42.2±28.2	4.8±2.0	62.1±83.5	4.4±2.1	46.7±39.9
Moderate	3.1±2.6	136.6±129.0	2.7±2.6	62.1±64.7*	3.6±2.7	115.0±124.6
Vigorous	0.7±1.7	12.2±29.0	0.6±1.4	26.8±54.8	0.9±1.5	38.1±68.6
METs total	3,329.2 ± 3,762.5		2,678.6 ± 2,859.5		3,666.6 ± 3,838.4	

* $P < .05$

Table 3. *Number of steps (x ± s) in PW according to gestational period*

	1° Trimester (N=6)	2° Trimester (N=23)	3° Trimester (N=28)
Weekdays	11.264,6 ± 5.676,8	7.392,7 ± 4.955,9	6.614,9 ± 3.691,0
Weekend	9.600,1 ± 7.348,0	5.441,5 ± 3.785,7	6.576,6 ± 3.934,0
Total weekly	10.789,0 ± 5.933,6	6.812,1 ± 4.092,4	6.746,8 ± 3.572,0

lyzed and all three groups had a larger number of steps taken on weekdays (Monday through Friday) than on the weekend (Table 3). PW in the second trimester presented the largest differences (Δ = 35.8%); they walked a lot more on weekdays than on the weekend. PW in the first trimester walked 17.3% more on weekdays than on the weekends, and the PW in the third trimester showed almost no difference (Δ = 0.5%) in the number of steps between weekdays and weekends. There was no significant difference from one trimester group to the other in the number of steps. The highest difference between weekdays and weekend was during the second trimester (Δ = -26.3%). Figure 3 shows the mean values of each day of the week (from Monday to Sunday) per trimester.

The correlation between the number of steps and total weekly energy expenditure in METs (total sum of walk, moderate and vigorous physical activity) was significantly weak (r= .15; *P*<.05). However, when we analyzed the association between the number of walking steps and the energy expenditure in METs

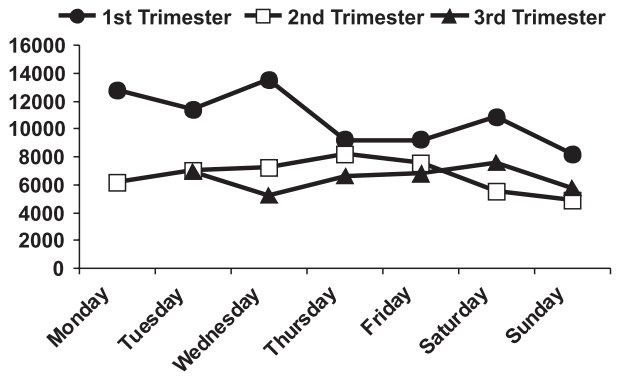

Figure 3. *Number of steps per day of pregnant women according to gestational trimester during one week*

(frequency x duration x 3.3), the correlation, although weak was significant (r= .36; *P*<.05).

Discussion

The purpose of this study was to analyze the PA level in three different groups of PW in each trimester of gestation. In the self-reported assessment (IPAQ), the 2nd trimester group related less duration of moderate-intensity PA type compared to 1st and 3rd trimester. A longitudinal study could be more effective to understand this phenomenon.

The longitudinal study conducted by Poudevigne & O'Connor [23] showed that the number of movements detected by the MTI motion sensor decreased (23%) in PW from the first to the third trimesters, a feature undetected by two questionnaires applied in the sample.

In our study, when we analyzed the total weekly energy expenditure in METs (Table 1), PW in the first trimester were more active when compared to the ones in the second trimester (Δ = 24.2%), and that behavior repeated itself in the average number of steps taken per day (Table 2). PW in the second trimester were less active than the ones in the first, as observed in the total weekly METs as well as in the average number of steps taken per day (Table 3).

Our sample was predominantly low-income. In developing countries as Brazil, the lowest women's involvement with the practice of exercise directs attention to occupational and domestic activities [20].

The IPAQ was answered by interview. When PW were asked about how often they walked, for example, they answered based on how many times they went to the supermarket, visited someone, or went to the clinic. In the questions about moderate-intensity PA, they answered based on cooking, cleaning the house, sweeping, washing, and ironing clothes. In the vigorous type, their examples were cleaning the bathroom, walking in side-walks, and washing clothes by hand. These findings suggest that PW could spend too much time in a standing position which could be a risk for low birth weight. All these activities require a lot of time in standing position. Takito et al. [26] evaluated the effects of walking and maternal posture on birth weight, in 152 low-income Brazilian PW. A questionnaire was elaborated to evaluate the frequency and duration of daily PA during the last week. Close to 60% of the PW walked for less than 30 minutes per day. The univariate analysis suggested that there was a protective effect on birth weight in PW who walked for at least 50 minutes a day during the first trimester. Whereas, in the second trimester, remaining in a standing position for over two and a half hours per day was considered by the authors as

a risk for inadequate birth weight [26]. Therefore, despite our sample had performed many activities in a standing position, it seems that it was not considered a risk to their babies.

The type of physical activity during pregnancy in the sample reported that they had warrants attention. Stamatakis et al. [27] analyzed the impact that domestic activities had on cardiovascular disease prevention in 14,836 adults, and concluded that this type of PA contributed to high energy expenditure, as well as an increase in PA levels. On the other hand, some researchers have shown that benefits of PA, especially the psychological, for PW can be earned when they engaged in leisure time [7,9,28-30].

Pereira et al. [31] explained that there are many factors that can prevent a woman from practicing leisure physical activities during or after pregnancy. Factors such as the socio-economic level, number of children to look after and domestic tasks are a few examples. In the study by Takito et al. [26] PW reported a higher frequency of daily PA such as sweeping, cooking, washing and ironing clothes, even though cooking and washing clothes represented a significant statistical risk for inadequate birth weight, as the PW increased the frequency of those tasks.

Our study also showed that there was a low but significant correlation (r=0.36; $P<.05$) between the pedometer and the question in the IPAQ related to walking. Studies with pedometers confirmed that this instrument is not capable of detecting PA intensity [32]. In the study by Lindseth & Vari [15], two PA measures were compared: a PA diary and a pedometer. The correlation between both instruments was significant and moderate-intensity (r=0.49; $P<.05$). In addition, some types of activities - such as child care, housework, lifting, biking, and swimming - cannot be adequately measured by the pedometer but may be important in studies examining activity in pregnancy [15].

By analyzing the PA level of PW, we were able to conclude that although the pattern of PA was similar among the three trimesters, moderate-intensity PA was lower in the second trimester. This PA decrease could be explained by the marked decline in PA levels on the weekends during the second trimester. A longitudinal study might be more appropriate to evaluate this phenomenon. The IPAQ seemed to be a good instrument to evaluate the PA level of PW.

One weakness in the study could be that the participation in the Healthcare Surveillance may have changed women's physical activity pattern and their behavior did not represent the usual physical activity level. Another limitation in this study is the number of participants who actually concluded the study: more than half of the sample did not want to wear the pedometer.

Health care professionals are encouraged to provide pregnant and postpartum women with information on recommendations of physical activity, particularly regarding the minimum duration and intensity level [33].

The present study suggests that orientation for the practice of physical activities during pregnancy should be more widespread available and reinforced, so that PW could enjoy the physical and psychological benefits of regular and moderate-intensity PA. PW can follow the same ACSM recommendations as non-pregnant women.

SYNOPSIS: assessing physical activity in pregnant women, especially in developing countries is a way to identify if PW follow PA recommendations.

Acknowledgments

We express our thanks to the participants and to the Sao Caetano do Sul Public Health Department to support our study.

References

1. Matsudo VKR, Matsudo SMM, Andrade DR et al. Promotion of physical activity in a developing country: the Agita Sao Paulo experience. *Public Health Nutr* 2002; 5: 253-61.
2. Matsudo VKR, Matsudo SMM, Araujo TL et al. Time trends in physical activity in the state of São Paulo, Brazil: 2002-2008. *Med Sci Sports Exerc* 2010; 42(12): 2231-6.
3. Haskell WL, Lee I-Min, Pate RR et al. Physical activity and public health. Updated Recommendation for Adults From the American College of Sports Medicine and the American Heart Association. *Circulation* 2007; 116: 1081-93.
4. American College of Obstetricians and Gynecologists. Exercise during pregnancy and the postpartum period. *The American College of Obstetricians and Gynecologists Committee Opinion No 267*. 2002; 99: 171-3.
5. Chasan-Taber L, Schmidt MD, Roberts DE et al. Development and validation of a Pregnancy Physical Activity Questionnaire. *Med Sci Sports Exerc* 2004; 36: 1750–60.
6. Moreira P, Padez C, Mourão-Carvalhal I et al. Maternal weight gain during pregnancy and overweight in Portuguese children. *Int J Obesity* 2007; 31: 608-14.
7. Domingues MR, Barros AJ, Matijasevich A. Leisure time physical activity during pregnancy and preterm birth in Brazil. *Int J Gynecol Obstet* 2008; 103: 9-15.
8. Hegaard HK, Pedersen BK, Nielsen BB et al. Leisure time physical activity during pregnancy and impact on gestational diabetes mellitus, pre-eclampsia, preterm delivery and birth weight: a review. *Acta Obstet Gynecol Scand* 2007; 86: 1290-6.
9. Hegaard HK, Hedegaard M, Damm P et al. Leisure time physical activity is associated with a reduced risk of preterm delivery. *Am J Obstet Gynecol* 2008; 198: 180.e1-5.
10. Goodwin A, Astbury J, McMeeken J. Body image and psychological well-being in pregnancy. A comparison of exercisers and non-exercisers. *Aust N Z J Obstet Gynaecol* 2000; 40: 443-7.
11. Poudevigne MS, O'Connor PJ. A review of physical activity patterns in pregnant women and their relationship to psychological health. *Sports Med* 2006; 36: 19-38.
12. Fell DB, Joseph KS, Armson BA et al. The impact of pregnancy on physical activity level. *Matern Child Health J* 2009; 13: 597-603.
13. Chasan-Taber L, Schmidt MD, Pekow P et al. Correlates of physical activity in pregnancy among Latina women. *Matern Child Health J* 2007; 11: 353-63.
14. Melzer K, Schutz Y, Soehnchen N et al. Effects of recommended levels of physical activity on pregnancy outcomes. *Am J Obstet Gynecol* 2010; 202: 266.e1-6.

15. Lindseth G, Vari P. Measuring physical activity during pregnancy. *Western J Nurs Res* 2005; 27: 722-34.
16. Schmidt MD, Freedson PS, Pekow P et al. Validation of the Kaiser Physical Activity Survey in pregnant women. *Med Sci Sports Exerc* 2006; 38: 42-50.
17. Attaisalo M, Pasanen M, Fogelholm M et al. Validity and repeatability of a short pregnancy leisure time physical activity questionnaire. *J Phys Act Health* 2010; 7: 109-18.
18. Tudor-Locke C, Lind K, Reis JP et al. A preliminary evaluation of a pedometer-assessed physical activity self-monitoring survey. *Field Methods* 2004; 16: 422-38.a
19. Tudor-Locke C, Williams JE, Reis JP et al. Utility of pedometers for assessing physical activity – construct validity. *Sports Med* 2004; 34: 281-91.b
20. Takito MY, Benício MH, Neri LCL. Physical activity by pregnant women and outcomes for newborns: a systematic review. *Rev Saúde Publica* 2009; 43(6): 1059-69.
21. Tudor-Locke C, Williams JE, Reis JP et al. Utility of pedometers for assessing physical activity: convergent validity. *Sports Med* 2002; 32: 795-808.
22. Ogita S, Matsuo S, Oka T et al. Significance of exercise and bed rest in pregnancy and walking. *Annals Physiol Anthropol* 1989; 8: 13-9.
23. Poudevigne MS, O'Connor PJ. Physical activity and mood during pregnancy. *Med Sci Sports Exerc* 2005; 37: 1374-80.
24. Matsudo SMM, Araujo TL, Matsudo VKR et al. International Physical Activity Questionnaire (IPAQ): validity and reproducibility study in Brazil [in Portuguese]. *Rev Ativ Fis Saúde*. 2001; 6:5-18.
25. Matsudo SMM, Matsudo VKR, Araújo TL et al. Physical activity level of São Paulo State population: an analysis based on gender, age, socio-economic status, demographics and knowledge [in Portuguese]. *Rev Bras Ciênc Mov* 2002; 10: 41-50.
26. Takito MY, Benício MH, Latorre MR. Maternal posture and its influence on birthweight [in Portuguese]. *Rev Saúde Públic* 2005; 39: 325-32.
27. Stamatakis E, Hilldson M, Primatesta P. Domestic physical activity in relationship to multiple cardiovascular disease risk factors. *Am J Prev Med* 2007; 32: 320-7.
28. Madsen M, Jorgensen T, Jensen ML et al. Leisure time physical exercise during pregnancy and the risk of miscarriage: a study within the Danish National Birth Cohort. *BJOG* 2007;114: 1419-26.
29. Osterdal M, Strom M, Klemmensen A et al. Does leisure time physical activity in early pregnancy protect against pre-eclampsia? Prospective cohort in Danish women. *BJOG*. 2009; 116: 98-107.
30. Domingues MR, Barros AJ. Leisure-time physical activity during pregnancy in the 2004 Pelotas Birth cohort study. *Rev Saúde Pública* 2007; 41: 173-80.
31. Pereira MA, Rifas-Shiman SL, Kleinman KP et al. Predictors of change in physical activity during and after pregnancy. *Am J Prev Med* 2007; 32: 312-9.
32. Masurier GCL, Tudor-Locke C. Comparison of pedometer and accelerometer accuracy under controlled conditions. *Med Sci Sports Exerc* 2003; 35: 867-71.
33. Borodulin K, Evenson KR, Herring AH. Physical activity pattern during pregnancy through postpartum. *BMC Womens Health* 2009; 19: 9-32.

Received: August 26, 2010
Accepted: April 08, 2011
Published: April 27, 2011

Address for correspondence:
Paula Costa Teixeira
Rua Heloisa Pamplona, 263 – Fundação
São Caetano do Sul, SP, Brasil
CEP 09501-000
Phone/Fax: (5511) 4229-8980
E-mail: paulapct@usp.com.br

Sandra Matsudo: celafiscs@celafiscs.org.br
Victor Matsudo: celafiscs@celafiscs.org.br
Melanie Poudevigne: melaniepoudevigne@mail.clayton.edu