

# Physical Activity Counseling Received Throughout Pregnancy: Effect on Behaviors: A Quasi-experimental Study.

Shelly RUART (✉ [sruart01@gmail.com](mailto:sruart01@gmail.com))

Univ Antilles, Laboratory ACTES EA3596, Pointe-à-Pitre, Guadeloupe <https://orcid.org/0000-0003-2868-8399>

Stéphane SINNAPAH

Université des Antilles

Olivier HUE

Université des Antilles

Eustase JANKY

Centre Hospitalier Universitaire de Guadeloupe Pointe-à-Pitre/Abymes

Sophie ANTOINE-JONVILLE

Université des Antilles

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## Research article

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# Abstract

**Background:** Pregnant women declare perceived barriers to physical activity. Although physical activity is not often dispensed, effective counseling by health professionals is recommended. Health professionals training has been proposed as a target to improve physical activity effective counseling. The objective was to evaluate the physical activity counseling of trained and untrained health professionals given to pregnant women and the effect on the women's physical activity behaviors.

**Methods:** In a quasi-experimental trial, 72 pregnant women were allocated to a control or intervention group. Physical activity counseling was dispensed to the women in the intervention group by trained healthcare providers throughout pregnancy. The women in the control group followed the usual consultations. The counseling and physical activity levels were evaluated by Chi2 tests and repeated measures ANOVAs respectively.

**Results:** Overall, the women received little counseling in accordance with the recommendations, although the intervention group women received it more frequently ( $p=0.049$ ). All women who received counseling throughout pregnancy limited their decline in physical activity more than the others. The decline in sports activity among normal-weight pregnant women was reduced in the intervention group ( $p=0.032$ ), and sedentary activity was preserved among the pre-pregnancy overweight women ( $p=0.027$ ). The total quantity of physical activity was not different in women who received counseling in accordance with recommendations compared with that of the others.

**Conclusion:** Our intervention showed the effectiveness of counseling on physical activity behaviors, although the effect was limited. Training for professionals should be strengthened to ensure that counseling in line with the recommendations is provided throughout pregnancy.

Pregnant women should be encouraged to engage in physical activity from the beginning of pregnancy.

**Trial registration:** The database for this study was retrospectively registered under No. MR 5815250919.

## Background

The efficacy of lifestyle changes, especially around physical activity (PA) to reduce or prevent pregnancy complications, has been shown [1–3]. This research has given rise to recommendations for pregnant and postpartum women that should be useful to researchers, policy organizations, and the obstetric care providers and exercise professionals who provide guidance to them [4]. Effective PA promotion in healthcare settings relies on professionals having the appropriate level of knowledge and skills. Studies have indicated that after an educational intervention, healthcare professionals are more likely to give their pregnant patients PA guidance [5, 6]. However, the efficacy of counseling has been questioned [7].

The purpose of the study was to evaluate the physical activity counseling given by trained health professionals and the effect on the physical activity behaviors of pregnant women.

## Methods

## Study design

The study was part of a PA promotion project to improve maternal and infant health by offering individual and lifestyle counseling during pregnancy. We employed a longitudinal quasi-experimental repeated-measures design, with the Maternity Unit of the Guadeloupe Hospital as the unit of randomization. The project was presented to the midwives and gynecologists of the unit. The health professionals randomized into the intervention group attended two meetings, each lasting approximately 30 minutes, during which time they received information about the PA recommendations. They were also given a document summarizing the American College of Obstetricians and Gynecologists (ACOG) recommendations (on PA, recommended and non-recommended activities, signs of cessation of PA practice) [4], which were recently updated [8]. A follow-up sheet was created for communications between the coordinator and the intervention group health professionals to ensure consistency in the messages on PA recommendations. The control group practitioners were free to talk about PA with their patients or not. No recommendations were made.

## Participants, recruitment and group assignment

Seventy-two questionnaires were completed and collected: 37 and 35 in the intervention and control groups, respectively. The inclusion criteria were as follows: maternal age  $\geq 18$  years old, gestation  $\leq 15$  weeks, a single fetus, possessing a mobile phone for receiving messages, and French speaking. Women with medical or obstetric complications or risks were excluded from participation, in line with the ACOG guidelines.

Health professionals were randomly assigned to the control group or the intervention group after presentation of the PA promotion project. At the end of each standard antenatal appointment, if a health professional deemed a woman eligible to participate according to the inclusion criteria, the coordinator was invited to explain what the research entailed (information on the project objectives and procedures) (Visit 0). Following this explanation, the pregnant women were allocated to either the intervention or control group, depending on the health professional who was following them. They were recruited between January 2017 and April 2018. Each woman in the intervention group received PA counseling throughout the pregnancy by the same trained health professional, and none of the women asked to change groups during this period.

## Ethics

Ethics approval for this study is deemed unnecessary according to national regulations. The study was conducted in accordance with the Declaration of Helsinki and the database for this study was retrospectively registered under No. MR 5815250919. All participants provided written consent prior to participation in the study.

## Intervention

### Physical activity counseling

The women in the intervention group received individually tailored PA consultations throughout pregnancy (once a month) with the project coordinator, who was a trained adapted PA teacher. These meetings were composed as follows: the women were first encouraged to comply with the ACOG recommendations: at least 20-30 minutes of PA per day on most or all days of the week. Women who had previously been engaged in no or very little moderate-intensity PA were advised to begin with 15 minutes of moderate-intensity PA three times per week, gradually increasing to 30 min.

Recommended and non-recommended activities were then discussed, as were the risks and benefits of PA related to pregnancy. Before or after this PA consultation, the health professionals of the intervention group were also instructed to systematically devote 1 minute of their time to providing counseling about PA to supplement and/or reinforce the project coordinator's messages. This time could be lengthened if necessary. The PA consultations were thus held alongside the routine monthly pregnancy visits with the health professionals of the intervention group.

## Measurements Counseling

A structured questionnaire that covered the PA recommendations to be counseled was created and pre-tested. The questions were open-ended and concerned the women's experiences with PA during pregnancy. Table 1 presents the questions.

Table 1  
Questions at delivery: Health professionals' counseling on physical activity during pregnancy

During your pregnancy, did a health professional discuss physical activity with you?
Did you receive counseling on the frequency (the number of times per week) of physical activity during pregnancy? * If yes, what was the number of times per week?
Did you receive counseling on how much time you should spend on physical activity every day during pregnancy? * If yes, what was the time you were advised to spend on it?
Did you receive counseling on the intensity of physical activity during pregnancy? * If yes, what was the intensity?
At what stages of pregnancy did your gynecologist/midwife talk to you about your physical activity? * <b>Women were asked to expand on their answers if they had answered "yes" to the previous question</b>

The counseling specifically dealt with the recommendations for the frequency, intensity, and duration (FID) of PA, with information on these three PA characteristics pooled [4]. We assumed that the questionnaire responses indicating that the recommendations were being met would be the following: "5 times/week" and "every day" for the frequency of PA AND "20-30 minutes" and "> 30 minutes" for the duration AND "moderate" for the intensity. The women completed this questionnaire within 3 days after childbirth.

# Physical activity behavior

PA behavior was measured with the adapted French version of the pregnancy physical activity questionnaire (PPAQ) [9]. The women reported the time (per day or week) they spent on each activity. Each activity was then assigned an intensity value in metabolic equivalent of task (MET, where 1 MET=energy expended at rest), based on either field measurements of the pregnant women or the values found in the compendium of PA [10]. The time spent on each activity was multiplied by its intensity to obtain an average of the weekly energy expenditure (MET-h.wk), then added to calculate the weekly total activity. The average weekly energy expenditure was categorized according to four levels of PA intensity: sedentary (<1.5 MET), light (1.5- <3.0 MET), moderate (3.0-6.0 MET) or vigorous (>6.0 MET).

## Assessment of pre-pregnancy body mass index (BMI)

These items were used for discretization in some of the analyses. Pregnant women with weight problems were defined as pre-pregnancy overweight. Pre-pregnancy BMI was calculated using pre-pregnancy weight and height collected from the medical records, and the women were categorized as underweight (<18.5 kg/m<sup>2</sup>), normal weight (BMI 18.5–24.9 kg/m<sup>2</sup>) or overweight (>25.0 kg/m<sup>2</sup>).

## Statistical Analysis

The general characteristics of the two groups were first described using means and standard deviations (SD) for continuous variables (age, height, weight, and BMI) and frequency for categorical variables (pre-pregnancy BMI, marital status, education).

The Kolmogorov-Smirnov test determined whether the data followed a normal distribution. The Friedman test compared the differences between the distribution of counseling over the pregnancy trimesters on the whole sample, followed by Wilcoxon test. The effect on the group that had received PA counseling was explored by Chi<sup>2</sup> tests. Odds ratios were calculated when Chi<sup>2</sup> analyses revealed significant associations and are presented reported in the tables. The effect of counseling on PA behaviors was evaluated in the last two trimesters. PA behaviors in the first trimester were not taken into account because we assumed that the evaluations had taken place too soon after the PA counseling to have an effect on the behaviors.

A dichotomization was achieved between all women in the intervention group who reported receiving PA counseling (n=20) vs. those who reported not receiving PA counseling. The women in the intervention group who did not report receiving PA counseling throughout the pregnancy were thus grouped together with the women in the control group and this group was henceforward referred to as the group of other women (n=52). Repeated measures ANOVAs were used to investigate the changes between groups over time for PA behaviors. Mann-Whitney U tests were used when the conditions of application were not met. A post-hoc Bonferroni multiple comparison procedure was then used.

A p-value of <0.05 was considered statistically significant.

## Results

### Participants

At baseline (trimester one), the demographic characteristics of the intervention and control groups presented no significant differences. Marital status and educational level were significantly different between the dichotomized subgroups (Table 2).

Table 2

Baseline characteristics of study participants (n = 72, unless otherwise stated) and the dichotomized subgroup with data from the Pregnancy Physical Activity Questionnaires (PPAQs) (n = 72, unless otherwise stated). p stands for the intervention vs. control group comparison.

	<b>Intervention group n = 37</b>	<b>Control group n = 35</b>	<b>p</b>	<b>Intervention 1 group = 20</b>	<b>Control 1 group n = 52</b>	<b>p</b>
	Mean ±	Mean ±		Mean ±	Mean ±	
Age (years)	29.4 ± 6.42	28.5 ± 7.06	0.590	30.9 ± 5.8	28.2 ± 6.9	0.130
Height, (m)	1.63 ± 0.06	1.62 ± 0.05	0.110	1.64 ± 0.05	1.63 ± 0.06	0.653
Weight and Weight status	n = 36	n = 32		n = 20	n = 48	
Pre-pregnancy Weight (kg)	69.54 ± 18.31	72.82 ± 14.92	0.425	74.19 ± 17.69	69.79 ± 16.37	0.328
Pre-pregnancy Body Mass Index	n (%)	n (%)	0.797	n (%)	n (%)	0.364
Underweight	2 (5.6%)	3 (9.4%)		1 (5.0%)	4 (8.3%)	
Normal	16 (44.4%)	13 (40.6%)		6 (30.0%)	23 (47.9%)	
Overweight	8 (22.2%)	5 (15.6%)		6 (30.0%)	7 (14.6%)	
Obesity	10 (27.8%)	11 (34.4%)		7 (35.0%)	14 (29.2%)	
Smokers			0.305			0.484
Smoker	2 (5.7%)	0 (0.0%)		0 (0.0%)	2 (4.5%)	
Non-smoker	33 (94.3%)	28 (100.9%)		19 (100.0%)	42 (95.5%)	
Marital status			0.190			0.015
Single	9 (25.7%)	11 (39.3%)		2 (10.5%)	18 (40.9%)	
Living with partner/married	26 (74.3%)	17 (60.7%)		17 (89.5%)	26 (59.1%)	
Educational level			0.079			0.014
Higher Education	19 (54.3%)	10 (35.7%)		14 (73.7%)	15 (34.1%)	
High school diploma	10 (28.6%)	6 (21.4%)		3 (15.8%)	13 (29.5%)	
Secondary	6 (17.1%)	12 (42.9%)		2 (10.5%)	16 (36.4%)	

For the two groups pooled, 35.8% (95%CI 27.8–43.7) of the pregnant women reported receiving PA counseling throughout pregnancy and 6.0% did not remember this.

Among the women who received counseling, all reported receiving counseling on frequency, intensity or duration or the three pooled together: FID.

# Counseling received throughout pregnancy on physical activity (intervention and control groups)

There was a general effect of pregnancy trimester on the distribution of counseling ( $p < 0.001$ ), but no significant difference between the trimesters (Table 3).

Table 3  
Distribution of physical activity counseling during pregnancy in sample per trimester ( $n = 72$ )

Counseling received on PA per trimester		Trimester effect (p)
Trimester	<i>n</i> (%)	
First	38 (55.9) <sup>a</sup>	< 0.001
Second	54 (78.3) <sup>b</sup>	
Third	58 (85.3) <sup>c</sup>	
Post-hoc Wilcoxon test. a # b; a # c; b = c (# significantly differences between trimesters, = or not)		

Table 4 shows the counseling received throughout pregnancy in the intervention and control groups. Comparisons showed that the women in the intervention group reported receiving PA counseling throughout pregnancy ( $p < 0.001$ ). The same results were observed for the women with weight problems (pre-pregnancy overweight) in this group ( $p = 0.002$ ).

Table 4

Counseling received throughout pregnancy on physical activity in the intervention and control groups, and dichotomization of all women who received PA counseling throughout the pregnancy vs. other women.

	Intervention group n = 37 (%)	Control group n = 35 (%)	OR	(IC 95%)	All women in intervention group with counseling n = 20 (%)	Other women n = 52 (%)	OR	(CI 95%)
Counseling received on PA throughout pregnancy	(n = 36) 20 (55.6%)	(n = 31) 4 (12.9%)	8.00	(2.28–27.99)	20 (100.0)	4 (7.7)	6.00	(2.45–14.67)
P-p Overweight	(n = 17) 13 (76.5%)	(n = 15) 2 (13.3%)	7.63	(0.80–72.40)	(n = 13) 13 (100.0)	(n = 25) 0 (0.)	7.50	(2.06–27.2)
In accordance with the recommendations								
FID pooled	(n = 37) 11 (29.7%)	(n = 35) 4 (11.4%)	3.27	(0.93–11.53)	(n = 20) 11 (100.0%)	(n = 61) 4 (6.6)	3.75	(1.62–8.67)
P-p Overweight					(n = 6) 6 (100.0%)	(n = 28) 1 (3.6)	7.00	(1.14–42.96)
P-p: pre-pregnancy								

The pregnant women in the intervention group also reported receiving information more frequently on pooled FID, in line with the recommendations ( $p = 0.049$ ).

## Counseling received throughout pregnancy (all women who received PA counseling vs. other women)

Table 4 shows counseling received throughout pregnancy for all women in the reformulated intervention group vs. the other women. Comparisons showed that the women in the reformulated intervention group were

more likely to receive PA counseling throughout their pregnancy vs. the other women ( $p < 0.001$ ). The same results were found for pregnant women with weight problems ( $p < 0.001$ ).

In accordance with the recommendations, the same results were observed for counseling on pooled FID (all  $p < 0.001$ ).

## **Physical activity behavior (women who received PA counseling in the reformulated intervention group vs. other women)**

### **Self-reported physical activity**

The following tables present the median and quartiles of PA by intensity and type (supplementary data). Table 5 presents the median and quartiles of PA for all women who received PA counseling compared with the other women, including the pre-pregnancy overweight subgroup. Table 6 presents the median and quartiles of PA for all women who received PA counseling in accordance with the recommendations compared with the other women. For both groups, the significant (or not) decrease in self-reported PA is presented in Tables 7, 8, and 9.

All women who received PA counseling in the reformulated intervention group reported significantly more vigorous activity in the third trimester than the other women ( $p=0.044$ ). Concerning the type of activity, the women in this reformulated intervention group reported significantly more sports activity in the third trimester than the other women ( $p=0.032$ ) (Figure 1). There was no significant difference between groups for other intensities or types of activities ( $p>0.05$ ).

### **Overweight**

The women who received PA counseling in the reformulated intervention group preserved significantly more sedentary activity than the other women in the third trimester ( $p=0.027$ ) (Figure 2). There was no significant difference between groups for other intensities and types of activities ( $p>0.05$ ).

### **With counseling in accordance with the recommendations**

There was no significant difference between the women who received PA counseling in the reformulated intervention group and the other women for intensities and types of activities ( $p>0.05$ ) (Table 6).

### **Discussion**

This study showed that women in the intervention group received PA counseling more frequently during pregnancy and that all women who received PA counseling positively modified their PA behaviors.

Overall, the low proportion (35.8%) of pregnant women who reported receiving PA counseling throughout pregnancy is alarming. We found no longitudinal studies to date assessing PA counseling received throughout pregnancy, but our result is low compared to the cross-sectional studies in the literature [11, 12]. This observation adds to the concerns about the rise in maternal obesity and the related complications [13].

Our study supported the findings that (1) pregnant women who benefit from PA counseling by trained health professionals are more likely to report it [14] and (2) this counseling tends to be in line with the recommendations. Similar results were found for the overweight pregnant women whose obstetric care counseling has been suboptimal up to now [15]. However, these overweight pregnant women did not receive PA counseling in line with the recommendations. Efforts should be made for women with weight problems since the advice has beneficial effects on gestational weight gain [16].

## Counseling and PA behaviors

The purpose of this secondary analysis was to investigate the impact of counseling in a routine care setting on prenatal PA behavior. Our results showed that the women who received counseling throughout pregnancy improved their PA behaviors more than the other women. Indeed, a smaller decrease in vigorous and sports activity was reported. These results highlight the reduced perceived barriers reported in the literature and increasing physical activity behavior [17]. As observed by others [18, 19], PA declined over the course of pregnancy overall, but our results nevertheless show the efficacy of the intervention. We cannot, however, exclude the possibility that differences between the dichotomized subgroups in educational level and marital status contributed to the differences in received counseling [20], PA behaviors changes [21, 22] or both.

Although the intervention did not lead to a significant effect on total activity, all women who received PA counseling in the intervention group were more likely to improve their behavior, with a smaller PA decrease in the third trimester ( $p=0.053$  result not shown).

Our results are in line with recent findings, notably the intervention effect in prenatal care and goal setting as favorable to physical activity behaviors in overweight women [23, 24]. A significant difference in sedentary physical activity was observed in the pre-pregnancy overweight women. Based on the assumption that women who were overweight before pregnancy would be less likely to comply with the recommendations [25, 26], the explanation for the non-significant difference for the other types and intensities remains plausible. However, moderate-intensity PA remains the aim throughout pregnancy [8].

The report in the literature of the low rate of pregnant women who reach the recommended PA levels [27] also gives meaning to our results. Indeed, we observed no difference in the PA behaviors of the women who received counseling in accordance with the recommendations. Of the women who have received PA counseling throughout pregnancy in this study, a little more than half received pooled information on FID in accordance with the recommendations.

We assumed that the women would be able to meet the PA recommendations if health professionals delivered the right recommendations, in line with Connelly et al. [28]. Our study has convinced us that discussions and counseling on PA in line with the recommendations should be systematic. Moreover, our results provide

additional justification for strengthening health policies, educational interventions and the training of healthcare providers on the PA recommendations during pregnancy [29], especially for pregnant women with weight problems.

It should be kept in mind that despite the ACOG update [8], the hypothesis that health professionals take into account pre-pregnancy physical activity and then progressively help their patients reach the recommendations [30, 31] can be retained. This especially may concern those women who were sedentary before pregnancy [8, 32]. Besides providing the recommendations, health professionals are also responsible for working in concert with their patients to make PA decisions appropriate for each one.

Overall, our results on the distribution of PA counseling were similar to those of other studies. In one study, health professionals reported that they offered counseling to all patients early in pregnancy [33]. This can explain the general effect of trimester on the distribution of PA counseling showing no significant difference. The clinical workload of health professionals who deal with pregnant women is such that they often lack time, which in turn reduces the time allocated to PA counseling [34, 35]. Addressing the time pressure on healthcare providers, who nevertheless need to promote health during antenatal care, is a complex challenge [36].

Overall, the effect on PA behaviors observed in late-pregnancy compared to early-pregnancy counseling suggests that appropriate counseling for women both before conception and during pregnancy would be beneficial [37].

## Strengths and limitations

Our study has several limitations. Although structured and based on the ACOG recommendations, our questionnaire has not been validated and thus might constitute a methodological bias. As it was self-administered after delivery, misclassification on the counseling received throughout pregnancy may have been prevalent due to, for example, recall bias and social desirability [38, 39]. Our study did not examine the knowledge and counseling provided by the health professionals throughout pregnancy, and thus we were unable to investigate the low rate of counseling as per the ACOG recommendations. The training for the intervention health professionals may also have been too short for them to fully develop skills in prescribing PA. The strengths of this study are the following: it responds to the barriers that pregnant women often report that force them to limit their physical activity, and it presents an intervention that opens perspectives on promoting physical activity because, as it is integrated into primary care, it does not require significant resources.

## Conclusion

This study found that women who receive counseling throughout pregnancy can limit their decline in physical activity. Trained professionals provide more counseling on physical activity than do untrained professionals. The counseling given in accordance with the recommendations is still insufficient. This study suggests that health professionals need more extensive training to provide counseling in accordance with the recommendations throughout pregnancy. By being more fully informed on the ACOG recommendations, health professionals might be better equipped to encourage pregnant women to change their behaviors.

## **Abbreviations**

PA: Physical activity

BMI: Body mass index

ACOG: American College of Obstetricians and Gynecologists

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### **Consent for publication**

N/A

### **Availability of data and materials**

N/A

### **Competing Interest**

No conflicts of interest, financial or otherwise, are declared by the authors.

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### **Authors' contributions**

RS, SS and A-J S designed the research project. RS set up the study protocol, analyzed and interpreted the data and contributed to successive drafts and the revising of the manuscript. RS, SS and A-J S had primary responsibility for the final content. All authors (RS, SS, HO, JE & A-J S) read and approved the final manuscript.

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## Figures

# Physical activity self-reported

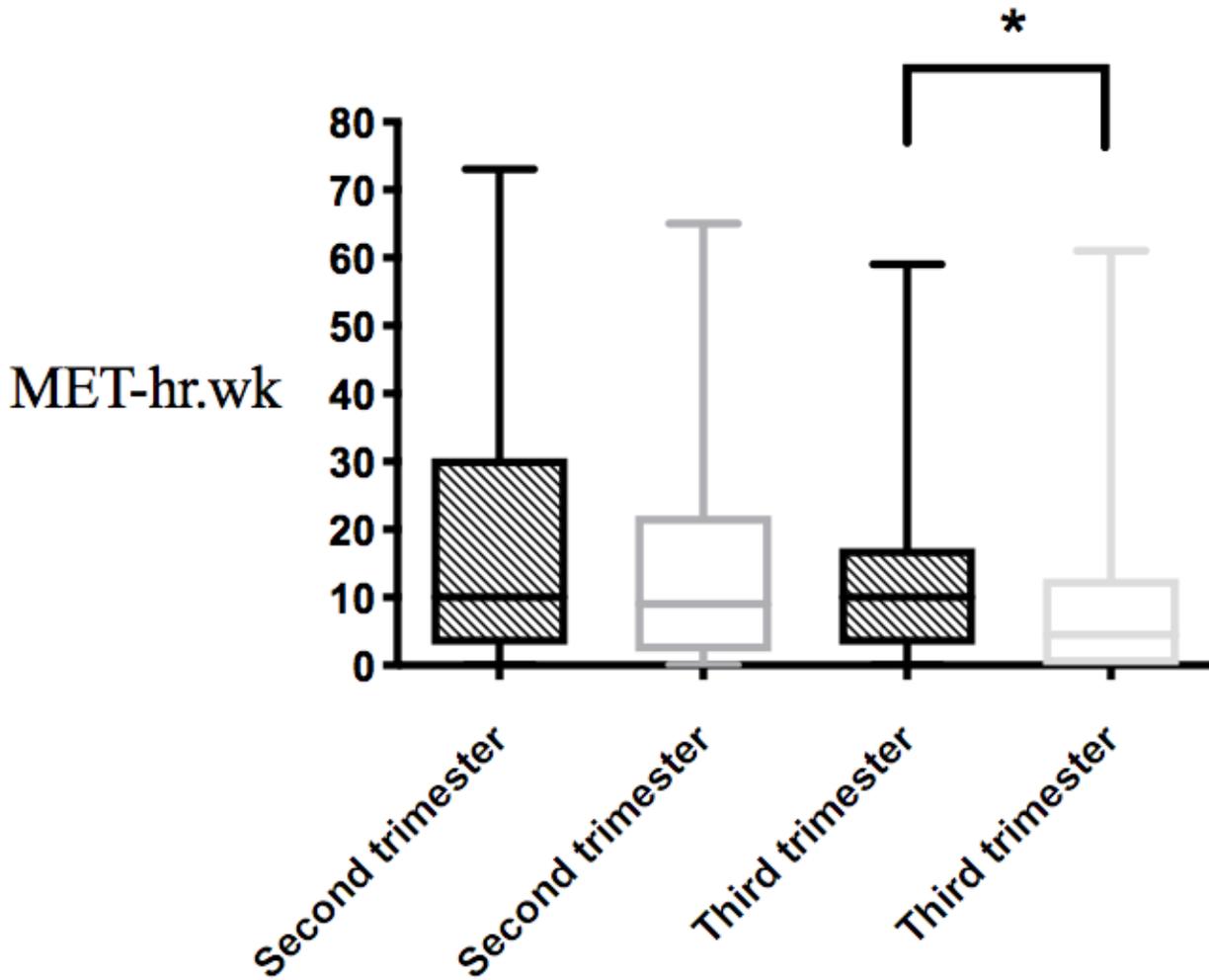


Figure 1

Box plot of sports activity for all women who received PA counseling in the intervention group vs. other women (n=20 and 44, respectively). Median score values (MET-hr.wk) for the self-administered Pregnancy Physical Activity Questionnaires (PPAQs) in the two groups, during the second and third trimesters.  $\square$  p=0.032 Significant difference /control group.

## Physical activity self-reported

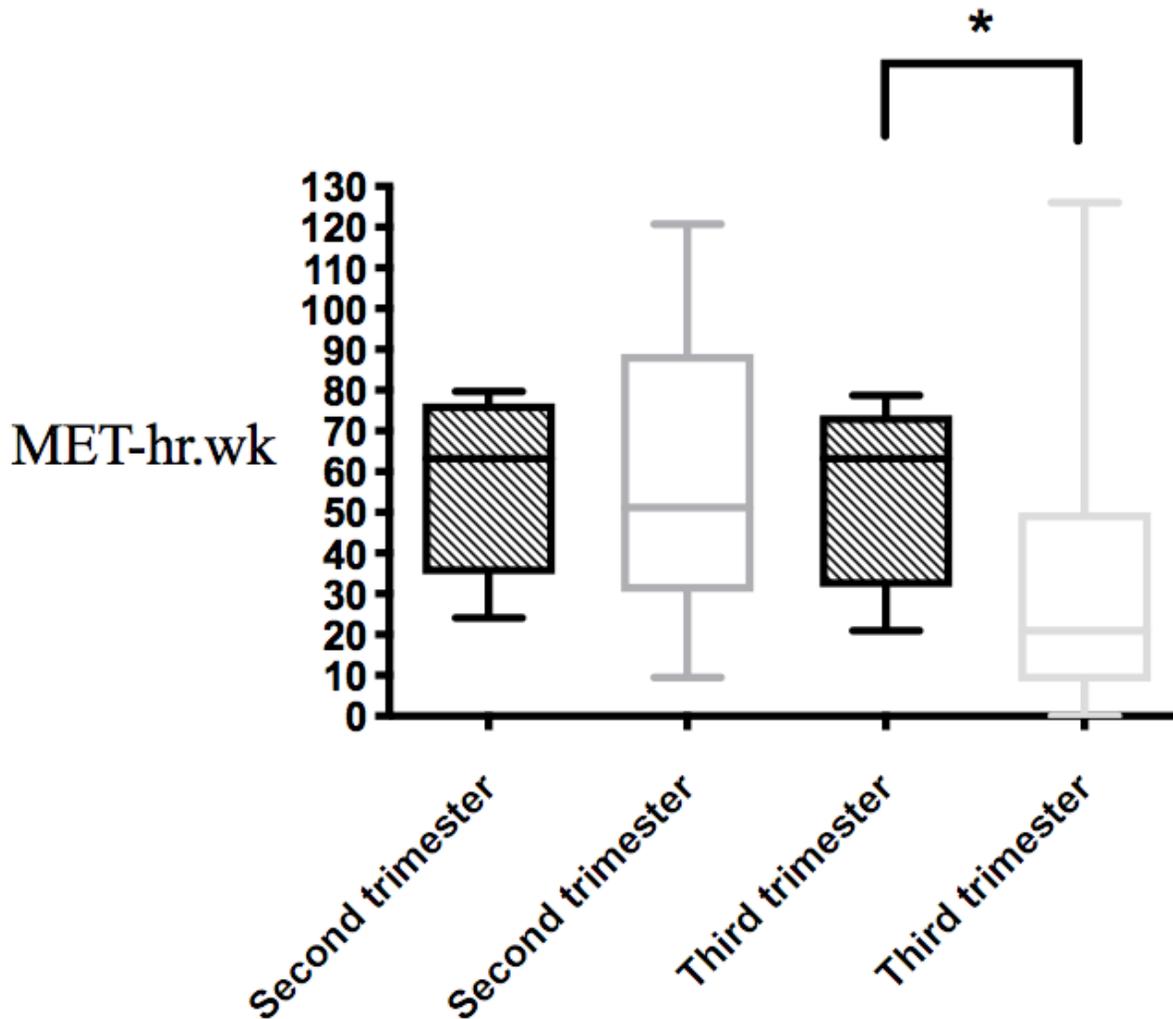


Figure 2

Box plot of sedentary activity for all pre-pregnancy overweight women who received PA counseling in the intervention group vs. other women (n=13 and 19, respectively). Median score values (MET-hr.wk) for the self-administered Pregnancy Physical Activity Questionnaires (PPAQs) in the two groups, during the second and third trimesters.  $\square$  p=0.027 Significant difference /control group.

## Supplementary Files

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- [supplementarydata.docx](#)