

Physical activity, health-related quality of life and depression during pregnancy

Atividade física, qualidade de vida e depressão durante a gravidez

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Abstract

This study examines physical activity patterns among women, from pre-pregnancy to the second trimester of pregnancy, and the relationship between physical activity status based on physical activity guidelines and health-related quality of life (HRQoL) and depression over pregnancy. 56 healthy pregnant women self-reported physical activity, HRQoL and depression at 10-15 and 19-24 weeks of pregnancy and physical activity before pregnancy. Whereas vigorous leisure physical activity decreased after conception, moderate leisure physical activity and work related physical activity remained stable over time. The prevalence of recommended physical activity was 39.3% and 12.5% in the 1st and 2nd trimesters of pregnancy respectively, and 14.3% pre-pregnancy. From the 1st to the 2nd pregnancy trimester, most physical HRQoL dimensions scores decreased and only mental component increased, independently of physical activity status. No changes in mean depression scores were observed. These data suggest that physical activity patterns change with pregnancy and that physical and mental components are differentially affected by pregnancy course, independently of physical activity status.

Motor Activity; Quality of Life; Depression; Pregnancy

Introduction

Regular physical activity throughout one's life span is recommended to promote and maintain good health and prevent premature mortality ¹. Moreover, an active lifestyle/exercise has been associated with more positive mood states, reduced risk of depression ^{2,3} and better health-related quality of life (HRQoL) in the general population ^{4,5}.

Unlike other periods, not all types of physical activity performed during pregnancy seem to be associated with health benefits. Several studies suggest leisure physical activity may have beneficial effects on maternal health by reducing the risk of gestational diabetes mellitus, preeclampsia, preterm birth and preventing excessive maternal weight gain during pregnancy ^{6,7,8,9}. Nevertheless, other studies either failed to demonstrate important benefits or risks ¹⁰ or documented adverse effects of exercise in pregnancy to the mother or fetus ¹¹. The intensity and time period of pregnancy in which the activity is performed, previous exercise history, dietary carbohydrate intake or maternal availability of oxygen seem to be important variables to take into account. High-intensity occupational activity and high demanding physical tasks at work (e.g. long hours of work, prolonged standing, lifting loads, night hours, irregular or shift-work schedules and high psychological demands) have been associated with adverse pregnancy outcomes ^{12,13,14}.

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Studies of physical activity patterns during pregnancy show a low prevalence of recommended activity levels^{15,16,17}, as well as a decline of leisure physical activity/sports/exercise and occupational activity across gestation^{6,15,16,18,19,20,21,22,23,24}. Even so, there is some evidence that household and childcare activities are maintained over the course of pregnancy^{18,22} or increase in the third trimester²³. Recent studies suggest that transportation activity is also stable over pregnancy^{15,25}. A significant proportion of women may still perform strenuous physical activity during late pregnancy²⁶. Thus, pregnancy seems to have a differential impact on physical activity intensity and modes. A shift from high to light intensity physical activity throughout pregnancy is observed^{15,18,19,27}, as well as an energy economy in occupational and leisure activities¹⁸.

Pregnancy also seems to be a vulnerable time for depression²⁸ and lower HRQoL^{29,30,31,32,33} when compared with other periods of life. Pregnant women report lower levels of physical functioning, vitality, social functioning and more limitations due to emotional problems than non-pregnant women³³. Several studies also suggest that women demonstrate significant declines in physical functioning throughout pregnancy^{29,31,34}.

Reduced well-being during pregnancy has also been associated with lower levels of physical activity^{27,29}. Pregnant women who exercise during the first and second trimesters of pregnancy report significantly less depressed mood, state-anxiety and pregnancy-specific stress compared with non-exercisers²⁷ and enhanced mood after exercise when compared with a parent-craft intervention or a control group³⁵. Lack of exercise prior to and during pregnancy has also been associated with poor or fair self-rated health and poor physical functioning during pregnancy²⁹.

Surprisingly, little is known about the relationship between meeting physical activity guidelines before and during pregnancy and perceived HRQoL and depression during pregnancy. To address this gap, this study examines physical activity patterns of women from pre-pregnancy to the second trimester of pregnancy, and the relationship between physical activity status based on physical activity guidelines and HRQoL and depression changes over pregnancy.

Method

Study design and population

A longitudinal survey to assess physical activity, health-related quality of life and depression was

carried out among healthy pregnant women in their first or second pregnancy trimesters who were attending one of four private obstetric clinics in Porto, Portugal. Previous consent was obtained from the private practice physicians specializing in obstetrics and gynaecology to recruit participants from their offices. From 1 May to 30 September 2005, pregnant women with singleton pregnancies, with 10-15 weeks of pregnancy and aged 18-40 years were invited to participate in the study. Women were not eligible if they had one of the following exclusion criteria: were not able to read and/or write Portuguese; had severe mental illness that seriously compromised mental functioning; had an obstetric, physical disease or adverse health condition that restricted habitual physical activity.

Data collection

Women volunteering for this study received from their attending physician at 10-15 weeks of pregnancy a detailed cover letter, an informed consent form and the questionnaires assessing socio-demographic and medical history, physical activity 3 months pre-pregnancy and at 10-15 weeks of pregnancy, HRQoL and depressive symptoms in the first trimester of pregnancy. At 19-24 weeks, participants were asked to complete the same questionnaires with the exception of the socio-demographic and medical history questionnaire. The socio-demographic and medical history information collected included age, education level, marital status, number of pregnancies and children, employment status, previous diagnosed mental disorders, substance consumption (coffee, tobacco, alcohol and illicit drugs) prior to and during the first trimester of pregnancy, planning and initial acceptance of the current pregnancy.

Women were asked to return the questionnaires of both assessments in the same day of the medical appointment or in the next medical appointment. Missing information on the questionnaires was completed by phone when possible. Varying response rates were therefore observed in individual questions.

Of the 100 potentially eligible women that were approached, 78 agreed to participate in the study (78%). Nine women were excluded either due to obstetric problems that limited normal physical activity ($n = 4$) or questionnaire fulfillment before or after 10-15 weeks and 19-24 weeks of pregnancy ($n = 5$). 69 eligible participants completed the first assessment and 56 also the second (72.7%). For the present analyses, participants included women who completed both assessments. Women who completed only the first

assessment had similar demographic characteristics (age, education level), physical activity level at baseline and general health and depression at 10-15 weeks of pregnancy compared to women who completed both assessments.

The study protocol complied with the ethical principles contained in the Helsinki Declaration and was approved by the Scientific Committee of the Faculty of Medicine at the University of Porto and participants gave written informed consent to participate in the study.

HRQoL was assessed with the *36-Item Short-Form Health Survey* (SF-36)³⁶, a generic measure designed to assess the individual perception of health status. The 36 items are grouped in to eight scales – physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health – and two summary measures – physical component and mental component. Scores for each scale and component range from 0 to 100, a higher value indicates a higher level of function. The SF-36 has been found to be a reliable and valid measure of health-related quality of life and used to study the relationship between exercise or physical activity and quality of life^{4,29}. The SF-36 has been used and validated in Portugal^{37,38,39}.

Physical activity data was collected by the *Global Physical Activity Questionnaire* (GPAQ), a self-report measure with 18 items, derived from a previously validated questionnaire (*International Physical Activity Questionnaire – IPAQ*)⁴⁰. Frequency and time spent in physical activities of moderate- and vigorous-intensity for at least 10 minutes within the domains of work (household and occupational), transportation, and leisure-time physical activity during a typical week are assessed.

Women were classified as active or low active pre-pregnancy based on the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) guidelines¹ and during pregnancy based on the American College of Obstetrics and Gynaecologists (ACOG) guidelines⁴¹. ACSM/AHA recommends that adults participate in 30 minutes or more of moderate-intensity aerobic physical activity during five days of the week or vigorous-intensity aerobic physical activity for at least 20 minutes, three days per week. Combinations of moderate- and vigorous-intensity physical activity can also be made to meet this recommendation¹. Metabolic equivalents (METs) are used to measure the amount of activity performed. When moderate- and vigorous-intensity physical activity was reported a total physical activity index in weekly METs was calculated by summing the weighted frequency of moderate and vigorous activity using the follow-

ing formula: (3-6 METs x moderate) + (> 6 METs x vigorous)⁴². To meet the current recommendations of physical activity, the minimum value per week is 450 METs (30 min x 5 days x 3 METs = 450 MET·min/week). During pregnancy, the ACOG limits the recommendation to moderate exercise during 30 minutes or more on most, if not all, days of the week in the absence of either medical or obstetric complications⁴¹.

Women reporting 150 minutes of moderate physical activity per week, 60 minutes of vigorous physical activity or at least 450 METs of combined moderate and vigorous physical activity pre-pregnancy and also 150 minutes of exercise per week during pregnancy were categorized as *active* and those who reported no activity or less than the recommended level per week were categorized as *low active*. Based on this classification, women were divided into four groups for analysis: low active both at pre-pregnancy and at 10-15 weeks of pregnancy, low active pre-pregnancy and active at 10-15 weeks of pregnancy, active both at pre-pregnancy and at 10-15 weeks of pregnancy, active pre-pregnancy and low active at 10-15 weeks of pregnancy.

Depression was assessed using the *Edinburgh Postnatal Depression Scale* (EPDS)⁴³. This questionnaire is a self-report measure of depression symptoms consisting of 10 items scored on a 4-point likert scale (0-3) with 0 indicating absence of depressed mood and 3 the worst mood within the previous seven days. Higher scores indicate increasing severity of depressive symptoms. EPDS has been used in several countries, including Portugal, during pregnancy and the postpartum period^{44,45}. A score equal to or higher than 10 is suggestive of the presence of clinical depression⁴⁴. The Portuguese version of EPDS⁴⁶ showed good reliability (Cronbach alpha = 0.85, test-retest $r = 0.75$) and validity ($r = 0.86$ with the *Schedule for Affective Disorders Psychiatric Interview*).

Statistical analysis

Changes over time regarding the proportions of physical activity modes and intensities, as well as the prevalence of recommended physical activity throughout the study period were investigated by means of Cochran's Q test, which tests for differences between three or more matched sets of proportions. McNemar 2 related sample tests were used for post hoc comparisons between pairs of time points (1st vs. 2nd, 2nd vs. 3rd, 1st vs. 3rd). A Bonferroni correction was used to adjust for the number of tests and so the effects are reported at 0.017 level of significance.

Repeated-measures analysis of variance was carried out to determine changes in modes and

intensities of physical activity over time. Pairwise comparisons were made and the Bonferroni correction was applied. Similar analyses were performed to test for differences between active and low active groups in HRQoL dimensions and depression scores during pregnancy. Greenhouse-Geisser estimates are reported when the sphericity assumption was violated. Mean difference (Δ) between the two pregnancy trimesters (2nd minus 1st) was calculated to analyze how variables changed over time. A positive Δ indicates an increase in HRQoL dimensions or depression scores, whereas a negative Δ indicates a decrease in these scores over pregnancy. Extreme values were excluded to prevent an undesirable influence on the mean values. When significant between-subject effects were found, one-way analysis of variance was used to test for group differences at each pregnancy trimester.

Data were analyzed using SPSS version 17 (SPSS Inc., Chicago, USA) and a p-value < 0.05 was considered significant.

Results

The sociodemographic characteristics of the sample are summarized in Table 1. The mean age was 30.4 years (SD = 4.0, range 20-39 years). More than half had college education (62.5%),

and were primiparous (60.7%). The majority was married or cohabiting (94.6%) and was employed at the time of enrolment (92.9%). Approximately 11% reported smoking and 8.9% drinking alcohol before pregnancy and 5.4% reported smoking at 10-15 weeks of pregnancy. There was no self-reported use of illicit drugs. At the first and second assessment, pregnant women had an average of 12.2 and 21.3 weeks of gestation, respectively.

Physical activity from pre-pregnancy to the second trimester of pregnancy

Longitudinal changes in physical activity modes and intensities are displayed in Table 2.

No significant changes in moderate leisure physical activity proportions [Q(2) = 4.17, p = 0.124] were observed from pre-pregnancy to 19-24 weeks of pregnancy, as well as in moderate [Q(2) = 2.00, p = 0.368], vigorous [Q(2) = 4.00, p = 0.135] and total work physical activity [Q(2) = 3.00, p = 0.223]. Transportation physical activity was reported by approximately one quarter of women and remained also fairly stable over the same period [Q(2) = 0.118, p = 0.943]. In contrast, vigorous [Q(2) = 18.20, p < 0.001] and total [Q(2) = 8.09, p = 0.018] leisure physical activity proportions changed significantly (Table 2). Vigorous leisure physical activity proportion declined from pre-pregnancy to 10-15 weeks (McNemar p = 0.004) and to 19-24 weeks of pregnancy (McNemar p = 0.002). Total leisure physical activity proportion declined from pre-pregnancy to 10-15 weeks (McNemar p > 0.017; n = 56) and to 19-24 weeks of pregnancy (McNemar p > 0.017; n = 56), although these declines were not statistically significant.

The time spent in moderate [F(1.71, 94.14) = 0.26, p = 0.735], vigorous [F(1.55, 55.0) = 1.73, p = 0.194], total work physical activity [F(1.56, 85.63) = 0.61, p = 0.507], moderate leisure physical activity [F(2,49) = 2.97, p = 0.061] and transportation [F(1.62, 85.67) = 0.21, p = 0.763], did not change significantly between the three time points, whereas vigorous [F(1.09, 57.80) = 6.68, p = 0.011] and total leisure physical activity [F(1.54, 76.94) = 7.89, p = 0.002] changed over time (Table 2). Before pregnancy, women engaged in more vigorous and total leisure physical activity compared to the first (p = 0.019) and second (p = 0.008) pregnancy trimesters. No significant differences were observed between the two pregnancy trimesters for these intensities.

Prevalence of recommended activity

The prevalence of women who reached the recommended level of physical activity pre-preg-

Table 1

Sociodemographic characteristics of study sample (n = 56).

Characteristics	n	%
Age (years)		
20-26	7	12.5
27-33	36	64.3
34-39	13	23.2
Education (years)		
< 10	13	23.2
10-12	8	14.3
> 12	35	62.5
Marital status		
Married/Cohabitate	53	94.6
Single/Divorced	3	5.4
Employment status		
Employed	52	92.9
Student/Other	4	7.1
Number of previous pregnancies		
0	34	60.7
1	16	28.6
≥ 2	6	10.7

Table 2

Modes, frequency and intensity of self-reported physical activity (min/week) before and at the first two trimesters of pregnancy.

	Pre-pregnancy		10-15 weeks of pregnancy		19-24 weeks of pregnancy		p-value *
	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)	
Leisure activity							
Moderate	42.4	48.4 (74.1)	35.7	39.8 (67.0)	28.6	22.5 (48.6)	0.061
Vigorous	22.2	41.1 (105.8)	5.4	6.1 (28.2)	3.6	3.1 (17.6)	0.011
Total **	48.2	72.5 (103.8)	35.7	39.8 (71.7)	28.6	25.9 (54.0)	0.002
Work activity							
Moderate	12.5	165.2 (706.0)	10.7	154.2 (669.0)	7.1	128.6 (563.7)	0.735
Vigorous	3.6	27.3 (155.3)	0.0	0	0.0	0	0.194
Total **	14.3	192.5 (745.6)	10.7	154.2 (669.0)	7.1	128.9 (563.6)	0.507
Transportation activity	27.3	75.10 (19.05)	27.3	64.17 (17.40)	29.1	71.02 (23.43)	0.763

* p-value from the mean difference between the three time points using repeated measures analysis of variance;

** Total physical activity is the sum of moderate and vigorous physical activity.

nancy proposed by the ACSM/AHA was 39.3%. During pregnancy, the proportion was 12.5% and 14.3% in the first and second trimester respectively, based on the ACOG recommendation. This represents a significant change on recommended physical activity over time [$Q(2) = 21.10$, $p < 0.001$]. The proportion declined significantly from pre-pregnancy to 10-15 weeks (McNemar $p < 0.001$) and to 19-24 weeks (McNemar $p = 0.001$), but not between pregnancy trimesters (McNemar $p = 1.00$).

Women meeting the recommended levels of physical activity both before pregnancy and during the first trimester of pregnancy represented 12.5%, whereas 26.8% that were previously active became low active at 10-15 weeks of pregnancy and 60.7% remained low active during these two time periods.

Health-related quality of life, depression and recommended physical activity

Table 3 shows the mean (SD) scores on the HRQoL and depression measures at each trimester of pregnancy according to physical activity status. Overall, substantial changes in health status during pregnancy were observed, mainly in HRQoL physical dimensions. While the physical component [$F(1,48) = 32.7$, $p < 0.001$], physical functioning [$F(1,49) = 32.0$, $p < 0.001$], role-physical [$F(1,49) = 8.7$, $p = 0.05$] and general health [$F(1,51) = 63.3$, $p < 0.001$] mean scores declined significantly from the first to the second trimester of pregnancy, the mental component [$F(1,48) = 13.8$, $p = 0.001$] mean scores increased independently of physical activity status. The mean bodily pain [$F(1,50) = 3.2$, $p = 0.079$], vitality

[$F(1,50) = 0.45$, $p = 0.504$], social functioning [$F(1,52) = 1.6$, $p = 0.218$], role-emotional [$F(1,52) = 1.7$, $p = 0.199$] and mental health [$F(1,46) = 0.04$, $p = 0.836$] scores did not meaningfully change from early to mid pregnancy. Significant group differences were noted in mental health [$F(2,46) = 4.06$, $p = 0.024$] mean scores. Low active women before and during the first trimester of pregnancy had higher mental health at 19-24 weeks than active women that became low active at 10-15 weeks of pregnancy ($p = 0.015$).

Mean depression scores were stable at both trimesters of pregnancy [$F(1,43) = 0.06$, $p = 0.814$]. No significant group differences were found in depression scores according to physical activity status [$F(2,43) = 1.89$, $p = 0.164$].

Discussion

The purpose of this study was to examine the physical activity patterns of women from pre-pregnancy to the second trimester of pregnancy, and the relationship between physical activity status based on physical activity guidelines and HRQoL and depression changes over pregnancy.

Our results are generally consistent with previous research indicating a significant decline in time spent in total^{16,19,20} and vigorous leisure physical activity and stable levels of moderate leisure physical activity from pre-pregnancy to pregnancy^{6,19}. Similarly, Haakstad et al.⁶ have also documented a higher proportion of women with vigorous leisure physical activity pre-pregnancy compared to the first and second trimesters of pregnancy. No changes on leisure time physical activity were observed from the first

Table 3

Health-related quality of life and the first two trimesters of pregnancy according to physical activity status both before and at the first trimester.

	Low active pre-pregnancy and at 10-15 weeks of pregnancy (n = 34)		Active pre-pregnancy and low active at 10-15 weeks of pregnancy (n = 15)		Active pre-pregnancy and at 10-15 weeks of pregnancy (n = 7)		$\Delta = 2^{\text{nd}} - 1^{\text{st}}$ trimester	
	1 st trimester	2 nd trimester	1 st trimester	2 nd trimester	1 st trimester	2 nd trimester	Mean difference	p-value *
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	(95%CI)	
SF-36								
Physical component	82.3 (10.6)	72.1 (14.8)	80.2 (13.7)	64.5 (17.2)	90.4 (2.1)	72.3 (14.0)	-14.7 (-19.8; -9.5)	< 0.001
Physical functioning	86.3 (9.2)	75.0 (14.9)	84.3 (9.8)	67.1 (14.1)	86.7 (9.3)	72.5 (21.6)	-14.2 (-19.2; -9.1)	< 0.001
Role-physical	86.9 (15.3)	84.8 (17.3)	82.7 (11.2)	67.8 (20.5)	90.2 (12.9)	81.3 (13.5)	-8.7 (-14.5; -2.8)	0.005
Bodily pain	82.5 (18.5)	78.5 (21.0)	73.3 (23.1)	71.9 (24.1)	100.0 (0.0)	87.2 (18.0)	-6.0 (-12.8; 0.7)	0.079
General health	81.3 (13.3)	69.8 (6.7)	80.3 (14.0)	66.7 (6.7)	92.6 (7.5)	73.1 (3.5)	-14.8 (-18.5; -11.1)	< 0.001
Mental component	64.3 (13.3)	72.5 (12.0)	59.6 (21.5)	65.7 (19.8)	66.9 (11.7)	79.5 (11.0)	9.0 (4.1; 13.8)	0.001
Vitality	55.7 (18.0)	60.0 (15.0)	52.7 (15.8)	54.9 (16.5)	68.8 (16.5)	67.9 (12.7)	1.9 (-3.7; 7.5)	0.504
Social functioning	87.1 (15.5)	86.7 (15.0)	80.0 (16.9)	79.2 (18.7)	80.4 (9.8)	92.9 (9.8)	3.8 (-2.3; 9.8)	0.218
Role-emotional	88.4 (15.6)	88.4 (16.7)	87.2 (19.1)	81.7 (20.0)	94.0 (10.4)	88.1 (11.6)	-3.8 (-9.8; 2.1)	0.199
Mental health	78.6 (11.0)	83.0 (9.7)	70.0 (23.9)	68.3 (24.7)	87.5 (6.1)	83.3 (11.3)	-0.5 (-4.9; 3.9)	0.836
Depression								
EPDS	4.5 (2.7)	3.9 (2.4)	5.9 (5.0)	6.3 (4.5)	3.8 (2.6)	3.7 (2.3)	0.1 (-0.8; 1.1)	0.814

 Δ : mean difference; EPDS: *Edinburgh Postnatal Depression Scale*; SF-36: *36-Item Short-Form Health Survey*.

* p-value for the mean difference between the three time points from repeated measures analysis of variance.

to the second trimester of pregnancy. This was not an unexpected finding as major changes in leisure physical activity have been noted when comparing the beginning and middle gestation with the end period of gestation^{6,15,18,19,25,27}.

In terms of work physical activity, we found no significant time differences or proportions during the studied period. In our study, work physical activity includes both paid and non-paid work physical activity and it is not possible to know if the lack of variance in this measure is due to a simultaneous decrease on paid work activity and an increase on non-paid work activity. Schmidt et al.²³ observed that household/caregiving activity energy expenditure was higher in late pregnancy, whereas occupational physical was lower in the third trimester compared to the first trimester. Other studies^{18,21} reported that household activity remained unchanged throughout pregnancy.

The reported time spent in total leisure physical activity and work physical activity before and during pregnancy was markedly lower than in previous studies^{15,47}. One possible explanation for this discrepancy with the literature is that only moderate and vigorous intensity activities were assessed. In our study, women spent, on

average, 1 hour in leisure physical activity and little more than 3 hours in work physical activity before pregnancy, 40 minutes in leisure time physical activity and 2h30min in work physical activity at the first trimester and less than 30 minutes in leisure time physical activity and 2 hours in work physical activity per week at the second trimester of pregnancy. Previous studies have documented that first-time mothers and women who do not participate in moderate or vigorous physical activity before pregnancy seem to feel unsafe/unsure about vigorous physical activity during pregnancy⁴⁸. As most pregnant women in our study were primiparous and had low levels of vigorous physical activity before pregnancy it is possible that they felt more reluctant to perform high intensity activities, especially when only moderate physical activity is currently recommended. Health professionals may have an important contribution to the adoption of a more active lifestyle during pregnancy, especially in previously sedentary women. According to the ACOG guidelines⁴¹, previously sedentary women should be evaluated before recommendations for physical activity are made. In addition, more than half of our sample have white-collar occupations (data not shown) and, thus, report very

low levels of work physical activity, especially of a vigorous intensity. It is possible, however, that job adaptations have been made in some cases since a decrease in moderate work physical activity is observed from prepregnancy to the second trimester of pregnancy, although these differences were not statistically significant. Job adjustment in pregnancy is foreseen in European legislation⁴⁹.

A somewhat higher proportion of participation in transportation physical activity was obtained (27% before pregnancy and in the first trimester, 29% in the second trimester), as well as a greater amount of time spent per week in this activity compared with previous studies^{15,25}. However, a similar pattern of stability during pregnancy was observed.

Consistent with the literature, a decreasing prevalence of recommended leisure physical activity was found from pre-pregnancy to pregnancy. Evenson et al.¹⁷ found a lower prevalence of recommended physical activity among pregnant compared with non-pregnant women (15.8% vs. 26.1%) and Hausenblas & Downs¹⁹ reported a linear decrease in exercise from pre-pregnancy to the third trimester of pregnancy (38.5% before pregnancy, 17% at first trimester, 14.1% at second and 7.5% at third trimester of pregnancy). The 1988 National Maternal and Infant Health Survey data (USA) analyzed by Leiferman & Evenson⁹ and Zhang & Savitz²⁴ revealed that 48% of the 9,089 women studied retrospectively reported exercising regularly (3 or more times per week) before pregnancy and 41% during pregnancy. According to the prospective study of 7,281 young women (aged 18-23 years) participating in the *Australian Longitudinal Study of Women's Health*, having a first or subsequent child increases the risk of not reaching the recommended level of physical activity⁵⁰. The reported estimates of recommended activity during pregnancy varied from 3% to 78%^{15,17,19,47}. Three factors may explain the wide array of estimates: (1) diverse definitions of active, (2) different time frames (e.g. activities before/after you found out you were pregnant, activities over the last seven days in the first, second and third trimesters of pregnancy) and (3) diverse sample characteristics (race/ethnic background, employment status, education level, age). Our findings suggest that the decrease in the proportion of recommended activity after conception is mostly explained by the restriction on activity type and intensity in the definition of recommended activity. Overall, women maintain moderate levels of leisure physical activity during early to mid pregnancy.

Pregnant women reported more limitations in physical activities because of health problems, more problems with daily activities as a result of

physical health and a more negative perception of their health based on physical limitations from the beginning to middle gestation, independently of physical activity status. The decline of physical functioning during pregnancy is supported by the findings of other studies^{31,34}. The results of Haas et al.²⁹ suggest that women have increasing limitations in physical function during pregnancy when compared with pre-pregnancy. These authors compare physical functioning mean scores during pregnancy with studies of people with congestive heart failure, diabetes, and recent myocardial infarction. In contrast, an increase in the mental component was observed, as well as in most mental dimensions, although it was not statistically significant. Förger et al.³⁴ found stable mental health scores from pre-pregnancy to 24 weeks postpartum in healthy pregnant women, although no results were provided regarding physical and mental components.

Unexpectedly, women that became low active at 10-15 weeks of pregnancy reported lower mental health at the second trimester than women who continued to be low active in the first trimester of pregnancy. This result suggests that reduced leisure physical activity at the first trimester is associated with poor psychological well-being and higher distress during mid pregnancy in previously active women compared with women who were already low active before pregnancy. This decrement might be voluntary or forced by the appearance of physical discomforts associated with pregnancy that may inhibit leisure physical activity. Based on this finding, it is unclear whether women become low active due to decreased mental health or that the decrease in physical levels impairs their mental health. Even so, Poudevigne & O'Connor⁵¹ argue that a relationship between pregnancy-related reductions in physical activity and psychological distress is plausible, given the known links between inactivity and reduced mental health. Women who become low active in early pregnancy may perceive their mental health more negatively than inactive women probably because physical activity had previously been an important coping strategy to deal with stress and negative emotions, while inactive women used other coping strategies. Future research is needed to confirm this hypothesis.

Study limitations and strengths

Some limitations should be recognized. First, we used a questionnaire to analyze physical activity, which is an indirect method and involves a series of measurement difficulties that comes with such instruments. Nevertheless, while objective meth-

ods have been developed such as accelerometers it will be hard to use them due to the sample characteristics. Further, the instrument (GPAQ) was validated against accelerometers. Second, the use of a highly educated convenience sample makes it difficult to make generalizations about the results obtained, and apply them to a wider population of women. Future studies are needed to confirm our results in larger and more diverse groups of pregnant women. Another limitation of our study was the small number of pregnant women included and the multiple comparisons made.

This study also demonstrates the importance of measuring other domains of physical activity than leisure physical activity⁵² by revealing the amount of time women spent on paid and non-paid work physical activity before and during

pregnancy and its relation to well-being and depression. To our knowledge, this is the first study to examine the relationship between physical activity status before and during early pregnancy and HRQoL and depression.

In conclusion, pregnancy reduces vigorous leisure activity and the proportion of women engaging in recommended levels of physical activity. Physical HRQoL decreases from early to mid pregnancy independent of changes in physical activity, but not mental HRQoL. Although the depressive symptoms remain stable in all physical activity groups, women that become low active at early pregnancy experience impaired mental health. This information is helpful when counseling women to promote mental well-being and prevent the potential risk of mental health problems.

Resumo

Este estudo examina os padrões de atividade física antes da concepção até o segundo trimestre de gravidez e a relação entre o nível de atividade física, com base nas recomendações de atividade física, a qualidade de vida relacionada à saúde (QVRS) e depressão ao longo da gravidez. Cinquenta e seis grávidas saudáveis reportaram nível de atividade física, QVRS e depressão às 10-15 e 19-24 semanas de gravidez, além de atividade física antes da concepção. Enquanto a atividade física vigorosa no lazer diminuiu depois da concepção, as atividades físicas moderadas no lazer e no trabalho mantiveram-se estáveis. A prevalência de atividade física recomendada foi de 39,3%, 12,5% e 14,3% antes, no primeiro e no segundo trimestres de gravidez, respectivamente. Independentemente do estatuto de atividade física, a maior parte dos escores nas dimensões físicas da QVRS diminuiu do primeiro para o segundo trimestre de gestação, e apenas o componente mental aumenta. Não se verificaram alterações nos escores médios de depressão. Estes dados sugerem que, com a gravidez, há alteração nos padrões de atividade física; além disso, os componentes físico e mental são diferentemente afetados pelo curso da gestação, independentemente do nível de atividade física.

Atividade Motora; Qualidade de Vida; Depressão; Gravidez

Contributors

I. Tendais carried out the research and wrote the article. B. Figueiredo and J. Mota provided orientation for the analysis, data interpretation, and reviewed the article. A. Conde contributed to the data analysis and reviewed the manuscript.

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