Meeting physical activity guidelines and its association with health-related quality of life throughout pregnancy: the PregnActive project.

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Abstract

Pregnancy is a unique period in women life, characterized by anatomical and metabolic variation that may affect health-related quality of life (HRQoL). Physical activity has the potential to positively influence HRQoL. The aim of this study is to analyze the association between the fulfillment of physical activity guidelines and HRQoL throughout pregnancy. Seventy eight pregnant women were assessed at two time point through their pregnancy: at mid- and at later-pregnancy. Physical activity was objectively assessed by a multi-sensor monitor and pregnant women were categorized by the fulfillment of the minimum physical activity recommendations: at least 30 minutes/day on at least 5 days/week. Perceived mental health was evaluated by health-related quality of life and by psychological pregnancy symptoms, using the SF-36 and the Pregnancy Symptoms Inventory, respectively. T-Student Test and hierarchical multiple linear regressions analysis was developed. Pregnant women who fulfilled physical activity recommendations reported better mental HRQoL both at mid-pregnancy ($p = 0.148$) and later-pregnancy ($p = 0.007$). The number of days meeting minimum physical activity recommendations contributes to better mental HRQoL and together with depression and anxiety symptoms the model explain the 65% of the mental HRQoL at later pregnancy. Meeting the minimum physical activity recommendations is associated with better perceived health at both midpregnancy and later pregnancy. While mental HRQoL is explained by physical activity, physical HRQoL is explained by others factors such as age or pregnancy-related symptoms, but not by meeting the minimum physical activity recommendations.

Keywords: physical activity, perceived health, health-related quality of life, pregnancy.

Introduction

Pregnancy is a unique period in women life, characterized by profound anatomical and metabolic variation that occur in a short period of time (Tan & Tan, 2013). During pregnancy, the rapid fluctuation of hormonal levels and the change in the gender role socialization may involve psychological changes (Marcus, 2009) that have the potential risk of affect pregnant women mental functioning and social interactions (Nicholson et al., 2006). Health-related quality of life (HRQoL) is considered a broad measure of perceived health related to both self-reported chronic diseases and their risk factors (Centers for Disease Control and Prevention, 2000). Pregnant women reported lower level of HRQoL compared with non-pregnant women of their same age (Chang et al., 2014). Focusing on maternal HRQoL during prenatal care is necessary due to the decline on HRQoL levels along the course of pregnancy (Lagadec et al., 2018).

Lifestyle has the potential to positively influence psychological disorders during pregnancy such as depression or anxiety (Loprinzi et al., 2012; Takahasi et al., 2013). However, the literature findings about the relationships between meeting physical activity recommendation and HRQoL during pregnancy have shown both positive relationships (Campolong et al., 2018; Krzepota et al., 2018) and no relationships (Mourady et al., 2017; Oviedo-Caro et al., 2018). Among them, only one study objectively assessed physical activity (Oviedo-Caro et al., 2018), but this cross-sectional study was developed only at midpregnancy.

Up to date, no studies have analyzed the association of objectively measured physical activity and HRQoL throughout pregnancy. The aim of this study is to assess the associations between meeting the minimum physical activity recommendations and perceived health throughout pregnancy. Our working hypotheses were that meeting physical activity guidelines would be associated with high perceived health levels throughout pregnancy.

Methods

An exploratory cross-sectional study was developed among pregnant women throughout two points of pregnancy: mid-pregnancy (≈20th gestational week) and later-pregnancy (≈32nd gestational week) at the Utrera Hospital, a public hospital of the sanitary area of Seville, Spain. Coinciding with the 12th gestational week visit to the antenatal clinics, potential participants (N = 200), aged 18-45 years old, were individually informed about the study aims and protocol. To achieve a confidence interval of 95% and an error margin of 5% a minimum sample of 132 pregnant women was required. The exclusion criteria included physical illnesses or disabilities that affected their normal daily routine and high-risk pregnancy (i.e., diabetes or hypertension). Written informed consent was obtained from participants prior to enrolling in the study. A total of 157 pregnant women were included in the study sample and 79 women were excluded to not complete the evaluation procedure (Supplementary Figure 1 and Supplementary Table 1). The study protocol obtained ethical approval from the Medical Research Ethics Committee of the University Hospital Virgen del Rocio (Seville, Spain) in accordance with the Declaration of Helsinki, approval number 2014PI-066.

Sociodemographic characteristics (age, educational level, employment situation, and parity) were assessed by self –report questionnaire. Physical activity was objectively assessed by a body monitoring device Sensewear Mini Armband (BodyMedia Inc., Pittsburgh, PA, USA), which has been validated on pregnant women (Smith et al., 2012), over at least the 95% of the 24-hour day during a 9-day period. HRQoL was assessed by The Medical Outcome Study 36-item short form (SF-36), a questionnaire with satisfactory psychometric properties among

pregnant women (Jomeen & Martin, 2005). Psychological pregnancy-related symptoms were assessed by the Pregnancy Symptoms Inventory (Oviedo-Caro et al., 2017).

Statistical analysis were performed using the Statistical Package for the Social Sciences version 20 (IBM Corp., Armonk, NY, USA), with significance set at $p<0.050$. Pregnant women was categorized as sufficiently active or insufficiently active by meeting or not meeting the minimum physical activity recommendations: fulfill at least 30 minutes/day on at least 5 days/week (American College of Obstetricians and Gynecologists, 2015). Student's t-tests or Mann–Whitney U tests were calculated to compare perceived health between sufficiently and insufficiently active pregnancy women groups. A series of hierarchical three-step multiple linear regression analysis were performed: 1) sociodemographic variables were entered as covariates to control for their potential association, 2) Physical activity was entered to analyze their potential association, and 3) psychological pregnancy-related symptoms were entered as mediators of the associations between physical activity and perceived health. Outcome variable with non-normally distribution (mental HRQoL) was transformed using a square root transformation.

Results

Seventy eight healthy pregnant women, with a mean age of 33.1 ± 4.1 years, 55.1% with university studies and 50.0% with children were included in the study sample (Table 1). The number of days pregnant women meet >30 minutes of MVPA and the percentage of women meeting the minimum recommendation significantly decrease from mid- to later-pregnancy (Table 1). While the physical HRQoL significantly decreased, the mental HRQoL significantly increased from mid- to later-pregnancy.

At mid-pregnancy, being sufficiently active was associated with reporting better HRQoL, although the differences were only significant for social function and close to being higher than half an SD for mental component summary (Table 2). At later pregnancy, being sufficiently active was associated with reporting significantly better physical role, vitality, social function and emotional role and mental component summary. In addition, a minimally relevant difference was found when compared the mental health between sufficiently active and insufficiently active pregnant women groups.

The hierarchical linear regression models at mid-pregnancy shows that the first block was statistically significant only for physical HRQoL, the addition of the number of days meeting ≥ 30 minutes of MVPA did not improved models (block 2), and the addition of psychological pregnancy symptoms as mediators significantly added to the models (block 3). The full physical HRQoL model explained the 32% of the variable, contributing age and frequency of back pain symptomatology to a worse physical HRQoL. The full mental HRQoL model explained the 42% of the variable, contributing the frequency of feeling depressed, anxiety and having altered body image symptomatology to a worse mental HRQoL (Table 3). At later pregnancy, the first block was not statistically significant for any model, the addition of the number of days meeting ≥ 30 minutes of MVPA contributed for a better mental HRQoL (block 2), and the addition of psychological pregnancy symptoms as mediators significantly added to both models (block 3). The full physical model explained the 27% of the variable, contributing the frequency of tiredness or fatigue symptomatology to a worse physical HRQoL. The full mental HRQoL model explained the 65% of the variable, contributing the number of days meeting the minimum physical activity recommendations to a better mental HRQoL while the frequency of feeling depressed, anxiety, headache, and having an altered body image symptomatology contributed for a worse mental HRQoL.

Discussion

This study leads to expand the current knowledge about the associations of an active lifestyle and perceived health throughout pregnancy. Our results suggest that fulfill the minimum physical activity recommendations is associated with better mental HRQoL both at mid- and later-pregnancy, and a dose-response association between the number of days fulfilling the minimum physical activity recommendations and mental HRQoL at later pregnancy. It could be explained by the positive influence of physical activity on psychological disorders during pregnancy (Loprinzi et al., 2012; Takahasi et al., 2013) and their role on the promotion of social interactions, which is affected by pregnancy (Marcus, 2009). Although with better scores, being physically active during pregnancy was not significantly associated with better physical HRQoL, in line with previous randomized-controlled trials (Gustafsson et al., 2015). It suggest that meeting the minimum recommended volume may not be sufficient and others explanatory factors such as age and frequency of back pain and tiredness symptoms (Lagadec et al., 2018; Oviedo-Caro et al., 2018) explain to a greater extend the physical HRQoL. Future studies are needed to investigate the amount of physical activity that is required to improve physical HRQoL during pregnancy.

Although this study expands the current knowledge on the association of objectively measure physical activity with HRQoL throughout pregnancy, future studies combining an objective measurement with the analysis of physical activity domains will improve this topic. Some limitations can be found such as the cross-sectional design, the exclusion of high-risk pregnant women, and the small sample size. Future epidemiological and multicenter studies with larger sample sizes are also required to explore this association.

Conclusions

Meeting the minimum physical activity recommendations is associated with better perceived mental health compared with being insufficiently active at both mid- and later-pregnancy. While mental HRQoL could be explained by physical activity, physical HRQoL could be explained by others factors such as age or pregnancy-related symptoms, but not by meeting physical activity recommendations. The number of days meeting physical activity recommendations contributes to explain a better perceived mental health at later pregnancy, suggesting that may be a dose-response in this association. An integration of physical activity in the daily activity routine may be the most appropriated way to develop an active lifestyle that allows to obtain mental health benefits.

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Table 1 Characteristics of the study sample (n=78).

	Midpregnancy evaluation	Later pregnancy evaluation	Paired T-test or Chi squared p value
Age (years)	33.1 ± 4.1		
Educational level (university studies)	55.1 %		
Parity (with children)	50.0 %		
Employment situation (active)	62.8 %	28.2 %	<0.001
Days meeting ≥30 min MVPA (days)	6.0 ± 1.6	5.4 ± 1.9	0.001
MVPA (minutes/day)	86.9 ± 42.3	77.7 ± 47.4	0.086
MVPA (minutes/week)	608.1 ± 296.1	544.1 ± 331.6	0.086
Meeting minimum PA recommendations (sufficiently active)	84.6 %	67.9 %	0.014
Frequency of tiredness or fatigue symptomatology (0-3)	1.9 ± 0.9	2.2 ± 0.6	0.001
Frequency of feeling depressed symptomatology (0-3)	0.8 ± 0.9	0.7 ± 0.9	0.511
Frequency of anxiety symptomatology (0-3)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.775
Frequency of back pain symptomatology (0-3)	1.2 ± 1.1	1.6 ± 1.1	<0.001
Frequency of hip or pelvic pain symptomatology (0-3)	0.7 ± 1.0	1.1 ± 1.1	0.001
Frequency of breast pain symptomatology (0-3)	1.3 ± 1.1	0.6 ± 0.9	<0.001
Frequency of headache symptomatology (0-3)	1.1 ± 1.0	0.6 ± 0.8	<0.001
Frequency of altered body image symptomatology (0-3)	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.305
Physical component summary (0-100)	46.0 ± 8.0	39.8 ± 9.1	<0.001
Mental component summary (0-100)	53.2 (46.0-57.7)	55.0 (49.2-60.2)	0.021
Physical function (0-100)	74.9 ± 15.4	58.8 ± 19.8	<0.001
Physical role (0-100)	67.9 ± 25.7	52.3 ± 25.9	<0.001
Pain (0-100)	68.3 ± 22.6	61.9 ± 23.1	0.011
General health (0-100)	74.0 ± 16.9	71.5 ± 17.6	0.128
Vitality (0-100)	51.5 ± 14.3	48.8 ± 15.1	0.090
Social function (0-100)	77.7 ± 21.4	77.7 ± 23.9	1.000
Emotional role (0-100)	100.0 (100.0-100.0)	100 (89.5-100.0)	0.323
Mental health (0-100)	80.0 (63.7-90.0)	77.5 (65.0-90.0)	0.454

Data are presented by percentage, mean ± SD, or median (IQR) based on variable characteristics. Abbreviations: PA: physical activity. MVPA: moderate-to-vigorous physical activity.

Table 2 Comparison of HRQoL levels between sufficiently and insufficiently active pregnant women (n=78).

	Midpregnancy			Later pregnancy		
	Sufficiently active (n=66)	**Insufficiently active (n=12)**	**T-test p value**	**Sufficiently active (n=53)**	**Insufficiently active (n=25)**	**T-test p value**
Physical component summary (0-100)	46.4 ± 8.2	43.5 ± 6.6	0.240	40.7 ± 9.1	37.8 ± 8.9	0.188
Mental component summary (0-100)	51.6 ± 9.2	47.5 ± 8.0	0.148	55.0 ± 7.9	49.2 ± 10.1	0.007
Physical function (0-100)	75.8 ± 16.2	70.0 ± 9.0	0.237	61.2 ± 19.9	53.6 ± 19.0	0.113
Physical role (0-100)	69.8 ± 26.1	57.3 ± 21.5	0.122	57.0 ± 23.9	42.5 ± 27.5	0.020
Pain (0-100)	69.3 ± 22.0	63.2 ± 25.9	0.394	62.9 ± 23.0	59.8 ± 23.7	0.578
General health (0-100)	75.0 ± 16.1	68.8 ± 20.6	0.243	74.1 ± 16.7	66.0 ± 18.7	0.059
Vitality (0-100)	52.5 ± 14.1	46.4 ± 15.2	0.176	52.0 ± 14.5	42.0 ± 14.3	0.005
Social function (0-100)	80.1 ± 21.4	64.6 ± 16.7	0.020	83.3 ± 20.8	66.0 ± 26.2	0.002
Emotional role (0-100)	93.1 ± 14.7	88.2 ± 19.6	0.320	93.7 ± 15.8	82.3 ± 22.7	0.012
Mental health (0-100)	76.0 ± 18.7	68.3 ± 13.4	0.180	78.3 ± 14.3	71.2 ± 18.6	0.067

Abbreviations: HRQoL: health-related quality of life.

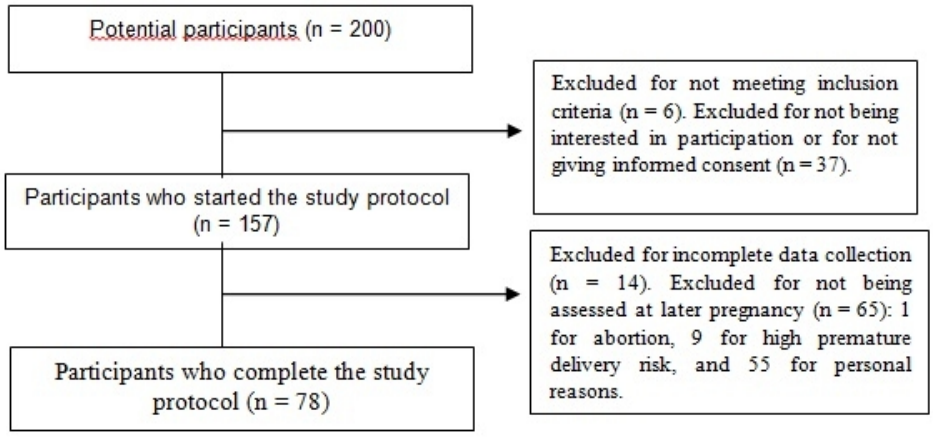
Table 3 Hierarchical linear regression models for variables explaining pregnant women's HRQoL.

	Midpregnancy		Later pregnancy	
	Physical HRQOL	Mental HRQOL	Physical HRQOL	Mental HRQOL
Block 1				
Age	-0.38***	0.14	-0.12	-0.02
Educational level (university studies)	0.15	0.01	0.11	0.07
Employment situation (active)	-0.18	-0.09	-0.16	-0.01
Number of children (with children)	-0.09	0.03	-0.05	0.10
F p value	0.001	0.702	0.277	0.931
R2	0.23	0.03	0.07	0.01
Standardized R2	0.18	-0.02	0.02	-0.04
Block 2				
Age	-0.38***	0.13	-0.13	-0.04
Educational level (university studies)	0.16	0.02	0.12	0.09
Employment situation (active)	-0.17	-0.08	-0.17	-0.03
Number of children (with children)	-0.09	0.04	-0.04	0.11
Days meeting ≥30 min MVPA	0.07	0.13	0.15	0.36***
F p value	0.003	0.655	0.232	0.047
R2	0.23	0.05	0.09	0.14
Standardized R2	0.17	-0.02	0.03	0.08
Block 3				
Age	-0.42***	0.04	-0.12	-0.02
Educational level (university studies)	0.11	0.11	0.12	-0.02
Employment situation (active)	-0.20	-0.06	-0.07	0.07
Number of children (with children)	0.04	-0.03	0.08	-0.13
Days meeting ≥30 min MVPA	0.09	0.12	0.06	0.20**
Frequency of tiredness or fatigue symptomatology (0-3)	-0.15	0.06	-0.41***	0.09
Frequency of feeling depressed symptomatology (0-3)	0.22	-0.48***	0.16	-0.52***
Frequency of anxiety symptomatology (0-3)	0.11	-0.41***	0.09	-0.47***
Frequency of back pain symptomatology (0-3)	-0.32*	-0.17	-0.18	-0.03
Frequency of hip or pelvic pain symptomatology (0-3)	-0.15	0.03	-0.21	0.04
Frequency of breast pain symptomatology (0-3)	-0.02	-0.03	-0.00	0.08
Frequency of headache symptomatology (0-3)	0.02	-0.00	-0.05	-0.26***
Frequency of altered body image symptomatology (0-3)	-0.14	-0.22*	-0.04	-0.22*
F p value	0.000	0.000	0.001	0.000
R2	0.44	0.52	0.39	0.71
Standardized R2	0.32	0.42	0.27	0.65

Abbreviations: HRQoL: health-related quality of life0. MVPA: moderate-to-vigorous physical activity. Linear regression models assumptions were reached. Tolerance of independence variables ranged from 0.47 to 1.17 and variance inflation factor of independent variables ranged from 0.85 to 2.15). * $p < 0.050$, ** $p < 0.010$, *** $p < 0.005$.

Supplementary Table 1. Comparisons between participants and non-participants.

	Participants	Non-participants	P value
Age (years)	33.1 ± 4.1	32.0 ± 4.8	0.103
Gestational week (week)	19.6 ± 2.3	19.5 ± 2.5	0.726
Educational level (university studies)	55.1 %	34.2 %	0.008
Parity (with children)	50.0 %	48.1 %	0.812
Employment situation (active)	62.8 %	57.0 %	0.227



Supplementary Figure 1. Participants flow diagram.

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