Aerobic exercise during pregnancy improves health-related quality of life: a randomised trial

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Question: Does supervised aerobic exercise during pregnancy improve health-related quality of life in nulliparous women? **Design**: Analysis of secondary outcomes of a randomised trial with concealed allocation, blinded assessors, and intention-to-treat analysis. **Participants**: 64 nulliparous, pregnant women attending for prenatal care at one of three tertiary hospitals. **Intervention**: The experimental group completed a 3-month supervised exercise program, commencing at 16 to 20 weeks of gestation. Each session included walking (10 min), aerobic exercise (30 min), stretching (10 min), and relaxation (10 min). The control group continued usual activities and performed no specific exercise. **Outcome measures**: The primary outcome was health-related quality of life assessed by the Colombian version of the Medical Outcome Study Short-Form Health Survey at baseline and immediately after the 3-month intervention. **Results**: Fifty women completed the study. After the 3-month intervention, the experimental group had improved their health-related quality of life more than the control group in the physical component summary of the questionnaire by 6 points (95% CI 2 to 11), the physical function domain (7 points, 95% CI 0 to 14), the bodily pain domain (7 points, 95% CI 1 to 13) and the general health domain (5 points, 95% CI 1 to 10). **Conclusions**: A supervised 3-month program of primarily aerobic exercise during pregnancy improves health-related quality of life. **Trial registration**: NCT00741312. **[Montoya Arizabaleta AV, Orozco Buitrago L, Aguilar de Plata A C, Mosquera Escudero M, Ramírez-Vélez R (2010) Aerobic exercise during pregnancy improves health-related quality of life: a randomised trial. *Journal of Physiotherapy* 56: 253–258]**

Key words: Aerobic exercise, Pregnant women, Health-related quality of life, Randomised trial, Physiotherapy

Introduction

Guidelines from the American College of Obstetricians and Gynecologists (Artal and O'Toole 2003) recommend regular exercise for pregnant women, including those who are sedentary, for its overall health benefits such as improved physical fitness. Physical activity during pregnancy appears to be beneficial to the maternal-foetal unit and may prevent the occurrence of maternal disorders, such as hypertension (Yeo et al 2000, Barakat et al 2009) and gestational diabetes (Dempsey et al 2004, Callaway et al 2010). Several studies over the last decade have reported that physical activity has few negative effects for many pregnant women (Alderman et al 1998, Artal and O'Toole 2003, Barakat et al 2008, Barakat et al 2009).

Pregnancy is a time of intense physical change, and is associated with a great deal of emotional upheaval in many women (Hueston and Kasik-Miller 1998). In addition to the obvious outward physical changes that accompany pregnancy, significant increases in mental health problems, including depression and psychosis, occur during pregnancy and in the immediate postpartum period (Watson et al 1984). Even in normal pregnancies, women experience subtle changes that may alter their ability to carry out their usual roles and may detract from their overall health-related quality of life (Hueston and Kasik-Miller 1998). This can cause a period of physical and emotional stress that can have a significant impact on the well-being of an expectant mother (Haas et al 2005).

While the primary goal of healthcare during pregnancy remains directed at increasing the likelihood of a favourable maternal and neonatal outcome, consideration should also be given to how a woman's life can be affected by factors that arise during pregnancy (Hueston and Kasik-Miller 1998, Haas et al 2005). An awareness of these factors and how they influence a woman's functional status may lead to the ability to provide effective interventions to protect a woman's health-related quality of life during pregnancy. Evidence about the health-related quality of life of pregnant women could inform policies related to leave around the time of pregnancy (Haas et al 1999). One intervention that improves physical and psychological function in healthy people and in people with a range of disorders is exercise (Taylor et al 2007). Despite its other benefits outlined above, exercise during pregnancy has not been investigated for its effect on maternal quality of life. It is therefore worth assessing the effect of exercise during pregnancy on health-related quality of life in healthy women (Brown et al 2004, Clapp 1995). Therefore the research question for this study was:

> Does a 3-month supervised aerobic exercise program improve health-related quality of life in nulliparous pregnant women?

Method

Design

A randomised trial was conducted. Participants were recruited from the prenatal care services of three hospitals in Cali, Colombia. Women who were interested in the study were invited to a screening visit at one of the centres. Sociodemographic data were recorded and a detailed physical examination was performed by a physician to determine eligibility. After confirmation of eligibility, the women were randomly allocated to one of two groups: aerobic exercise plus usual prenatal care, or usual prenatal care only. Randomisation was performed using a permuted

block design with a block size of 8 and exp:con ratios of 3:5, 4:4 or 5:3. Participants in the exercise group commenced the program when each block was completed, allowing supervised group exercise sessions comprising three to five women. Baseline measures were taken the day before the exercise program commenced and outcomes were measured the day after the program was completed. The investigator responsible for randomly assigning participants to treatment groups did not know in advance which treatment the next person would receive (concealed allocation) and did not participate in administering the intervention or measuring outcomes. The investigators responsible for assessing eligibility and baseline measures were blinded to group allocation. Participants and therapists administering the intervention were not blinded. The investigators responsible for outcome assessment were blinded to group allocation. All investigators received training before the trial and reminders during the trial regarding the protocol, measurement procedures, and methods and importance of maintaining blinding. Measurements were taken at baseline (Month 0, which corresponded to between 16 and 20 weeks of gestation) and at the end of the three-month intervention period (Month 3, week 28–32 of gestation).

Participants, therapists, centres

Pregnant women were eligible for the study if they were aged between 16 and 30 years, between 16 and 20 weeks of gestation, with a live foetus at the routine ultrasound scan. They were excluded if they had participated in a structured exercise program in the past six months or had a history of high blood pressure, chronic medical illnesses (cancer, renal, endocrinology, psychiatric, neurologic, infectious, and cardiovascular diseases), persistent bleeding after week 12 of gestation, poorly controlled thyroid disease, placenta praevia, incompetent cervix, polyhydramnios, oligohydramnios, miscarriage in the last twelve months, or diseases that could interfere with participation, according to the recommendations of the American College of Sports Medicine (ACSM 2000) and the American College of Obstetricians and Gynecologists (Artal and O'Toole 2003).

At each participating centre two health professionals, who volunteered, were trained to recruit and assess eligibility. During the recruitment period, the opportunity to participate in the study was offered daily to all patients at the participating centres when they attended for routine antenatal care, if they previously had been identified on the doctors' lists as being without a chronic pathology. The sessions were supervised by a physiotherapist and a physician. The participating centres were required to offer routine antenatal care and have facilities to allow the conduct of a supervised exercise class.

Intervention

Participants in the experimental group were invited to participate in three 60-min exercise classes per week, starting between week 16 and 20 of gestation and continuing for 3 months. All subjects wore a heart-rate monitor during the training sessions to ensure that exercise intensity was moderate to vigorous (Ramírez-Vélez et al 2009). Sessions consisted of walking (10 min), aerobic exercise (30 min), stretching (10 min), and relaxation (10 min). Aerobic activities were prescribed at moderate to vigorous intensity, aiming for 55–75% of maximal heart rate and adjusted according to ratings on the Borg scale (Borg 1982). Adherence to the exercise program was encouraged by the physiotherapist who supervised the exercise sessions. In order to maximise adherence to the training program, all sessions were conducted in groups of 3 to 5 women, accompanied by music, and performed in a spacious, air-conditioned room.

The control group received no exercise intervention, did not attend the exercise classes, and did not take part in a home exercise program. Both groups continued with their normal prenatal care (1 session per week for 3 months) and physical activity.

Outcome measures

The Colombian standard version of the Medical Outcome Study Short-Form Health Survey (SF-12 version 2) is a questionnaire comprising 12 questions grouped into eight different domains of health: physical functioning, role limitation due to physical problems, bodily pain, general health perception, vitality, social function, role limitation due to emotional problems, and mental health (Lugo et al 2006). These eight scales are further clustered into the Physical Component Summary (comprising physical function, role-physical, bodily pain and general health) and Mental Component Summary (comprising vitality, social function, role-emotional, and mental health). Test scores were calculated according to the instructions provided in the questionnaire's user manual (Ware and Kosinski 2001, Lugo et al 2006). Reliability values (Pearson's r) range from 0.89 to 0.94 for the Physical Component Summary and from 0.84 to 0.91 for the Mental Component Summary (Bize et al 2007, Ware and Kosinski 2001, Tessier et al 2007).

Data analysis

Our sample size of 64 participants provided 80% power to detect as significant, at the two-sided 5% level, a 3-point difference in the Physical Component Summary between groups, assuming a SD of 5 points (Ramírez-Vélez et al 2009) and allowing for a loss to follow-up of 25%.

Data were entered in an electronic database by investigators at the time of assessment. Random checks of data entry were performed regularly and corrections made where possible by checking against hospital records or by phoning participants for confirmation. The normality of the distribution of scores for each variable was confirmed with the Kolmogorov-Smirnov test. We then used the unpaired t-test to estimate the between-group difference in each outcome. The significance level was set at $p < 0.05$. Analysis was according to the principle of intention-to-treat.

Results

Flow of participants, therapists, centres through the study

Sixty-four participants were recruited to the study. The baseline characteristics are presented in Table 1. Thirty-three participants were allocated to the experimental group and 31 to the control group. At 3 months after admission to the study, there were 24 participants in the experimental group and 26 in the control group. Figure 1 outlines the flow of participants through the trial.

A qualified, registered physiotherapist and a medical doctor with three years of experience in exercise programs, supervised all exercise sessions. In addition, the physiotherapist received further training in the specific exercise program for this study.

Table 1. Baseline characteristics of participants, therapists, and centres.

Characteristic	Randomised (n = 64)		Lost to follow-up (n = 14)	
	Exp (n = 33)	Con (n = 31)	Exp (n = 9)	Con (n = 5)
Participants				
Age *(yr)*, mean (SD)	19 (3)	20 (3)	19 (2)	19 (2)
Gestation *(wk),* mean (SD)	18 (3)	17 (4)	18 (2)	19 (3)
Marital status, n (%)				
Single	11 (33)	8 (26)	4 (44)	4 (80)
Married/de facto	22 (67)	23 (74)	5 (56)	1 (20)
Ethnicity, n (%)				
African Colombian	5 (15)	3 (10)	1 (11)	1 (20)
Indigenous	2 (6)	2 (6)	0 (0)	0 (0)
Mestize	22 (67)	16 (52)	1 (11)	1 (20)
Caucasian	4 (12)	10 (32)	7 (78)	3 (60)
Socioeconomic level, n (%)				
Stratum 1 (range 1–3)	31 (94)	25 (80)	7 (78)	3 (60)
Stratum 2 (range 4–6)	2 (6)	6 (20)	2 (22)	2 (40)
Education, n (%)				
None	1 (3)	1 (3)	2 (22)	2 (40)
Primary	4 (12)	1 (3)	0 (0)	0 (0)
Secondary	23 (70)	26 (85)	3 (33)	1 (20)
Technical	4 (12)	2 (6)	3 (33)	1 (20)
University	1 (3)	1 (3)	1 (12)	1 (20)
Occupation, n (%)				
Student	7 (21)	8 (26)	7 (78)	2 (40)
Housewife	26 (79)	23 (74)	2 (22)	3 (60)
Location, n (%)				
Urban	16 (49)	18 (58)	6 (67)	4 (80)
Rural	17 (51)	13 (42)	3 (33)	1 (20)
Therapists, n participants (%)				
A	12 (36)	9 (29)	3 (33)	1 (20)
B	12 (36)	9 (29)	2 (22)	1 (20)
C	6 (19)	7 (23)	2 (22)	1 (20)
D	3 (9)	6 (19)	2 (22)	2 (40)
Centres, n participants (%)				
1	20 (61)	15 (48)	1 (11)	2 (40)
2	7 (21)	9 (29)	2 (22)	3 (60)
3	6 (18)	7 (23)	6 (67)	0 (0)

Exp = experimental group, Con = control group

The study was conducted at three hospitals specialising in antenatal care, which were located in different regions of Cali, Colombia (Hospital Cañaveralejo, Centro de Salud Siloe, and Centro de Salud Melendez), with a combined throughput of 1200 pregnant women per year.

Compliance with the trial method

Eighteen (75%) of the 24 participants in the experimental group participated in 25 or more of the 36 scheduled sessions.

Effect of intervention

Group data are presented in Table 2 and individual data in Table 3 (see eAddenda for Table 3). At 3 months, the supervised aerobic exercise program improved health-related quality of life more in the experimental group than the control group in the Physical Component Summary of the questionnaire, with a between-group difference of 6 points (95% CI 2 to 11). The experimental group also improved significantly more than the control group in three of the four domains within the Physical Component Summary: the physical function domain by 7 points (95%

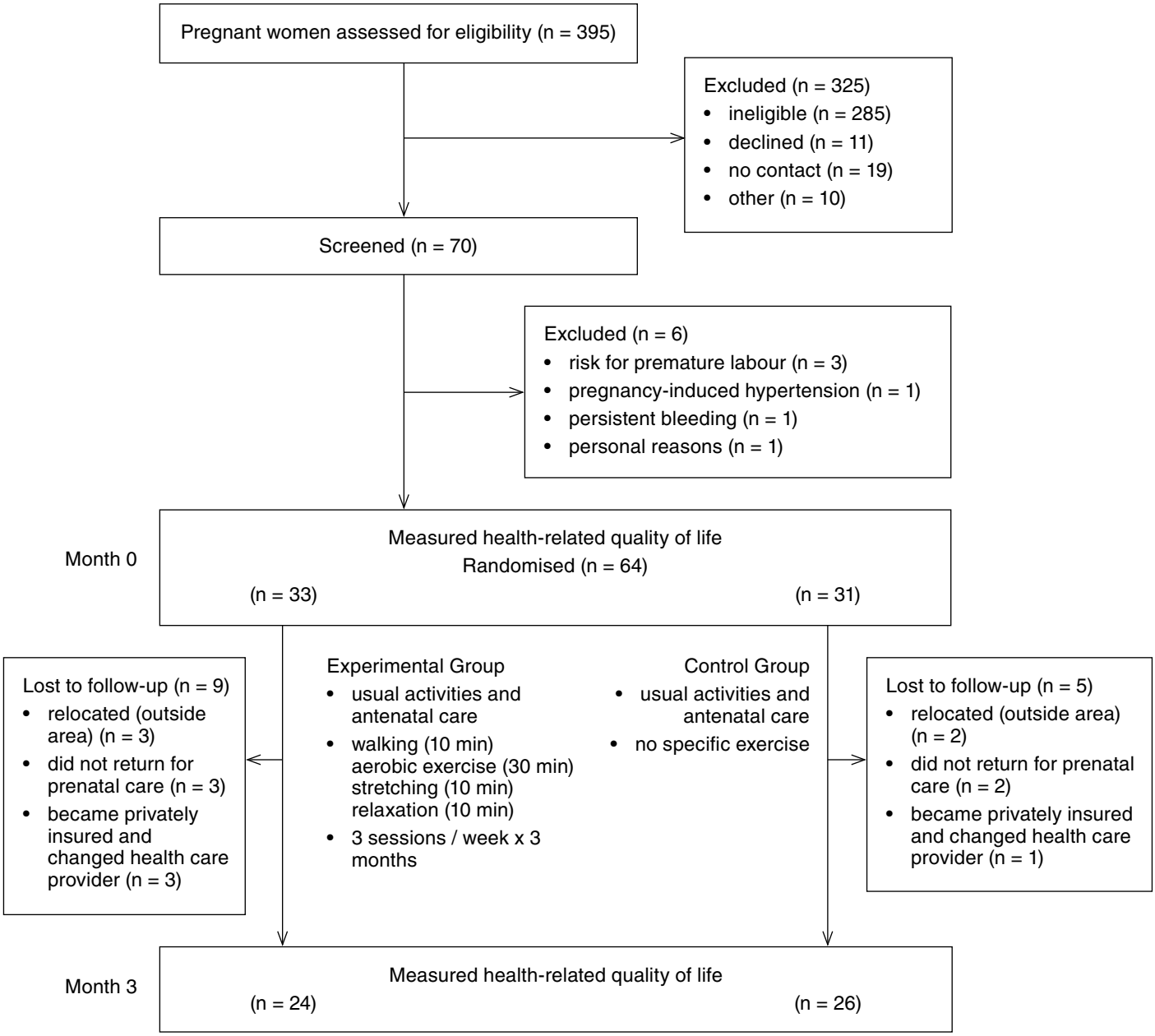

Figure 1. Design and flow of participants through the study.

CI 0 to 14), the bodily pain domain by 7 points (95% CI 1 to 13) and the general health domain by 5 points (95% CI 1 to 10). The Mental Component Summary and its four domains showed no significant effect of the exercise intervention.

Discussion

This is the first study to assess of the effect of a supervised aerobic exercise program on health-related quality of life in nulliparous pregnant women. While the pre-intervention health status reported by the participants was similar to or better than normative data from women of reproductive age (Haas et al 1999, Marcus et al 2003), limitations in physical and social functioning increased over the course of pregnancy. The median role physical and role emotional scores observed in our study of pregnant women were similar to other studies of patient populations with conditions such as congestive heart failure and diabetes (Smith and McFall 2005, Saavedra et al 2007). Following the 3-month exercise program, trends to improvement were seen in most domains of the health-related quality of life questionnaire, with statistically significant changes in the Physical Component Summary and several of its domains. The confidence intervals were not narrow enough to confirm that the benefits would be worth the effort of exercising for these women. Nevertheless, given the other benefits of exercise during pregnancy, physiotherapists can prescribe exercise expecting that it will improve quality of life.

During pregnancy, symptoms are an important contributor to poor health status, while in the postpartum period a lack of social support is the most consistent predictor of poor health outcomes (Hueston and Kasik-Miller 1998). The recommended levels of physical activity were positively associated with one or more domains of health-related quality of life (Hueston and Kasik-Miller 1998). In particular, physical functioning, general health, vitality, social functioning, and mental health are critically affected by the recommended level of physical activity (Brown et al 2003). In the current study, the physical aspects of health-

Table 2. Mean (SD) of groups, mean (SD) difference within groups, and mean (95% CI) difference between groups for component summaries and domains of the Colombian standard version of the Medical Outcome Study Short-Form Health Survey.

	Groups				Difference within groups		Difference between groups
SF-12v2	Month 0		Month 3		Month 3 minus Month 0		Month 3 minus Month 0
(0 to 100)	Exp (n = 24)	Con (n = 26)	Exp (n = 24)	Con (n = 26)	Exp	Con	Exp minus Con
Physical component	43 (8)	47 (6)	46 (6)	43 (6)	2 (10)	–4 (6)	6 (2 to 11)
Physical function	42 (11)	46 (10)	44 (11)	41 (10)	1 (14)	–6 (10)	7 (0 to 14)
Role physical	25 (4)	26 (4)	25 (4)	25 (4)	–1 (6)	–1 (5)	1 (–2 to 4)
Bodily pain	47 (10)	50 (7)	52 (7)	48 (10)	5 (10)	–2 (9)	7 (1 to 13)
General health	50 (9)	51 (7)	55 (8)	50 (7)	4 (8)	–1 (7)	5 (1 to 10)
Mental component	43 (8)	38 (7)	43 (9)	40 (7)	0 (8)	2 (6)	–3 (–7 to 1)
Vitality	56 (11)	54 (9)	57 (11)	53 (7)	2 (8)	0 (9)	2 (–3 to 7)
Social functioning	45 (11)	51 (8)	46 (9)	45 (11)	1 (11)	–5 (12)	6 (–1 to 13)
Role emotional	18 (5)	20 (4)	19 (5)	19 (4)	1 (6)	–1 (5)	2 (–1 to 5)
Mental health	51 (10)	46 (7)	52 (10)	47 (9)	0 (7)	1 (8)	–1 (–6 to 3)

Exp = experimental group, Con = control group, SF-12v2 = Colombian standard version of the Medical Outcome Study Short-Form Health Survey

related quality of life, such as bodily pain and general health, seemed to be more closely associated with the amount of physical activity than the mental aspects are. This finding is consistent with several previous studies (Brown et al 2000, Ramirez-Velez 2007, Tessier et al 2007). Although the perception of vitality – measuring the degree of energy, pep, or tiredness experienced – is classified as a mental health component in the Short Form-8 and the Short Form-36 questionnaires, it has a complex construction and is moderately correlated with both mental and physical health functioning.

Our data for healthy women with uncomplicated pregnancies would provide useful norms for evaluating the effect of pregnancy and its management in women with underlying health problems or complications of pregnancy. Because of the changes associated with gestational age in physical domains, researchers may wish to adjust the normative values of the physical domains when pregnant women are included in research studies.

The long-term effects of exercise on quality of life in women after their pregnancy would best be evaluated if exercise were adopted by these individuals as a lifestyle modification (Brown et al 2000, Ramírez-Vélez et al 2008). Studies that report long-term data from these or similar participants in subsequent years would be necessary for such an evaluation. Future studies could also aim to determine the effects of different physical exercise programs on quality of life in healthy pregnant women, eg, assessing the intensity of the exercise expressed in relative maximum oxygen uptake or relative heart rate, or through quantification of daily physical activity with accelerometers. ■

eAddenda: Table 3 available at www.JoP.physiotherapy.asn.au

Ethics: The University of Valle Research Ethics Committee approved this study (Res-022/29-UV). Informed consent was gained from all participants before data collection began.

Competing interests: None declared.

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