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The Effect of Aquatic Physiotherapy on Low Back Pain in Pregnant Women

Esther Intveld, Stephanie Cooper, and Gisela van Kessel

This study evaluated the effect of antenatal aquatic physiotherapy sessions on low back pain in pregnant women. Thirty-three subjects (31.8 ± 4.8 years) participated in a prospective, quantitative, repeated measures, within subjects design. Low back pain was measured using a Numerical Rating Scale immediately before and after each session. The subjects significantly improved their post session pain scores by an average of 44%. Pain did not increase significantly from the beginning to the end of the course of sessions as is normally expected in this population, and the number of sessions made no significant difference. This finding suggests that attending once a week may contribute to the management of low back pain for pregnant women.

Low back pain is a common side-effect of pregnancy with prevalence rates ranging from 33–72% of women (Gutke, Ostgaard, & Osberg 2006; Mogren & Pohjanen 2005; Stapleton, MacLennan, & Kristiansson, 2002). The prevalence of this pain is not affected by gestational age but is more likely to be developed in younger women, those with a history of low back pain without pregnancy, those who experience pain during menstruation, or those who had pain during a previous pregnancy (Wang et al., 2004). Low back pain during pregnancy can cause sleep disturbances, impaired daily living, and reduced ability to attend paid work (Kihlstrand, Stenman, Nilsson, & Axelson, 1999; Wang et al. 2004).

One treatment option for low back pain is aquatic physiotherapy, which uses hydrodynamic principles and an understanding of the physiology of immersion to design therapeutic exercise programs to reduce pain and increase function. Water exercise may be particularly useful for women who are experiencing low back pain due to the altered biomechanics in pregnancy. The experience of weightlessness created by the buoyant forces of immersion in water may relieve their symptoms as muscles and joints experience decreased load. Furthermore, it is thought that the warmth of the water may decrease muscle tension, co-contraction, and spasm, which allow an increased flow of blood and oxygen to effect healing in body tissues (Konlian, 1999). Although Kihlstrand et al. (1999) have found that Swedish women who attended one antenatal water gymnastics class per week recorded lower pain scores throughout the study compared to a control group who received

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no treatment, overall the women's pain still increased as expected in pregnancy. Other populations could differ as there is an expectation that Scandinavian women will attend antenatal clinics, and they have corresponding paid maternity leave entitlements, facilitating attendance throughout their pregnancy. It was therefore difficult to ascertain the minimum treatment sessions required to achieve an effect or the optimum frequency of sessions.

Method

A prospective, quantitative, repeated measure, within subjects study was conducted at the Flinders Medical Centre in South Australia in conjunction with the University of South Australia Physiotherapy Honours Program. It was approved by the University of South Australia Divisional Ethics Committee, Health Sciences and by the Flinders Clinical Research Ethics Committee.

Participants

Participants were recruited from women receiving treatment at the Flinders Medical Centre Department of Physiotherapy antenatal aquatic physiotherapy classes. Women who were unable to read or write in English, had torn or ruptured membranes, a high risk of exercise-induced spontaneous labor, excessively high blood pressure, impaired renal function, active infection, open wounds, uncontrolled seizures, or incontinence were excluded from this study. Women were referred to aquatic physiotherapy and invited to participate in this study from 20 weeks gestation up to the time of birth of their babies. Once invited to participate in this study, each woman was provided with an information sheet to take home and read at their leisure and a consent form to sign and return at the first antenatal aquatic class that they attended.

Procedures

Antenatal aquatic physiotherapy classes were conducted by physiotherapists at the Flinders Medical Centre hydrotherapy facility with water temperature set at 91.4 °F (33 °C). Classes were of 30 minutes duration and included a warm up of gentle stretches of the neck and shoulders, quadriceps, and hamstring muscle groups as well as thoracic rotation and extension. Hydrodynamic principles were used to design exercises that would focus on thoracic mobility and strength to prepare for the postural demands of breast feeding, upper and lower limb muscle strength to prepare for the lifting required of new mothers, transversus abdominus and pelvic floor muscle training to enhance core stability, and an aerobic exercise component to maintain general fitness. Each class concluded with an additional relaxation component consisting of 10 minutes of massage and floatation within the pool.

After providing signed consent, each woman completed an initial screening questionnaire to obtain demographic information that was used to describe the study population. At each attendance, each woman completed a Numerical Rating Scale (NRS), which involved the rating of her pain on a 0-10 scale before and immediately after the session. The NRS is an 11-point scale requiring participants to give their current pain a numerical rating on a scale of 0-10 with zero representing "no pain" and 10 representing the "worst pain imaginable." The reliability and validity of

this measurement tool have been demonstrated, particularly in comparison to the Visual Analogue Scale (Bolton & Wilkinson, 1998; Ferraz, Quaresima, Aquino, Atra, & Goldsmith 1990; Guyatt, Townsend, & Berman 1987).

Paired samples *t*-tests were conducted on the pre-session and post-session scores of the NRS for each session using SPSS for Windows. Repeated measures Analysis of Variance tests were conducted to compare pre-session scores over time in order to address the hypothesis that low back pain in pregnancy was not significantly increased during a course of antenatal aquatic physiotherapy.

Results

Thirty-six subjects were recruited from pregnant women who were referred to the aquatic physiotherapy classes at Flinders Medical Centre to participate in this study. Three sets of subject data were excluded from analysis; one subject had an insufficient grasp of English to adequately understand the instructions related to completion of the NRS, one subject failed to report both pre and post-session NRS scores for all sessions, and one data set did not include dates thereby invalidating the data. No subjects withdrew from the study.

The mean age of the remaining 33 subjects was 31.8 years (SD = 4.82). The gestational stage at the commencement of participation in this study varied from 21 to 39 weeks with a mean of 31.4 weeks (SD = 3.94). For 61% of these subjects ($n = 20$), this was their first pregnancy, for 21% ($n = 7$) their second, 12% ($n = 4$) their third, and 6% ($n = 2$) their fifth. The number of sessions attended per subject ranged from 1–17 (mean 3.88 sessions). The number of weeks over which these sessions were attended ranged from 1–12 (mean 3.4 weeks).

The NRS was completed by all 33 subjects before and after each antenatal aquatic physiotherapy session. A paired samples *t*-test was conducted on the pre and post sessions NRS mean scores, using data from all women who attended a minimum of one session. Only four women attended more than seven sessions, and data from these later sessions was not included in the analysis as the small sample size would have provided insufficient statistical power for identifying significant differences even if they did exist. A statistically significant difference was found between pre and post session NRS scores ($p < 0.05$) using a paired samples *t*-test. Seventy percent of participants recorded an immediate decrease in low back pain and the average magnitude of this decrease was 44%. Figure 1 illustrates this by graphing the mean difference between pre session and post session scores.

To see if there was a change in the NRS scores over time, a one-factor repeated measures, within subject analysis of variance was conducted on the pre-session scores for sessions one to four. This test of change over a course of sessions found no significant difference in pre-session scores ($p = 0.313$), indicating that low back pain scores remained relatively stable during the course of the aquatic physiotherapy sessions. The final data set ($n = 33$) was sufficient to preclude either type 1 or type 2 statistical errors.

Thirteen subjects attended once per week and 11 subjects attended twice per week with the remainder attending only one session in total. An analysis was carried out of the first pre and last post score for the group who attended once and the group who attended twice. No statistically significant difference was found between the two groups ($p = 0.74$). These results indicate that low back pain did not increase

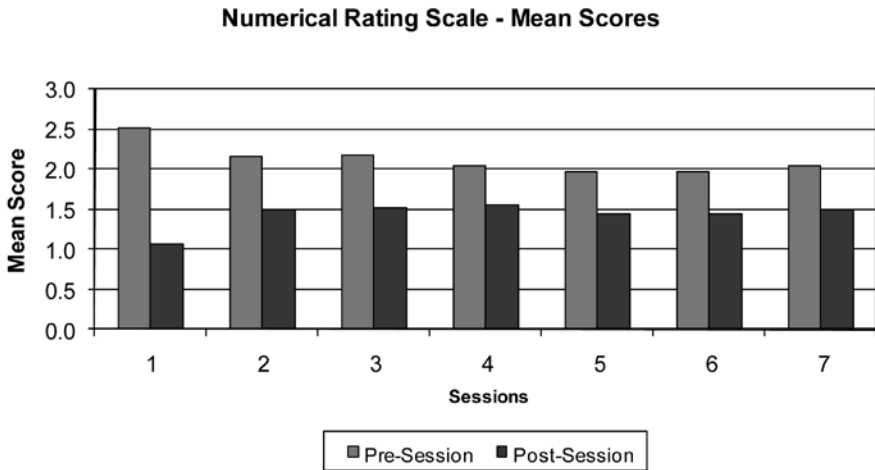


Figure 1— Numerical Rating Scale – mean scores ($n = 33$).

significantly in pregnant women over a course of aquatic physiotherapy, regardless of whether they attended one or more sessions per week. A power calculation found that for a 0.80 effect size, a mean difference of approximately 2.7 units could be detected between the differences of the pre-session scores of the two groups, which is insufficient power to claim that frequency of attendance does not affect pain over a course of sessions.

Discussion

This study investigates the effect of aquatic physiotherapy on low back pain in an Australian population of pregnant women. It found a statistically significant decrease in low back pain immediately following an aquatic physiotherapy session. In addition, it showed that low back pain did not increase significantly during the course of aquatic physiotherapy, even when low back pain has been reported to increase as the pregnancy progresses (Kristiansson, Svardsudd & von Schoultz 1996; Ostgaard, Zetherstrom, & Roos-Hanson 1997).

The results of this study support the research conducted into the effect of aquatic physiotherapy on low back pain in nonpregnant populations (Helliwell, Abbott, & Chamberlain 1996; Langridge & Philips, 1988; Smit & Harrison, 1991). It also supports the results of Kihlstrand et al. (1999), who found that pregnant women participating in water exercise reported significantly lower back pain scores at 31 and 33–38 weeks gestation than women in a control group who did not participate in water exercise.

While Kihlstrand et al. (1999) reported that although women in the water exercise group had less pain than the control group, overall the pain increased in both groups. The normal progression of low back pain in pregnancy is an increase from an early gestational age (Kristiansson et al., 1996; Ostgaard, Andersson, & Schultz, 1993). This study found there was no significant increase in pain from the

first session to the last session. This was despite the fact that classes in this study were shorter in duration (40 minutes compared to 60 minutes) and there were fewer sessions attended. There was greater attendance in the study by Kihlstrand and colleagues (1999) at the water exercise classes with 88% exercising 10–20 times, 55% exercising 15–20 times, and 33% exercising 10–15 times, which contrasts with the current study where the greatest attendance was 17 times with a mean of four sessions. As a result, a further difference is that the Kihlstrand et al. (1999) study was over a longer time span with subjects commencing from gestational week 18 until delivery, while the subjects in this study participated from a mean 31.4 weeks when it may be predicted that the intensity of pain should be greater.

In addition to the difference in exposure to water exercise in terms of duration of session and course and number of sessions, the participants in the two studies differed. First, the women studied by Kihlstrand et al. (1999) were younger with a mean age of 28 compared to the women in this study, who had a mean age of 32 years. In addition, all the patients in this study had low back pain while the Kihlstrand et al. (1999) study did not target women with back pain with only 70.5% of the intervention group indicating they had pain. This may also have led to differences in the intervention design.

Kihlstrand et al. (1999) described the exercise program as recommended by the Swedish Swimming Society and tested by physiotherapists but did not describe it in detail nor indicate how it addresses reducing pain. This contrasts to the classes described above where the physiotherapist ran the class and utilized their expertise to incorporate hydrodynamic principles into exercises specifically aimed at increasing back strength and thereby reducing pain. Exercises were carefully designed so as not to aggravate the back pain condition. Thus, the focus of the aquatic physiotherapy exercise design was on core muscle stability and included strategies for correcting the typical pregnant posture involving anterior pelvic tilt, increased lumbar lordosis, and posterior head position, which may have resulted in the subjects adopting better posture in between sessions.

The interpretation of these results needs to take into account that this study did not consider many other influences on back pain, such as the number of pregnancies, the participant's age, activities of daily living, or culture. A further limitation of the current study was the lack of a control group. The Kihlstrand et al. (1999) finding that water exercise compared to no water exercise was beneficial to women makes a study design that does not offer the intervention to all women problematic from an ethics viewpoint.

While aquatic physiotherapy can bring about immediate pain relief for pregnant women, it is not possible to determine how long the immediate reduction in low back pain will last, although it is unlikely to be longer than seven days as there was no significant difference in the pre session scores. It is not known, therefore, what the optimum frequency for attendance is or what the duration of the course should be.

While this study found that low back pain decreased in pregnant women immediately following an aquatic physiotherapy session, and that low back pain was not increased in pregnant women during a course of treatment sessions, further study needs to be undertaken into the most efficient and effective method(s) of managing low back pain in pregnant women, focusing on optimum frequency and attendance. There is room for further research on subsequent effects on function and quality of life.

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