

PPUK - Scientific Facts & Areas that need Further Research



PHYSIOLOGICAL CONCERNS, ADAPTATIONS, AND CHANGES DURING PREGNANCY

Why do controversy and concern surround the issue of exercise during pregnancy? Physiological changes occur in the cardiovascular, respiratory, musculoskeletal, and gastrointestinal systems and affect the maternal response to exercise. Anatomic changes of pregnancy alter balance, flexibility, joint stability, and co-ordination (Araujo 1997). Finally, exercising during pregnancy is of concern because of the fear that activity can harm a woman's unborn child.



Cardiovascular changes

The cardiovascular system quickly jumps into overdrive in early pregnancy and remains there through the third trimester. When compared to pre-pregnancy levels, cardiac output during pregnancy increases up to 50 percent, and a 45 percent increase in blood volume can take place by the third trimester (Artal and Sherman 1999). Cardiac output (heart rate times stroke volume) increases primarily by an increased stroke volume (the amount of blood pumped per beat of the heart). However, there is a gradual increase of resting heart rate of about 15 beats per minute by the third trimester. Maximum work capacity (i.e., VO₂max) is decreased dramatically by a combination of decreased cardiac reserve (i.e., because of increased cardiac output and blood volume) and increased oxygen cost of weight-bearing exercise (because of increases in body weight). These changes are offset to a degree by an increased capacity of the veins to reduce blood pressure and have greater vasodilation (expanding of blood vessels) at the skin to help dissipate heat and

lessen the likelihood of hyperthermia (over-heating) (Artal and Sherman 1999). The cardiovascular impact related to the double stress of exercise and normal changes caused by pregnancy has been the focus of much research. When the demands of exercise divert fetal blood flow to the working muscle, the theoretical risk of fetal hypoxia (insufficient levels of oxygen reach the baby) exists. However, it seems that during exercise, compensatory mechanisms are in place that limit the threat of insufficient blood flow and oxygen to the fetus.

Because the supine position (lying on your back) is associated with decreased maternal cardiac output after the first trimester, this has led to the often recommended caveat (warning/caution) against exercise in this position. Following this recommendation can prevent the theoretical diversion of blood flow from the utero-placental unit and potential risk of fetal hypoxia. Until research is definitive in this area, this guideline should be followed.

Respiratory changes

The respiratory system is affected anatomically by the enlarging uterus and physiologically by hormonal influences. A resting hyperventilation (fast or deep breathing) occurs in pregnant women (in response to increased plasma progesterone (Araujo 1997). In the third trimester, "deeper breathing" becomes more difficult because the enlarging fetus pushes the diaphragm up. Additionally, it takes more energy to breathe because inhalation causes the diaphragm to lower and it is resisted physiologically by the enlarged uterus, which it must push down during each inspiration.

Gastrointestinal changes

The gastrointestinal (stomach and intestines) system is affected anatomically by the enlarging uterus and physiologically by increased plasma progesterone, a smooth muscle relaxant. The combined effects of these changes contribute to constipation and a slowing of gastrointestinal mobility. The hormonal influence also promotes

relaxation of the lower oesophageal sphincter, which leads to increased gastric reflux and heartburn (Araujo 1997).

Metabolic changes

Hyperthermia is a concern because both exercise and pregnancy increase metabolic rate and raise maternal core temperature. Core temperature in excess of 102.6 degrees Fahrenheit (39.2 degrees Celsius) is potentially teratogenic (i.e., causing mal-development in the embryo) in the first trimester. Adaptive changes help to offset core temperature increases and include increased minute ventilation and skin blood flow, which help to augment heat dissipation and somewhat offset the potential hyperthermic effects of exercise (Artal and Sherman 1999).

Musculoskeletal changes

Significant changes occur in the musculoskeletal system of the pregnant client and could increase her risk of injury while exercising. Growth of the breasts, uterus and fetus increases lumbar lordosis (an exaggerated curve in the lower spine) and shifts the centre of gravity forward, putting strain on the lower back and altering normal balance. Low back pain is often reported during pregnancy. To compound these influences, hormonal changes increase joint laxity and mobility. Relaxin and progesterone soften the ligaments surrounding the joints, and the effect is systematic. This means that all joints in the body are affected, although the importance of the hormonal release is related to pelvic relaxation and symphyseal widening (i.e., at the base of the pelvis), which allows vaginal delivery (Araujo 1997). Although research has not directly linked this with an increased injury rate, caution and moderation are appropriate (Artal and Sherman 1999).

It makes sense that the pregnant client should maintain strength to help stabilise the joints, avoid contact sports, limit weight-bearing exercise if appropriate, and use caution with complex strength training exercises and stretching that is forced or emphasises extreme range of motion (ROM).

