

Review

Gait assessment of the expectant mothers – Systematic review

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ABSTRACT

Introduction: Since pregnant women may have potentially greater difficulty maintaining balance, their stability has been investigated by some researchers. However, there is no consensus considering the results. The purpose of our investigation was to compare all the experimental studies focusing on the analysis of gait that have been conducted over the last years to assess their methodological issues and changes induced by pregnancy.

Methods: The PRISMA Guidelines incorporating a risk of bias and strength of recommendations were used as a methodological template for this review. Literature searches were conducted using the following databases: PubMed, Embase, SPORTDiscus, Scopus. After limiting the search to meet the inclusion criteria, 25 articles remained in the final analysis.

Results: Some authors emphasised that adaptations due to pregnancy are recognised to provide safety and stability. Thus, they consistently reported reduced walking velocity as a result of lower frequency and smaller length of the steps. Longer contact times were reflected by the shortened peak forces. Plantar loads were re-distributed from the rearfoot (decrease) to the midfoot and forefoot (increase) throughout pregnancy. Another adjustment was an increase of base of support to improve lateral gait stability which allows to compensate increased medio-lateral ground reaction force. During the course of pregnancy the increase of anterior body mass and hormonal changes enhance some realignments of the pelvis and lumbar spine. Methodological approaches varied across the included studies. The critical appraisal identified some areas of weaknesses that should be considered for designing the future investigations.

Conclusions: Since many gait parameters are interrelated, in order to understand the cause-and-effect relationships an integrative and complete analysis of multiple factors is required.

1. Introduction

Walking, recognised as an example of dynamic stability, is subject to alterations in pregnancy. The interest in gravidas' pattern of walking arises from the questions concerning body changes and their effect on the woman's mode of progression in space. Since pregnant women may have potentially greater difficulty maintaining balance, their stability has been investigated by some researchers (e.g. Refs. [1–6]). However, there is no consensus considering the results. As this may stem from different reasons, it gives a rise to provide a review of the investigations in this subject. So far we have found only two review papers in this issue [7,8]. However, these are systematic reviews without any evaluation of the quality of the existing studies.

Walking is an essential daily activity. The mechanics of walking in pregnancy may be affected by maternal body changes in shape and dimensions. Postural changes could be caused by numerous factors including enlargement of gravid uterus, weight gain, anterior and

superior shift in the centre of mass, ligament and soft tissue laxity and hormonal changes (increased level of relaxin and estrogen). That is why it is essential to understand any potential effects of pregnancy on gait pattern, especially if several investigations that reported increased incidence of falls during pregnancy are taken into account [9–11]. As McCrory et al. [12] suggested, pregnant women who experienced a fall exhibited altered dynamic postural stability compared with those who did not fall, as well as non-pregnant women. In gravidas, musculoskeletal disorders are common. Foti et al. [1] evaluated the hypothesis that there are gait deviations associated with pregnancy that could contribute to overuse injury of specific muscle groups and that women who are not physically active are at greatest risk. Thus, in addition to the physiological relevance of investigating gait adaptation to the altered neuromuscular system, body and state of pregnant women, gait analysis seems to be of vital importance to determine if the measures may be predictive of falls or musculoskeletal problems associated with pregnancy.

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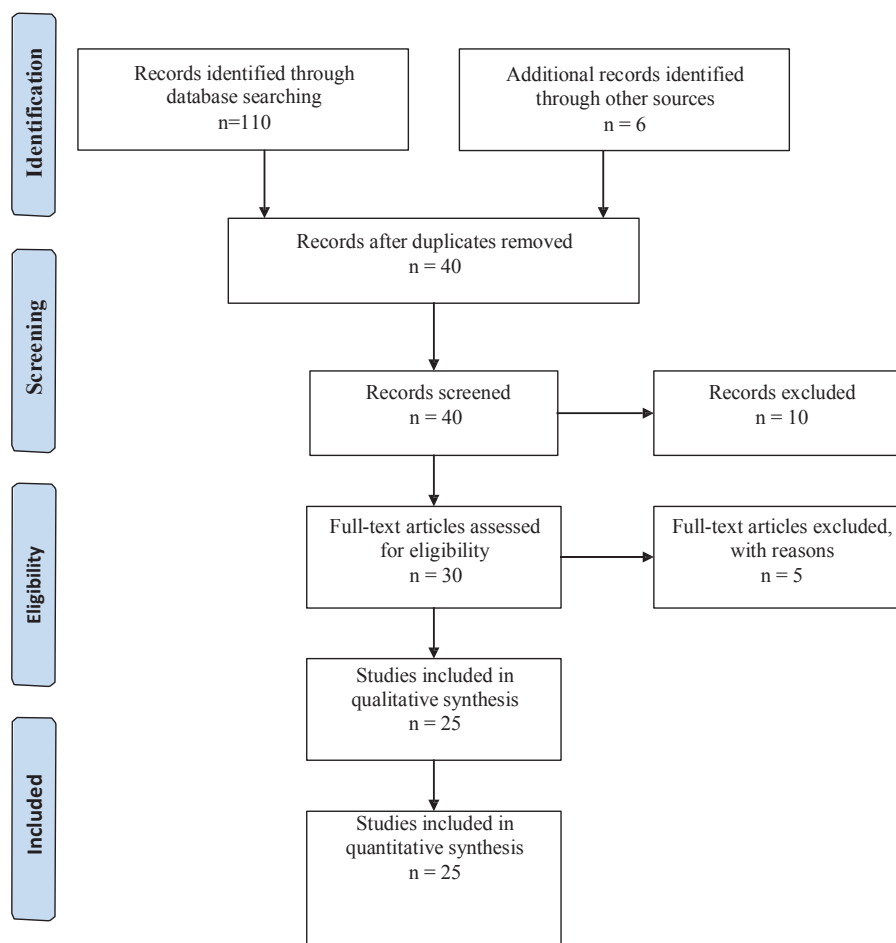


Fig. 1. PRISMA Flow Chart.

Therefore, the purpose of our investigation was to compare all the experimental studies focusing on the analysis of gait over the last years to assess their methodological issues and changes induced by pregnancy.

2. Methods

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Guidelines incorporating risks of a bias and strength of recommendations were used as a methodological template for this review [13].

2.1. Eligibility criteria

The review was restricted to experimental studies with application of the following criteria: pregnant healthy women, investigation designed to assess the effect of pregnancy on the gait of expecting mothers. Trials were excluded if they met any of the following criteria: reviews, letters, commentaries or editorials, only abstracts available or static assessments appeared during pregnancy (Fig. 1).

2.2. Search strategy

Literature searches were conducted between 24 and 26.09.2014 using the following databases: PubMed, Embase, SPORTDiscus, Scopus. The inclusion criteria were the papers published after 1990 year in English language. The following search terms were used in different combinations, depending on the data base:

PubMed– search through Medical Subject Headings (MeSH) with

terms: ‘pregnancy and gait, or walking or posture. Restrictions: humans, no type restrictions. The results: 1041 records.

Embase: search through the thesaurus Emtree, terms: ‘pregnancy and posture or gait or walking. Only Embase (without Medline). Restrictions: article and article in press, humans. The results: 251 records.

Embase: search through the thesaurus Emtree, terms: ‘pregnancy and biomechanics. Only Embase (without Medline). Restrictions: paper type: article or article in press, humans. The results: 56 records.

SPORTDiscus: search through the thesaurus, terms ‘pregnancy and posture or gait or walking. Restrictions: scientific articles, no type restrictions. The results: 28 records.

Scopus: search through “Index terms”. Terms: ‘pregnancy and posture or gait or walking’. Restrictions: article. The results: 1198.

Then the database was updated with the papers published in 2015.

2.3. Types of studies

Any randomised controlled trials, observational studies that evaluated dynamic stability during pregnancy.

3. Results

3.1. Study selection

In order to select the articles included in this review, pre-reading of titles and abstracts was done, followed by reading of full texts. Studies that did not fulfil the inclusion criteria were excluded. The research team independently reviewed the papers. When disagreement appeared, the discussion of the team resolved the problem.

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