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REVIEW ARTICLE

# Factors Influencing Physical Activity in Pregnancy: A Systematic Review

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## *ABSTRAK*

*Kekurangan aktiviti fizikal sewaktu kehamilan boleh menyebabkan komplikasi yang tidak diingini kepada ibu dan juga kandungan seperti penyakit kencing manis dan darah tinggi sewaktu kehamilan dan juga depresi selepas bersalin. Oleh sebab itu, adalah penting untuk mengenal pasti faktor yang mempengaruhi aktiviti fizikal semasa kehamilan untuk merancang dan melaksanakan program intervensi terhadap golongan yang berisiko tinggi ini. Artikel jurnal tentang faktor yang mempengaruhi aktiviti fizikal semasa kehamilan telah dicari dengan menggunakan pangkalan data Pub Med dan Ovid, dari 2014 sehingga 2019. Artikel terpilih telah disemak oleh dua pengarang dan dinilai secara kritis menggunakan Mixed Method Assessment Tool 2018. Sebanyak 16 artikel telah dipilih. Faktor-faktor yang mempengaruhi aktiviti fizikal secara positif semasa kehamilan ialah berseronok, status ekonomi yang lebih tinggi, trimester awal dan berat badan yang lebih tinggi. Manakala faktor yang mempengaruhi aktiviti fizikal secara negatif semasa kehamilan ialah kekurangan pengetahuan, kekurangan sokongan sosial, mempunyai anak lebih dari seorang, kesakitan dan ketidakselesaan fizikal, status etnik minoriti, dan kebimbangan terhadap keselamatan bayi. Walaupun berseronok merupakan salah satu pendorong aktiviti fizikal yang paling banyak dilaporkan semasa kehamilan, penyebab yang mendorong kepada kekurangan aktiviti fizikal sewaktu kehamilan yang paling banyak dilaporkan adalah kekurangan pengetahuan. Selain itu, sokongan sosial daripada rakan dan keluarga juga memainkan peranan penting dalam menggalakkan ibu hamil untuk bergiat aktif. Kajian sistematik ini menekankan keperluan untuk menambah baik program pendidikan kesihatan sedia ada mengenai aktiviti fizikal semasa kehamilan, yang sepatutnya diperluaskan dan disasarkan kepada keseluruhan komuniti, tidak tertakluk kepada golongan wanita hamil itu sahaja bagi memastikan penerimaan*

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*dan keberkesanan yang lebih tinggi.*

*Kata kunci: aktif, aktiviti fizikal, pendidikan kesihatan, pendorong, wanita hamil*

## ABSTRACT

Lack of physical activity in pregnancy may lead to poor maternal and perinatal outcomes including gestational diabetes, hypertensive disorders and postpartum depression. Given these risks, identifying factors that influence physical activity in pregnancy is crucial to planning and implementing appropriate interventional programmes and managing this vulnerable group. Peer reviewed articles on factors influencing physical activity in pregnancy were searched using the Pub-Med and Ovid databases, from 2014 to 2019. The selected articles were reviewed by two authors and critically appraised using the Mixed Methods Assessment Tool 2018. A total of 16 articles were included. Factors that positively influenced physical activity in pregnancy were fun, higher economic status, early trimester, and higher body weight. Factors that negatively influenced physical activity in pregnancy were lack of knowledge, lack of social support, multiparity, physical pain and discomfort, ethnic minority status, and concern for the safety of the baby. Fun was one of the most reported motivators of physical activity in pregnancy, and the most reported reason for reduced physical activity was lack of knowledge. Additionally, social support from friends and family played an important role in encouraging pregnant women to be active. This systematic review highlights the need to improve current health education programmes for physical activity in pregnancy, which should ideally be extended and targeted to the whole community, beyond pregnant women themselves for better uptake and acceptance.

Keywords: active, health education, motivators, physical activity, pregnant women

## INTRODUCTION

Physical inactivity is one of the most important modifiable risk factors in the general population for non-communicable diseases, which include hypertension, diabetes, stroke, and certain cancers such as breast and colon cancer (WHO 2018). It has also been identified as the fourth leading cause of global mortality by the World Health Organisation (WHO), contributing to 6% of deaths globally.

The prevalence of insufficient physical activity in 2016 was twice as high in high-income countries than in low-income countries (Guthold et al. 2018). This was mainly due to rapid urbanisation and the development of modern technology, especially in transportation systems (Sallis et al. 2016). In the same year, the global age-standardised prevalence of insufficient physical activity was 27.5%, with the

prevalence among women exceeding that among men by more than 8% (Guthold et al. 2018). The highest prevalence of insufficient physical activity among women was in Latin America and the Caribbean, followed by South Asia, whereas the lowest prevalence was among men was in Oceania and East and Southeast Asia, followed by sub-Saharan Africa (Guthold et al. 2018).

Insufficient activity is a worrying trend especially among women because in pregnancy, it has been associated with an increased risk of gestational diabetes and hypertensive disorders (Barakat et al. 2016; Rogozinska et al. 2017; Russo et al. 2015; University of Oxford Physical Activity and Pregnancy Study Group 2016; Yin et al. 2014). The WHO recommends that healthy pregnant women be involved in at least 150 minutes of moderate- to vigorous-intensity activity in a week (WHO 2020). Lack of exercise in pregnancy has also been associated with increased gestational weight gain, which may lead to poor maternal and perinatal outcomes (Renault et al. 2014; Rogozinska et al. 2017; University of Oxford Physical Activity and Pregnancy Study Group 2016). Although the health benefits of physical activity in pregnancy have been discussed in detail in previous studies, the level of physical inactivity in pregnancy remains relatively high. Pregnancy could mark the onset of some healthy behavioural changes, such as quitting smoking and restricting alcohol intake, but it also may be a barrier to being active due to the associated physiological and emotional changes (Barakat et al. 2015), which explains why pregnant women tend to lead a sedentary lifestyle. Furthermore, promoting physical activity in pregnancy remains a challenge, especially when the barriers and motivators are not well explored and understood.

Identifying the factors associated with physical activity in pregnancy is crucial for policymakers to review, plan and implement appropriate interventional programmes and manage this particularly vulnerable group. This study aimed to systematically review previous literature and identify the factors that positively and negatively affect physical activity in pregnancy.

## MATERIALS AND METHODS

### Search Strategy and Article Selection

Article searching was performed in Pub-Med and Ovid the using keywords: ("pregnant women" OR "pregnant lad*" OR "pregnant mother*") AND ("physical activity*" OR exercise*) AND (factor* OR determinant* OR predictor* OR barrier* OR motivator* OR enabler*). The searches found 248 articles published between 2014 and 2019 in Pub-Med, and 299 in Ovid. The inclusion criteria were original research and studies on factors influencing physical activity among pregnant women. The exclusion criteria were reviews, descriptive studies and non-English articles. After applying the inclusion and exclusion criteria, 16 articles remained for review. The article selection process

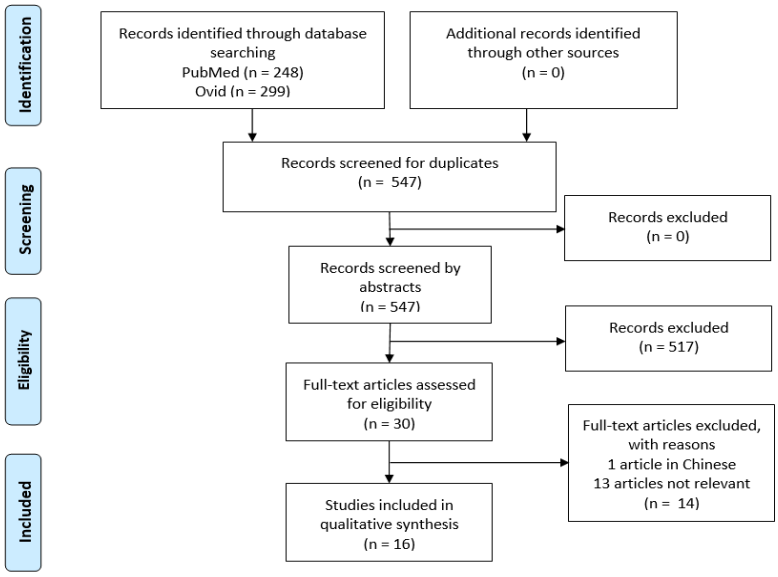


Figure 1: This is the PRISMA flowchart depicting the process of articles selection. A total of 547 articles were screened and assessed for eligibility according to the inclusion and exclusion criteria in which, a total of 16 articles were included in the final review process

was summarised in Figure 1.

### Quality Assessment and Data Extraction

The quality of each article was assessed using the Mixed Methods Assessment Tool (MMAT) 2018 (Hong et al. 2018). The MMAT was chosen since this review involved the assessment of quantitative, qualitative and mixed-methods studies. This process was performed by two independent authors. Any disagreement between these two authors was resolved by consulting a third author. Important information such as the study location and authors, sample size, study design, study tools, and outcomes of the selected studies was extracted and presented in the table of study characteristics.

## RESULTS

### Quality of Reviewed Articles

Most of the articles reviewed met the study criteria set in the MMAT, as listed in Table 1, for both qualitative and quantitative studies. However, eight out of the 11 quantitative studies did not represent the target population because most of these studies used convenience sampling instead of random sampling to select their respondents (Flannery et al. 2018; Hoodbhoy et al. 2018; Mullan et al. 2016; Newham et al. 2016; Rauff & Downs 2018; Richardsen et al. 2016). All three qualitative studies met all the quality criteria of a qualitative study set by the MMAT.

### Characteristics of Reviewed Articles

Table 1: Summary of MMAT assessment

| Authors | Study design | Qualitatitive | | | | | Quantitative non-randomized | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.1. Is the qualitative approach appropriate to answer the research question? | 1.2. Are the qualitative data collection methods adequate to address the research question? | 1.3. Are the findings adequately derived from the data? | 1.4. Is the interpretation of results sufficiently substantiated by data? | 1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation? | 3.1. Are the participants representative of the target population? | 3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)? | 3.3. Are there complete outcome data? | 3.4. Are the confounders accounted for in the design and analysis? | 3.5. During the study period, is the intervention administered (or exposure occurred) as intended? |
| Bauer et al. (2018) | Cross-sectional | | | | | | No | Yes | Yes | Yes | Yes |
| De Jersey et al. (2017) | Cross-sectional | | | | | | No | Yes | Yes | Yes | Yes |
| Hoodbhoy et al. (2018) | Cross-sectional | | | | | | Yes | Yes | Yes | No | Yes |
| Merkx et al. (2017) | Cross-sectional | | | | | | No | Yes | Yes | Yes | Yes |
| Flannery et al. (2018) | Qualitative | Yes | Yes | Yes | Yes | Yes | | | | | |
| Rauff and Downs (2018) | Prospective cohort | | | | | | No | Yes | Yes | Yes | Yes |
| Richardsen et al. (2016) | Prospective cohort | | | | | | No | Yes | Yes | Yes | Yes |
| Van Mulken et al. (2016) | Qualitative | Yes | Yes | Yes | Yes | Yes | | | | | |
| Mullan et al. (2016) | Cross-sectional | | | | | | Can't tell | Yes | Can't tell | Yes | Yes |
| Guelfi et al. (2015) | Cross-sectional | | | | | | Yes | Yes | Yes | No | Yes |
| Newham et al. (2016) | Cross-sectional | | | | | | No | Yes | Yes | Yes | Yes |
| Nascimento et al. (2015) | Cross-sectional | | | | | | Yes | Can't tell | Yes | Yes | Yes |
| Bahadoran & Mohamadirizi (2015) | Cross-sectional | | | | | | Yes | No | Yes | No | Yes |
| Muzigaba et al. (2014) | Qualitative | Yes | Yes | Yes | Yes | Yes | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tung et al. (2014) | Cross-sectional | No | Yes | Yes | Yes | Yes |
| Lee et al. (2016) | Cross-sectional | No | Yes | Yes | No | Yes |

A total of 16 studies were eligible for appraisal in this systematic review, as presented in Table 2. Three were qualitative, and the rest were quantitative. Among the quantitative studies, 11 were cross-sectional studies, and the remaining two were cohort studies.

One of the studies was conducted in multiple countries (China and Australia), and the remaining studies were each conducted in a single country. Five studies surveyed populations in European countries: Germany, Netherlands, Ireland, Norway, and the United Kingdom. Three were from Australia, two were from Taiwan, and one each were from the United States of America, Brazil, Iran, Pakistan, and South Africa. The sample size ranged from 61 to 1,279. The smallest sample sizes were from qualitative studies, and the highest sample size was from a cross-sectional study.

## Motivators of Physical Activity in Pregnancy

The factors that positively influenced the physical activity level among pregnant women in these studies were capable of managing their exercise participation (Guelfi et al. 2015), strongly valuing the benefit of exercise (Guelfi et al. 2015), not working (Lee et al. 2016), enjoying the physical activity (Bauer et al. 2018; Merkx et al. 2017), having normal or high body weight (De Jersey et al. 2017; Rauff & Downs 2018), burning fat (Bauer et al. 2018; Muzigaba et al. 2014), having to do household chores (Hoodbhoy et al. 2018), earlier trimester (Newham et al. 2016; Rauff & Downs 2018), later trimester (Tung et al. 2014), intention for physical activity (De Jersey et al. 2017; Mullan et al. 2016), pre-pregnancy exercise (Tung et al. 2014), and having exercise as a habit (Mullan et al. 2016; Nascimento et al. 2015). Additionally, some maternal characteristics were identified as motivators: older maternal age (Bahadoran & Mohamadirizi 2015), higher parity (Bahadoran & Mohamadirizi 2015; Lee et al. 2016), higher education level (Nascimento et al. 2015), higher economic status (Bahadoran & Mohamadirizi 2015; Muzigaba et al. 2014), greater general wellbeing (Muzigaba et al. 2014), and the presence of social opportunity and support to engage with physical activity (Flannery et al. 2018).

## Barriers to Physical Activity in Pregnancy

Barriers to physical activity or factors hindering pregnant women from being active were older age, (Merkx et al. 2017) having other children (Flannery et al. 2018; Merkx et al. 2017; Richardsen et al. 2016), tiredness (Bauer et al. 2018), overweight (Rauff & Downs 2018; Richardsen et al. 2016), physical

Table 2: Summary of the characteristics of the reviewed articles

| No | Authors | Country | Sample Size | Study design | Study instrument /tool | Motivators to physical activity in pregnancy | Barriers to physical activity in pregnancy |
|---|---|---|---|---|---|---|---|
| 1 | Bauer et al. (2018) | Germany | 61 | Cross sectional pilot study | Question-naire | - having fun<br>- burning fat | - tiredness |
| 2 | De Jersey et al. (2017) | Australia | 582 | Cross-sectional | Question-naire | - higher intention for physically active | - lower self-efficacy<br>- lack of time<br>- physical discomfort<br>- lack of information |
| 3 | Hoodbhoy et al. (2018) | Pakistan | 455 | Cross-sectional | Question-naire | - household activities | - lack of support from family<br>- lack of energy<br>- lack information regarding physical activity<br>- lack of affordable facilities |
| 4 | Merkx et al. (2017) | Nether-lands | 455 | Cross-sectional | Question-naire | - enjoying physical activity<br>- seeking information | - motivation healthy physical activity<br>- active before pregnancy<br>- pain<br>- tiredness<br>- advised to stop physical activity<br>- age<br>- multiparity |
| 5 | Flannery et al. (2018) | Ireland | 30 | Qualitative | In depth interview | - support from partners<br>- physically fit before pregnancy<br>- housechores<br>- setting goals<br>- self monitoring | - lack of knowledge<br>- lack of information from midwives<br>- perception of high risk pregnancy<br>- pain<br>- lack of time<br>- lack of energy/ tired<br>- having other children<br>- working<br>- less finance |
| 6 | Rauff & Downs (2018) | USA | 332 | Prospective Cohort | Question-naire | - earlier trimester<br>- normal weight | - Later trimester<br>- overweight |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | Richardsen et al. (2016) | Norway | 555 | Cohort | Question-naire | | - ethnic minority<br>- multiparity<br>- high body fat percentage<br>- few physically active friends. |
| 8 | Van Mulken et al. (2016) | Australia | 30 | Qualitative | Interview | | - weight gain<br>- baby safety<br>- primiparity<br>- lack of knowledge about physical activity<br>- lack of education from medical professionals<br>- negative social perception of physical activity in pregnancy<br>- demotivated by friends, family and people at work<br>- physically active at work<br>- lack of personal power<br>- fear of miscarriage<br>- lack of trust in medical professional |
| 9 | Mullan et al. (2016) | Australia | 195 | Cross-sectional | Question-naire | - motivation, belief of benefits of physical activity<br>- habit to exercise | - unsupportive environment |
| 10 | Guelfi et al. (2015) | China<br>Australia | 240<br>215 | Cross-sectional | Question-naire | - capable of managing their exercise participation<br>- strongly valued the benefit of exercise | - lack of time<br>- feeling too tired<br>- concern about safety of exercise |
| 11 | Newham et al. (2016) | United Kingdom | 480 | Cross-sectional | Question-naire | - lower trimester | - higher trimester<br>- health conditions |
| 12 | Nascimento et al. (2015) | Brazil | 1279 | Cross-sectional | Question-naire | - higher educational level<br>- primiparity<br>- exercising before pregnancy<br>- exercise guidance during prenatal care | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | Bahadoran and Mohamadirizi (2015) | Iran | 384 | Cross-sectional | Questionnaire | - age<br>- higher parity<br>- economic status | - gestational age |
| 14 | Muzigaba et al. (2014) | South Africa | 34 | Qualitative | Focus group discussion<br>Questionnaire | - financial position<br>- self motivation<br>- self confidence<br>- family support<br>- desire to stay in shape<br>- general wellbeing<br>- medically based permission to participate in physical activity | - physical pain<br>- large body size<br>- lack of energy<br>- unavailability of physical activity based facilities<br>- lack of time due to work<br>- lack of information regarding physical activity |
| 15 | Tung et al. (2014) | Taiwan | 692 | Cross-sectional | Questionnaire | - had regular prepregnancy exercise<br>- 3rd trimester | - working full time<br>- multiparous |
| 16 | Lee et al. (2016) | Taiwan | 581 | Cross-sectional | Questionnaire | - no income<br>- multiparity | - having an income<br>- primiparity |

discomfort (De Jersey et al. 2017), lower self-efficacy (De Jersey et al. 2017; Van Mulken et al. 2016), lack of time (De Jersey et al. 2017; Muzigaba et al. 2014), lack of knowledge regarding physical activity in pregnancy (De Jersey et al. 2017; Flannery et al. 2018; Hoodbhoy et al. 2018; Van Mulken et al. 2016), lack of support from family and friends (Hoodbhoy et al. 2018; Richardsen et al. 2016; Van Mulken et al. 2016), having physical capability and opportunity (Flannery et al. 2018), physical pain (Flannery et al. 2018; Merkx et al. 2017; Muzigaba et al. 2014), working (Flannery et al. 2018; Tung et al. 2014; Van Mulken et al. 2016), later trimester or gestational age (Bahadoran & Mohamadirizi 2015; Newham et al. 2016; Rauff & Downs 2018), ethnic minority (Richardsen et al. 2016), weight gain (Van Mulken et al. 2016), large body size (Muzigaba et al. 2014), concern for safety of the baby (Van Mulken et al. 2016), primiparity (Lee et al. 2016; Van Mulken et al. 2016), lack of education from medical professionals (Flannery et al. 2018; Van Mulken et al. 2016), lack of trust in medical professionals (Van Mulken et al. 2016), health conditions (Newham et al. 2016), lack of energy (Hoodbhoy et al. 2018; Muzigaba et al. 2014), physically active before pregnancy (Merkx et al. 2017), lack of facilities for physical activity (Hoodbhoy et al. 2018; Muzigaba et al. 2014), being advised to stop physical activity (Merkx et al. 2017), multiparity (Tung et al. 2014) and fear of miscarriage (Van Mulken et al. 2016).

## DISCUSSION

In general, women tend to restrict their physical activity during pregnancy, mainly due to perceived safety risks to both themselves and their unborn

baby; some may think that rest is more beneficial than exercising and that daily living activities are adequate (Garland 2017; Marshall et al. 2013; Sui & Dodd 2013). However, according to this systematic review, other factors were associated with reduced physical activity in pregnancy.

Whereas enjoyment was one of the most reported motivators of physical activity, the most reported reason for reduced physical activity was lack of knowledge or information among pregnant women regarding physical activity in pregnancy (De Jersey et al. 2017; Flannery et al. 2018; Hoodbhoy et al. 2018; Van Mulken et al. 2016). Certain studies reported that information from health providers was limited and insufficient (Flannery et al. 2018; Van Mulken et al. 2016), which could explain a lack of knowledge, especially regarding the importance of physical activity among these pregnant women. One qualitative study from Australia reported that some of the participants questioned the expertise of general practitioners who advised them to exercise regularly, reflecting a lack of belief and trust towards the general practitioner's knowledge on this subject.

Social factors such as support from friends and family also played an important role in encouraging pregnant women to be physically active (Bauer et al. 2018; Flannery et al. 2018; Hoodbhoy et al. 2018; Muzigaba et al. 2014; Richardsen et al. 2016; Van Mulken et al. 2016). This may explain why ethnic minority was reported as a barrier to being physically active by Richardsen et al. (2016): ethnic minority people may have a lack of friends and family to support them. This indicated the importance of targeting the whole community instead of only the individual in promoting physical activity in pregnancy. Expectant mothers' tendency to be active is highly likely to be influenced by the social perception of physical activity surrounding them (Van Mulken et al. 2016). This finding was in line with the socio-ecological model, in which a particular health outcome or behaviour is affected by not only the individual, but also their social surroundings (Özdemir 2013). Other factors in the social category were income, education, and employment status. Higher-income and higher-educated pregnant women were more likely to be physically active (Bahadoran & Mohamadirizi 2015; Muzigaba et al. 2014; Nascimento et al. 2015), although those in the workforce cited work and lack of time as barriers to be physically active (Flannery et al. 2018; Muzigaba et al. 2014).

The built environment was also an important aspect as evidenced by two papers from South Africa and Pakistan, which reported that the availability and affordability of physical activity facilities such as gyms and fitness centres were significant factors in physical activity in pregnancy (Hoodbhoy et al. 2018; Muzigaba et al. 2014). This could be partly due to the cultural values of certain communities in the world, where women are relatively deprived of opportunities and access to appropriate and safe outdoor environments and infrastructure for physical activity. This environmental

factor also highlights the importance of urban planning, among others, to increase physical activity levels, especially among women (Althoff et al. 2017; WHO 2018).

Among the non-modifiable factors identified in this review were age and number of living children. However, further research is needed to determine the influence of these two factors since conflicting findings were reported. For instance, Van Mulken et al. (2016) identified primiparity as a barrier whereas Nascimento et al. (2015) identified it as a motivating factor. Later trimester or gestational age was also a significant barrier to physical activity, as reported by four studies (Flannery et al. 2018; Merkx et al. 2017; Richardsen et al. 2016; Tung et al. 2014). This could be due to the physical pain and discomfort associated with physical activity during the later stages of pregnancy (Flannery et al. 2018; Merkx et al. 2015; Muzigaba et al. 2014).

To our knowledge, no systematic review has been conducted on the factors influencing physical activity in pregnancy, especially in recent years using the MMAT 2018 (Hong et al. 2018), a standardised and rigorous method of critically appraising quantitative, qualitative and mixed-methods studies. Therefore, this review's findings reflect the current situation and may help health professionals and policymakers alike to plan and implement effective physical activity programmes for pregnant women.

The findings of this review came from various countries and different populations, which may provide a broader view and comparison of factors influencing physical activity in pregnancy across the world. However, the operational definitions of physical activity used in these studies varied and therefore may have led to differing interpretations of results and outcomes.

## CONCLUSION

Fun and enjoyment was one of the most reported modifiable motivating factors, and lack of knowledge was the most reported barrier to physical activity in pregnancy, raising the need to review the effectiveness of current relevant health education programmes regarding this subject matter. These programmes should be extended and targeted beyond pregnant women themselves for better uptake and acceptance since depending on their surrounding people and social support was highly likely. Further reviews should focus on the type, duration, and intensity of physical activity recommended for pregnant women.

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