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Research

Attitudes, barriers and enablers to physical activity in pregnant women: a systematic review

Anne L Harrison [a,b], Nicholas F Taylor [a,c], Nora Shields [a,d], Helena C Frawley [e,f]

[a] School of Allied Health, La Trobe University; [b] Physiotherapy Department, Werribee Mercy Hospital; [c] Allied Health Clinical Research Office, Eastern Health; [d] Northern Health; [e] Department of Physiotherapy, Faculty of Medicine, Nursing and Health Sciences, Monash University; [f] Centre for Allied Health Research and Education, Cabrini Health, Melbourne, Australia

KEY WORDS

Pregnancy
Diabetes gestational
Attitudes
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ABSTRACT

Question: What are the attitudes, barriers and enablers to physical activity perceived by pregnant women? **Design**: In a systematic literature review, eight electronic databases were searched: AMED, CINAHL, Embase, Joanna Briggs Institute, Medline, PsycInfo, SPORTDiscus (from database inception until June 2016) and PubMed (from 2011 until June 2016). Quantitative data expressed as proportions were meta-analysed. Data collected using Likert scales were synthesised descriptively. Qualitative data were analysed thematically using an inductive approach and content analysis. Findings were categorised as intrapersonal, interpersonal or environmental, based on a social-ecological framework. **Participants**: Pregnant women. **Intervention**: Not applicable. **Outcome measures**: Attitudes and perceived barriers and enablers to physical activity during pregnancy. **Results**: Forty-nine articles reporting data from 47 studies (7655 participants) were included. Data were collected using questionnaires, interviews and focus groups. Meta-analyses of proportions showed that pregnant women had positive attitudes towards physical activity, identifying it as important (0.80, 95% CI 0.52 to 0.98), beneficial (0.71, 95% CI 0.58 to 0.83) and safe (0.86, 95% CI 0.79 to 0.92). This was supported by themes emerging in 15 qualitative studies that reported on attitudes (important, 12 studies; beneficial, 10 studies). Barriers to physical activity were predominantly intrapersonal such as fatigue, lack of time and pregnancy discomforts. Frequent enablers included maternal and foetal health benefits (intrapersonal), social support (interpersonal) and pregnancy-specific programs. Few environmental factors were identified. Little information was available about attitudes, barriers and enablers of physical activity for pregnant women with gestational diabetes mellitus who are at risk from inactivity. **Conclusion**: Intrapersonal themes were the most frequently reported barriers and enablers to physical activity during pregnancy. Social support also played an enabling role. Person-centred strategies using behaviour change techniques should be used to address intrapersonal and social factors to translate pregnant women's positive attitudes into increased physical activity participation. **Registration**: PROSPERO CRD42016037643. **[Harrison AL, Taylor NF, Shields N, Frawley HC (2018) Attitudes, barriers and enablers to physical activity in pregnant women: a systematic review. *Journal of Physiotherapy* 64: 24–32]**

Introduction

Physical activity has substantial benefits for women with uncomplicated pregnancies, minimal risks, and is recommended in pregnancy guidelines.[1–3] The benefits of physical activity during pregnancy include improved physical fitness,[3–5] reduced risk of excessive weight gain,[6] reduced risk of pre-eclampsia and pre-term birth,[7] reduced low back pain,[8,9] improved sleep,[10] reduced anxiety and depressive symptoms,[11,12] and improved health perception[13] and self-reported body image.[14]

Physical activity is also important for pregnant women with comorbidities and complications such as obesity[1] or gestational diabetes mellitus (GDM).[15–17] Physical activity assists with weight control and reduces the risk of GDM in obese pregnant women.[1] In women diagnosed with GDM (a common pregnancy-related complication occurring in 3.5 to 12% of pregnancies),[15,16] physical activity is beneficial as an adjunctive intervention in the management of glycaemic control.[15,17–20] Managing glycaemic control is critical for reducing adverse effects associated with poorly controlled GDM.[21] Consequently, aerobic exercise performed at moderate intensity for 30 minutes on most days of the week is recommended for healthy pregnant women,[1,3] those with GDM[15,22,23] and those who are overweight or obese.[24]

Despite well-documented health benefits,[1,3–17,24–27] 60 to 80% of pregnant women[28–31] – including those who are overweight or obese[31] – and more than 60% of women with GDM[32] do not participate in physical activity as recommended. Pregnant women from backgrounds other than Caucasian are also less likely to engage in physical activity.[29] However, to improve pregnant women's participation in physical activity (ie, leisure time physical activities or structured exercise programs), we need to understand their attitudes to it, the reasons why they do not engage in physical

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activity, and enablers that could be harnessed to design effective physical activity interventions or programs that facilitate behaviour change and thereby improve their participation in physical activity during pregnancy.

The inclusion of behaviour change techniques into physical activity interventions has been reported as helpful in improving physical activity levels during pregnancy.[33] Behaviour change techniques such as goal setting, planning and education to shape knowledge appear most effective when delivered with face-to-face feedback about goal achievement.[33] However, to facilitate uptake of these effective physical activity interventions, clinicians need to know which barriers, enablers and attitudes are common among pregnant women, so they can effectively target their education and evidence-based behaviour change strategies. A systematic review of barriers, enablers and attitudes of pregnant women to physical activity would provide valuable information to enable clinicians to effect a positive behaviour change of increased physical activity in this group.

Identification of women's attitudes and perceptions of barriers and enablers to physical activity in pregnancy could be informed by quantitative or qualitative research approaches. A review that collates data from studies using either method would benefit from the advantages of each: improving generalisability and providing deeper insights into pregnant women's beliefs and perceptions about physical activity during pregnancy. Inclusion of qualitative findings may assist in better understanding the factors that can influence women's attitudes and perceptions. Such deeper understanding would provide valuable insight that clinicians can use to plan strategies to encourage pregnant women – in particular at-risk groups of women such as those with GDM – to participate in physical activity. It would also inform the design of realistic and acceptable interventions to be tested in an effectiveness study. No systematic review has collated quantitative data or provided a meta-summary of attitudes and perceptions of barriers and enablers to physical activity in pregnant women.

Therefore, the research question for this review was:

> What are the attitudes, barriers and enablers to physical activity perceived by pregnant women, including women diagnosed with gestational diabetes mellitus?

Method

The review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,[34] the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ),[35] and guided by information from the Cochrane Qualitative and Implementation Methods Group.[36]

Identification and selection of studies

One reviewer (AH) searched eight electronic databases: AMED, CINAHL, Embase, Joanna Briggs Institute, Medline, PsycInfo, and SPORTDiscus from database inception until June 2016; and PubMed from 2011 until June 2016. The search strategy comprised three key concepts: attitudes, barriers and facilitators/enablers; physical activity; and pregnancy. For each concept, key words and MeSH terms were combined with the 'OR' operator and the results were combined with the 'AND' operator (see Appendix 1 on the eAddenda). No limits were applied to the search. Reference lists from included studies were manually searched for additional relevant articles. Using Google Scholar and Web of Science, citation tracking was performed on the included articles to identify any other relevant articles.

Two reviewers (AH and HF/NS/NT) independently reviewed the title and abstracts of articles yielded according to the inclusion criteria presented in Box 1. If eligibility was unclear based on the title and abstract, a full-text version was obtained and reviewed by two reviewers independently. Disagreements were resolved by discussion between reviewers.

Box 1. Inclusion criteria.

Design
- Qualitative or quantitative studies
- Full-text article published in a peer-reviewed journal

Participants
- Pregnant women whose pregnancy was not high risk [a]

Outcome measures
- Pregnant women's attitudes to physical activity [b] during pregnancy
- Pregnant women's perceived barriers and enablers to physical activity during pregnancy

[a] High-risk pregnancy was defined as premature labour, incompetent cervix, persistent bleeding, ruptured membranes, growth retardation, pre-eclampsia, severe anaemia, placenta previa after 26 weeks gestation, haemodynamically significant heart disease or restrictive lung disease.[1,2]

[b] Physical activity was defined as leisure time physical activities and structured exercise programs.

Studies using qualitative or quantitative methods were included. This integrated approach was used to enable thorough exploration of the women's perceptions, given the potential for qualitative data to complement and add greater meaning to quantitative findings.[36] This was intended to maximise the value of the findings for those designing interventions to promote physical activity in pregnant women.[37]

Assessment of characteristics of studies

Quality

Adapted from the McMaster Critical Review Forms for qualitative and quantitative research,[38,39] which include guidelines for interpreting the criteria[40,41] to facilitate inter-rater reliability,[42] the rating method for key criteria for quantitative and qualitative studies developed by Imms[43] was used to assess validity and rigor of included studies (Table 1 on the eAddenda). This form has been used previously in a study exploring similar phenomena in a different cohort.[44] Quantitative studies were rated on sample, measure and analysis. Qualitative studies were rated on credibility, transferability, dependability and confirmability, consistent with the criteria for trustworthiness.[45] A rating of one (no evidence of study meeting criterion), two (some evidence or unclear reporting) or three (evidence of study meeting criterion) was used to rate each criterion.

All included studies were assessed by two reviewers independently (AH and HF/NT) and any disagreements resolved by discussion until an agreement was reached. Where agreement could not be reached the findings were discussed with a third reviewer (NS). In appreciation that studies rated as lower methodological quality on rating scales can still provide useful insights based on the data,[36] all studies were included regardless of assessment of methodological quality but study quality was taken into account in interpretation of the results.

Participants

Data were extracted from each study regarding sample size, age, body mass index, ethnicity, education, gestation, parity, comorbidities (GDM, obesity) and physical activity level, where available. See Table 2 on the eAddenda.

Data extraction and analysis

Data were extracted from the included articles using a standardised form. Data were extracted by one reviewer (AH),

summarised into tables and independently checked by a second reviewer (HF/NT). Qualitative and quantitative data were analysed separately.

Analysis of qualitative data

Qualitative data on attitudes, barriers and enablers were synthesised using an inductive approach and synthesised into themes and sub-themes providing a meta-summary. An inductive approach provides a systematic process for analysing qualitative data, thereby deriving and summarising findings that are reliable, valid and linked to the research objectives.[46]

In preparation for analysis, two reviewers (AH and NS) independently read, re-read, reviewed and made notes to familiarise themselves with the content and the context from which the data arose. The data were transcribed verbatim into an electronic spreadsheet. Following this, the two reviewers independently derived initial coding categories, based on emerging themes. This coding was derived directly from words, phrases or paragraphs, as the primary aim was to identify the expression of attitudes and perceptions consistent with the review objectives. To facilitate consistency of coding, a 'code-book' of code names based on emerging themes and accompanying definitions to guide consistent interpretation was developed. To enhance the trustworthiness of the analysis, an audit trail was kept and an iterative process was followed involving: independently coding data; comparing inter-coder agreement; discussing and refining the coding scheme; and augmenting with interpretive memos. This iterative process was continued until sufficient coding consistency and agreement were achieved. Following this, the agreed coding rules were applied to all of the data by one reviewer/coder (AH) and independently checked by a second reviewer/coder (NS).

The themes were grouped in three categories: intrapersonal (eg, physical, psychological), interpersonal (eg, influences from family, friends, health professionals, social and cultural norms) and environmental (eg, access to facilities, built environment, policy and program such as cost), based on a social-ecological model.[47,48] An inductive approach was used to categorise the data into themes and sub-themes under this framework. Data were included under more than one theme if it was considered that the data satisfied the definition of more than one theme. For example, 'participants considered physical activity important for self and baby'[49] with an accompanying description of benefits was included under the themes of 'important' and 'beneficial'. Once all data were analysed, a count for each theme was conducted, checked and recorded.

Analysis of quantitative data

As the majority of quantitative studies reported data expressed as percentages, these data were synthesised by meta-analyses of proportions using a random-effects model to account for heterogeneity. Statistical heterogeneity in each meta-analysis was reported using the I^2 statistic with values $> 50\%$ considered indicative of statistical heterogeneity. The quantitative data were grouped under the categories: intrapersonal, interpersonal and environmental, consistent with qualitative analysis. Data collected using Likert scales were synthesised descriptively.

Results

Flow of studies through the review

The search strategy yielded 3045 articles, including papers in languages other than English. After screening of titles and abstracts, 99 full-text articles were retrieved and following reference checking and citation tracking, four additional articles were identified totalling 103 articles for full-text review. After review of these 103 full texts, 54 articles were excluded. Following this process, 49 articles presenting the results of 47 discrete studies were included in the review (Figure 1).[49–97]

Characteristics of included studies

Quality

Twenty-two articles reporting data from 21 discrete studies used qualitative methods, and seven studies used mixed methods.[60,61,66,75,83,91,97] Three[49,53,68] of these 28 studies provided evidence to satisfy all four quality criteria for qualitative studies. Six studies (reported in seven articles)[52,61,66,82,85,91,92] satisfied three criteria with some evidence of meeting the fourth (see Table 2 on the eAddenda). These studies reported evidence of prolonged engagement, a variety of data collection methods, member checking, detailed descriptions of participants, settings, processes, analyses, audit trails, reflection, peer review, and triangulation. All qualitative or mixed-methods studies demonstrated at least some evidence of trustworthiness.

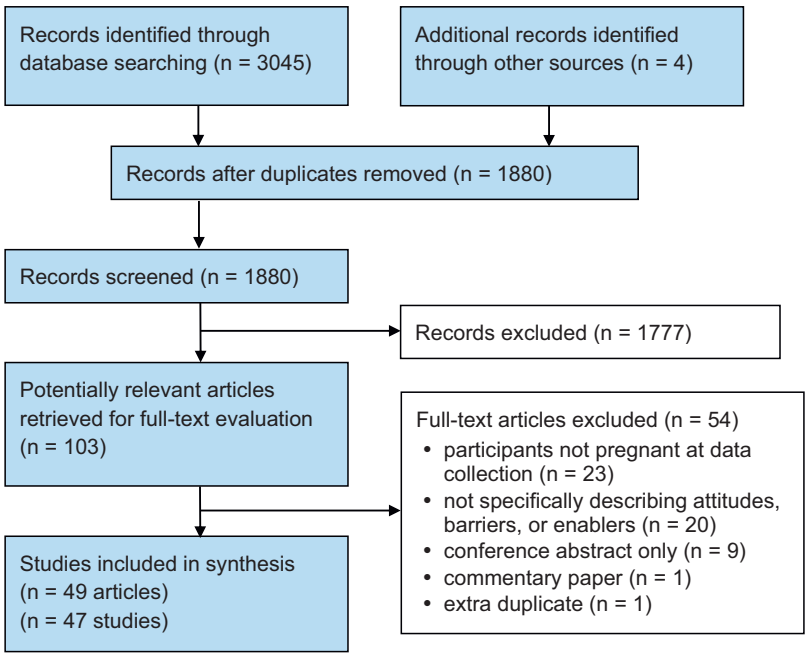

Figure 1. PRISMA flow diagram showing identification and selection of studies.[34]

Table 3
Content analysis summary of qualitative data on attitudes, barriers and enablers to physical activity during pregnancy from 28 studies (reported in 29 articles) that used qualitative methods.

Attitudes (15 studies)	n	Barriers (27 studies)	n	Enablers (21 studies)	n
Important		Intrapersonal		Intrapersonal	
Important/necessary	12	*Fatigue*	20	*Easier labour/delivery*	13
As important as diet in pregnancy	1	*Safety/fears*	20	*Maternal health and wellbeing*	12
Important for self and baby	1	*Pregnancy symptoms/discomforts*	19	*Weight control*	9
		Lack of time	17	*Ease pregnancy symptoms/discomforts*	7
Beneficial		*Lack of motivation*	13	*Confidence/physical activity habit*	7
Beneficial for women		*Lack of confidence*	8	*Baby's health*	6
For healthy pregnancy	10	*Lack of knowledge*	4	*Appearance*	5
Fitness and staying in shape	4				
For labour/birth	3	Interpersonal (social)		Interpersonal (social)	
Wellbeing/enjoyment	2	*Social support*		*Social support*	
For pregnancy symptom relief	1	Lack support of family/friends/others	9	Support of partner	10
Beneficial for baby	4	Lack support of partner	3	Support of family/friends/others	9
		Lack company	1	Socialisation with other pregnant women	5
Safety		*Informational*		Company for walks	1
Need to modify physical activity in pregnancy	2	Lack physical activity information	2	*Informational*	
Walking considered best/safest	1	Conflicting advice	2	Advice from doctor	4
		Lack of advice from professionals	2	Unambiguous advice	3
		Norms		Reassuring advice	3
		Social norms	2	*Social influence*	
		Cultural influence	1	Socialisation	4
		Responsibilities		Peer pressure	1
		Work commitments	7	*Responsibilities*	
		Childcare	5	Fewer commitments, more time	3
		Families	2	Childcare support	1
		Environmental		Environmental	
		Access		*Access*	
		Lack access to facilities/resources	11	Access to facilities/resources	9
		Lack safe place to be physically active	3	*Weather*	
		Weather		Good weather	4
		Bad weather, hot weather	9	*Policy/programs*	
		Policy/programs		Pregnancy-specific programs	6
		Affordability	7		
		Lack of pregnancy-specific programs	2		

Categories (unindented) contain themes (in italics) and subthemes. n = number of studies reporting each theme or subtheme.

Twenty articles reporting data from 19 discrete studies used quantitative methods. All of these studies and the seven mixed-methods studies provided some evidence toward meeting at least one of the three criteria (See Table 2 on the eAddenda). Four[58,64,70,80] studies met all three quality assessment criteria for quantitative studies and 11 studies met two criteria and provided some evidence toward the other.[50,54,60–62,72,74,76,87,91,97]

Participants

The characteristics of the participants in the included studies are detailed in Table 2 (see the eAddenda for Table 2). These studies included 7655 women representing a range of age groups, gestational age, parity, body mass index, countries and cultural, educational and socioeconomic backgrounds. Race/ethnicity and socio-economic background were broad and women were from rural, metropolitan, lower socio-economic and more affluent areas, accessing care in public and private health systems. Six studies (776 participants), reported in seven articles, studied only pregnant women who were overweight or obese.[56,63,67,87,91,92,95]

The range of gestational age reported across studies was from 4 to 41 weeks gestation, providing good representation of women from across the three trimesters of pregnancy. From the 35 studies reporting on parity, an average of 55% of participants were expecting their first baby. Although studies may have potentially included women with GDM, four studies (77 participants) explicitly included only pregnant women diagnosed with GDM, and measured and reported findings for this specific group of pregnant women.[51,55,57,72]

Attitudes to physical activity in pregnancy

Attitudes to physical activity in pregnancy were reported in 29 studies (5275 participants): 13 qualitative, 14 quantitative and two mixed-methods studies. The only attitudes reported in the 13 qualitative studies were that physical activity in pregnancy is important, beneficial and safe (Table 3). The majority of participants reported a positive attitude to physical activity in pregnancy. Based on pooling of the proportion data from 11 quantitative studies, most women identified physical activity as important (0.80, 95% CI 0.52 to 0.98), beneficial (0.71, 95% CI 0.58 to 0.83) and safe (0.86, 95% CI 0.79 to 0.92), as presented in Figure 2. (The numerical data used to generate Figure 2 are available in Table 4 on the eAddenda. The individual meta-analyses of proportions for each attitude are available in Appendix 2 on the e-Addenda.) The meta-analyses had high I^2 values with most > 90%. Five studies used Likert scales to rank attitude, and all reported a positive attitude to physical activity during pregnancy.[54,70,72,74,87] A positive attitude to the importance and benefits of physical activity during pregnancy was also consistent across studies reporting this outcome for overweight and obese pregnant women (n = 4),[63,87,91,95] specific race or ethnic populations (n = 3)[70,77,89] and women with GDM (n = 1).[72]

Barriers to physical activity in pregnancy

Barriers to physical activity in pregnancy were reported in 41 studies (6771 participants; 20 qualitative, 14 quantitative and 7 mixed methods). The most frequent barriers cited were intrapersonal: fatigue, lack of time and pregnancy discomforts such as nausea, pain and awkwardness due to weight gain and increasing size as pregnancy progressed, and less frequently safety concerns such as the type and intensity of physical activity that is considered safe during pregnancy and fears for self, the pregnancy and the baby (Table 3 and Figure 2). (The numerical data used to generate Figure 2 are available in Table 4 on the eAddenda. The individual meta-analyses of proportions for each barrier are available in Appendix 2 on the e-Addenda.) These same barriers

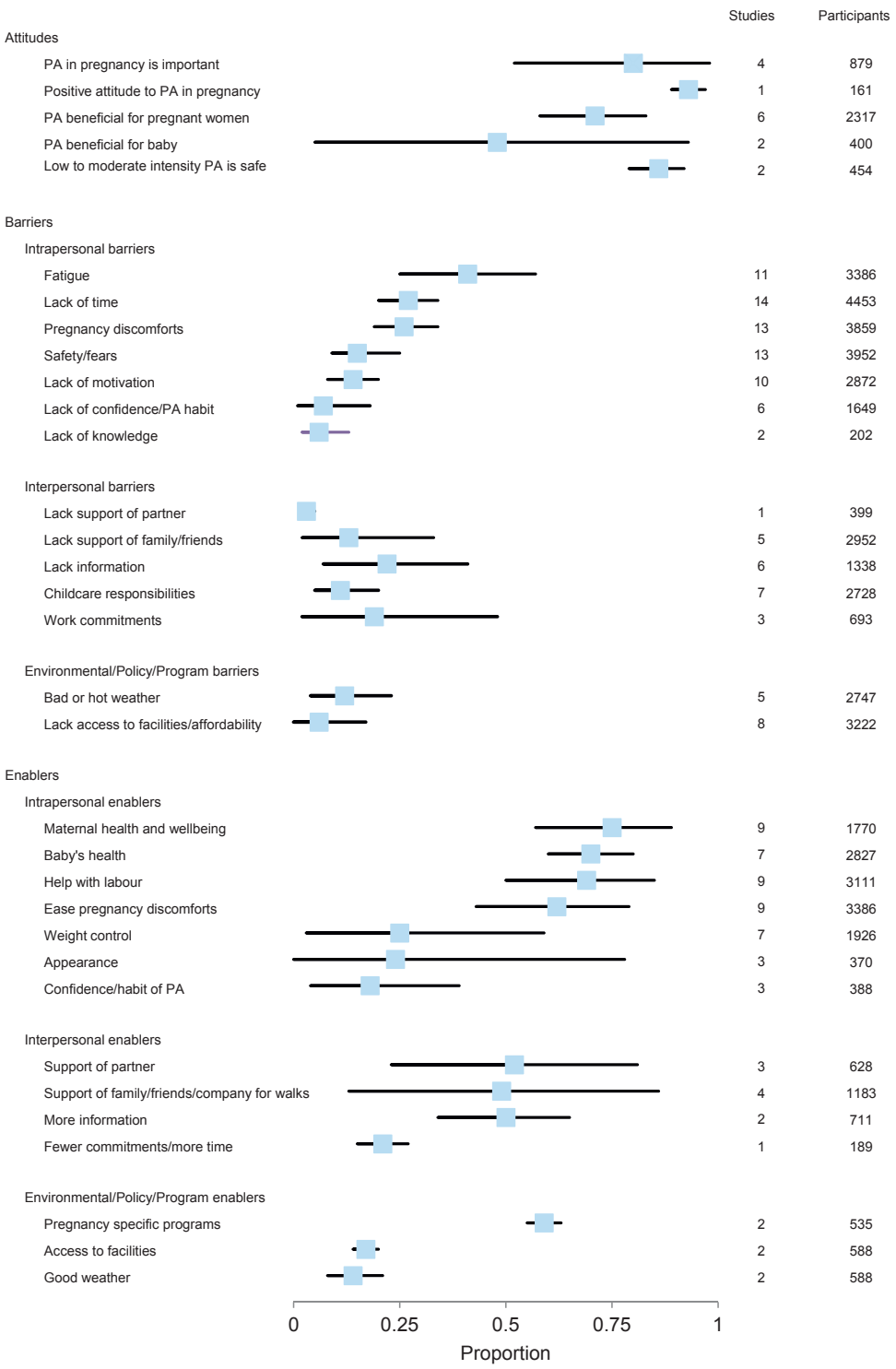

Figure 2. Forest plot of estimates of the proportion of pregnant women that report each attitude, barrier or enabler in relation to physical activity during pregnancy. Each estimate is the result of a 'meta-analysis of proportions' including the number of studies shown. Each meta-analysis of proportions is reported in detail in Appendix 2 (see eAddenda for Appendix 2). PA = physical activity.

were also highlighted in four quantitative studies that collected data using Likert scales.[58,62,70,87]

These themes also arose consistently across studies including: participants from particular races or ethnic populations (2371 participants);[51,70,71,73,77,80,81,89,93] overweight and obese pregnant women (802 participants);[56,63,67,87,91,92,95] and women with GDM (77 participants).[51,55,57,72] (For more detailed data on barriers in women with GDM, see Tables 5 and 6 on the eAddenda). In addition, for women from ethnic backgrounds other than Caucasian, safety concerns for their pregnancy and baby emerged as a theme.[51,70,71,73,81,89,93] One study[77] of low-income African-American women reported the cultural norm of lack of exercise habit and socio-economic factors of lack of affordable and safe places for physical activity as specific barriers for them. Lack of safe and affordable places to be physically active and suitable exercise classes also emerged as a barrier to physical activity in one study[95] that included overweight and obese pregnant women, while another study[67] reported lack of confidence, motivation and knowledge as important barriers. Lack of access to facilities was identified as a barrier to physical activity in pregnancy by a greater proportion of women with GDM (18%, 7 of 40 participants in one study)[72] compared to the whole sample (0.06, CI 0.00 to 0.17; 245 of 3222 participants).

Fewer sub-themes for barriers emerged in the interpersonal (social) and environmental or policy/programs categories. Lack of social support from family or friends, lack of information and work responsibilities were the most frequently cited interpersonal barriers. Environmental barriers were lack of access and (unfavourable) weather.

Enablers to physical activity in pregnancy

Enablers to physical activity during pregnancy were reported in 36 studies (5730 participants; 17 qualitative, 15 quantitative and 4 mixed methods). Intrapersonal factors were the most frequently reported enablers (Table 3 and Figure 2). (The numerical data used to generate Figure 2 are available in Table 4 on the eAddenda. The individual meta-analyses of proportions for each enabler are available in Appendix 2 on the e-Addenda.) The intrapersonal factors included maternal and foetal health and wellbeing, easing pregnancy discomforts, and an easier labour and birth. Two studies[62,87] reported data using Likert scales and found maternal health and wellbeing, decreasing stress, improving fitness and improving appearance were strong enablers of physical activity. These findings were consistent with the data reported by pregnant women who: were overweight or obese;[56,63,67,87,91,92,95] were from particular ethnic or racial groups;[71,81,89,93] or had been diagnosed with GDM.

Interpersonal enablers were often cited. Social support was the most frequently cited interpersonal enabler of physical activity, particularly partner support and family/friend's support. This was also a specific theme among overweight and obese women,[67] and the predominant theme in two studies (416 participants)[51,80] of particular racial groups and in three studies (72 participants)[51,55,72] including women with GDM (for more detailed data on enablers in women with GDM see Tables 5 and 6 on the eAddenda). In these studies, interpersonal enablers such as support from others (eg, walking with a partner) were reported more frequently than intrapersonal factors.

Six qualitative studies[49,53,67,77,82,96] and participants from quantitative studies[81,94] reported group exercise sessions for pregnant women as an enabler to physical activity, including one study[81] of Nigerian women (294/500) that reported a preference for exercise sessions performed at the antenatal clinic by an expert. One study[72] including women with GDM also reported blood glucose control (8/40 participants) as an important enabler to activity.

Discussion

Physical activity in pregnancy was identified by women as beneficial and important, with acknowledgement of safety considerations. Intrapersonal factors of maternal health and wellbeing, pregnancy symptoms, and safety of self and baby were most frequently identified as barriers and enablers to physical activity in pregnancy. Social support was a frequently identified enabler of activity. Across studies and designs with a range of methodological quality, there was strong similarity of emergent themes. This meta-summary with convergence of findings from 47 qualitative and quantitative studies suggests that pregnant women appear to have a strong internal focus on their health and wellbeing and that of their baby. This knowledge provides valuable insight for health professionals to help inform the design of physical activity interventions for pregnant women.

The attitude that physical activity is important and beneficial is a key finding because as suggested by theory,[98–101] attitude influences intention to action behaviour (physical activity). This finding spanned studies, including those solely focusing on specific populations such as particular racial/ethnic groups, women with obesity and those diagnosed with GDM. Therefore, women's positive attitude and knowledge about benefits of physical activity during pregnancy provides an important message to healthcare providers that, for many pregnant women, effort and resources may not need to be focused on increasing current levels of education. Rather, as physical activity participation rates for pregnant women are low despite positive attitudes to physical activity, this suggests a disconnect between the women's intention about physical activity and her action – a knowledge-action gap. Theory of Planned Behaviour[102] suggests factors additional to attitudes, such as barriers, enablers and social factors may also influence intention and subsequent behaviour.[102,103] Efforts to overcome intrapersonal barriers to physical activity may be directed at utilising enablers such as maternal health and wellbeing and interventions like pregnancy-specific exercise groups that incorporate social support, time efficiency for women if paired with antenatal visits, as well as fun and enjoyment critical to initiating and maintaining behaviour change.[104] This may facilitate the shift from intention to action needed in order to create behaviour change and may be more effective in improving pregnant women's participation in physical activity than knowledge or education strategies alone.

Intrapersonal themes emerged as both key barriers and key enablers to women's participation in physical activity in pregnancy, suggesting that strategies need to be person-centred and interventions need to be tailored to women's individual needs, including their stage of pregnancy. A person-centred approach may facilitate translation of the positive attitudes of pregnant women into increased physical activity participation during pregnancy and therefore may be more effective than education alone. As the type of intrapersonal barriers changed with stage of pregnancy (fatigue and nausea in early pregnancy and changes in size and shape later in pregnancy),[53,59,61,72,75] this suggests that physical activity interventions during pregnancy need to be flexible to accommodate physical changes during pregnancy, such as transitioning from land-based to water-based physical activity as pregnancy progresses. Therefore, there is an argument for ongoing review and encouragement of physical activity during pregnancy by exercise professionals to appropriately tailor interventions to suit physical changes during pregnancy to address intrapersonal barriers, and in doing so, maintain women's participation in physical activity.

Although the key findings across all studies were similar, some less frequent themes appeared to be more closely related to particular socio-cultural groups and are important and relevant to consider if caring for women from these groups. For women from low-income areas, addressing affordability and access to a safe place for physical activity are key to enabling these women to participate in physical activity.[77] Social interaction and support from other pregnant women, such as pregnancy-specific exercise groups, were also cited as important for women from specific socio-cultural backgrounds,[77,81] those who were overweight or obese,[67,92,95] and women generally.[49,53,82,94,96] If paired with antenatal visits and conducted by exercise professionals such as physiotherapists, pregnancy-specific exercise groups may offer not only a timely physical activity option but also the reassurance that some women need to overcome their concerns about physical activity in pregnancy.

Exercise professionals with specific skill sets in physical activity prescription and behaviour change may be well positioned to help facilitate physical activity interventions for pregnant women. Primary maternity care providers such as doctors, midwives and nurses appropriately focus on ensuring the health of the mother and baby, and planning for the birth.[105] However, healthcare professionals with physical activity training and skills in managing and educating about musculoskeletal changes occurring during pregnancy may be required to address the issue of physical inactivity during pregnancy by helping shift a pregnant woman's attitude from intention to action. Women in studies focusing on specific ethnic and cultural groups expressed concerns about safety of physical activity.[51,70,71,73,81,89,93] This reinforces the need for healthcare professionals to apply a person-centred approach, in order to work in partnership with the woman identifying and responding to her specific cultural needs or concerns such as

safety. Exercise professionals such as physiotherapists can provide valuable input to address important lifestyle factors, develop safe and appropriate physical activity programs suitable to women's personal needs, stage of pregnancy, any co-existing musculoskeletal limitations, physical activity preferences and socio-cultural needs. The system-level challenge is how to incorporate this intervention into local models of antenatal care, and address funding and access issues.

Little is known about the attitudes, barriers and enablers to physical activity for the at-risk group of pregnant women with GDM. Only four studies of mixed quality involving 77 pregnant women with GDM were found. This is a significant gap in the literature given they are an at-risk group for significant health consequences during pregnancy and beyond, and who have much to benefit by increasing their participation in physical activity. Safety concerns and lack of time were barriers for women with GDM, with social support the strongest enabler and maternal health and wellbeing other key enablers. The small number of studies explicitly including women with GDM suggests that further research is necessary to provide deeper insight into factors influencing physical activity participation in these women.

The strength of this review was that an extensive search identified 49 articles of 47 discrete studies with 7655 participants from a range of ethnic, cultural and educational backgrounds as well as specific health needs. The convergence of key themes across studies, using qualitative and/or quantitative methods, improves the generalisability of the findings and provides in-depth insights that emerged from the women's narratives with which to inform healthcare of pregnant women and the development of strategies to increase physical activity participation in pregnant women. Heterogeneity of data across quantitative studies was a potential limitation of this review but was accounted for by use of a random-effects model with the meta-analyses of proportions.

In conclusion, qualitative and quantitative data, interpreted through a social-ecological framework, identified key attitudes and perceived barriers and enablers of pregnant women to physical activity during pregnancy. Pregnant women had a strong, positive attitude toward physical activity during pregnancy. Intrapersonal factors – including maternal health and wellbeing, managing pregnancy symptoms, time and safety – were frequently cited as both barriers and enablers to physical activity during pregnancy. Social influences, particularly partner and family support, appeared to be important enablers. This knowledge will assist health professionals providing antenatal care to design physical activity interventions for pregnant women that respond to individual needs, optimise enablers and overcome barriers to shift women's exercise behaviour from intention to action. Due to the limited number of studies including women with GDM, further research is needed to confirm and extend understanding of attitudes and perceptions towards physical activity participation in women with GDM.

What is already known on this topic: Physical activity is recommended for women with uncomplicated pregnancies. Despite recommendations to be active many pregnant women are inactive.

What this study adds: Pregnant women believe that physical activity in pregnancy is important and beneficial. Many attitudes, barriers and enablers to physical activity were identified, which physiotherapists can use to guide their discussions with pregnant women about strategies to increase physical activity. Selection of optimal behaviour change techniques (eg, goal setting, education) and person-centred strategies able to respond to intrapersonal and social factors are needed to translate the positive attitude of pregnant women into increased physical activity participation. Data are lacking on attitudes, barriers and enablers to physical activity for pregnant women with GDM.

eAddenda: Appendices 1 and 2, and Tables 1, 2, 4, 5, 6 can be found online at https://doi.org/10.1016/j.jphys.2017.11.012.

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Correspondence: Anne Harrison, Physiotherapy department, Werribee Mercy Hospital, Victoria, Australia. Email: AHarrison@mercy.com.au

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