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Experiences of postpartum mothers and a significant other in a dyadic physical activity programme

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ABSTRACT

Dyadic interventions may promote physical activity (PA) amongst postpartum mothers. However, such interventions may not always be effective, and research is needed to explore the factors influencing engagement. Amongst this population, this study explores the perceived benefits, barriers to, and facilitators of a) PA participation, and b) engagement with two dyadic PA interventions. We conducted interviews with 17 postpartum mothers and 10 significant others (aged 26–61 years old). Data were analysed with reflexive thematic analysis. Barriers to PA engagement were that it was easy to set plans, but hard to carry them out due to childcare, work, studying/chores. Setting PA plans and receiving practical support from their partner were important ways to overcome barriers to being active, e.g., some participants looked after the children, so their partner could engage in PA, as a part of their plan. Feeling motivated to exercise as a family was also a facilitator of PA. Barriers to programme participation were a lack of motivation and a preference for exercise prescription. Perceived benefits of programme participation included increased PA commitment and accountability to the plans. Amongst other techniques, participants used prompts (e.g. spouse getting their children breakfast/coming home from work/their partner 'checking in'), as a cue to start their PA plans. Findings show that tailored interventions to address the challenges of being a postpartum mother are needed; "one-size" fits all approach does not work.

Introduction

The onset of parenthood has been associated with declines in physical activity (PA) (Brown & Trost, 2003; Hull et al., 2010). Many women decrease their PA levels when they become a mother (Mascarenhas et al., 2018). In the year after childbirth, many women over 25 years old find fulfilling the role of motherhood to be a key barrier to PA (Cramp & Brawley, 2006). However, major life changes (such as having a child) can also provide a window of opportunity to change (Wood & Neal, 2016). For example, having a child may trigger "unhealthy" eaters to consider improving their diet or challenge "healthy" eaters to maintain their good food habits (Moura & Aschemann-Witzel, 2020). The transition to motherhood may be more paramount to influence a healthier lifestyle than the transition to fatherhood. Becoming a mother has been linked to increased vegetable consumption, while becoming a father does not change consumption patterns to a significant extent (Hartmann et al., 2014). However, men consumed beer less frequently after becoming a father, while women's consumption when transitioning to motherhood remained low and stable. The same positive health effects may apply to PA, i.e., the transition to motherhood may prompt mothers to reflect on their PA habits. Becoming a parent can lead mothers to reconstruct their lifestyle to incorporate caring for a new baby Hamilton and White (2010), hence cues to old PA habits may no longer be present (Wood & Neal, 2016).

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Mothers often relinquish the opportunity to be active by putting the families' needs first (Saligheh et al., 2016; Walsh et al., 2018) as the health of the newborn is paramount (Østbye et al., 2009). Lack of time, inconvenient locations, and high-cost stop mothers enroling in postnatal exercise classes (Saligheh et al., 2016), despite the social support and health benefits these classes may offer. This is important given social support is an important facilitator to sustaining PA amongst mothers with young children (Batey & Owton, 2014).

Research has highlighted the perceived need for an ally to support new mothers' efforts to engage in PA. For example, higher levels of emotional support from close friends or family members directly influences the type of leisure time PA engaged in by women (Oliveira et al., 2014). Almost every mother interviewed by Saligheh et al. (2016) stated that having an "extra hand" for support would have facilitated their engagement in exercise. Dyadic (pair-based) interventions address this need by encouraging individuals to be active with support from a partner and/or friend. In a recent meta-analysis, dyadic interventions increased PA behaviour more than individual interventions ($g = 0.17$) (Carr et al., 2019).

There are several ways in which dyadic partnerships can facilitate PA. One way is via the co-creation of PA plans. When people make plans to be physically active with a significant other, they may have greater PA levels compared to planning individually or not planning at all (Prestwich et al., 2012). Involving a partner in one's plans, may make people less likely to forget their plan and the motivation to do the required action may increase and become more intrinsic (Prestwich et al., 2005). Another way is via the motivational support dyadic partners can provide to one another. According to Self Determination Theory (SDT) (Ryan & Deci, 2017), the motivational environment created by significant others will either support or thwart an individuals' basic psychological needs. These are the needs for autonomy (i.e., feeling volitional, a sense of having input into choices and decisions that align with one's values, competence (i.e., feeling that one has the confidence, capabilities, knowledge and skills to engage in the target behaviour), and relatedness (i.e., feeling connected to others, cared for and respected). Satisfaction of these needs is considered essential for optimal functioning and well-being. According to the theory,t when these needs are supported, engagement in PA is more likely to be undertaken for its inherent rewards (e.g. finding it challenging or enjoyable) (Ntoumanis & Moller, 2022) and so motivation is likely to be of higher quality (i.e., more self-determined and sustained). Meta-analytic evidence indicates that SDT-informed interventions positively predict health behaviours and indices of health (e.g., Ntoumanis et al., 2021); increases in autonomous motivation and need support (but not amotivation or controlled motivation) were associated with positive changes in health behaviour (Ntoumanis et al., 2021). Training dyadic partners in how to support each other's basic psychological needs in relation to PA behaviours could, therefore, be a useful approach to optimise the effectiveness of dyadic interventions. For these reasons, we designed a dyadic intervention for postpartum mothers using SDT as a theoretical basis.

Postnatal exercise partners study (PEEPS) programme description

The present study is associated with a 12-week randomised controlled trial – Postnatal ExErcise Partners Study (PEEPS) – that aimed to consider the feasibility of a dyadic PA intervention delivered in Western Australia. The intervention implemented principles from SDT (Deci & Ryan, 1985, 2000) and collaborative implementation intentions (Prestwich et al., 2005) to promote PA behaviour change amongst postpartum mothers and a significant other (for further details see Carr et al., 2021). PEEPS specifically targeted mothers with a child aged between 3 and 24 months, who self-selected a study partner (e.g., friend, romantic partner, family member) to also take part. In total, the programme engaged 51 dyads who, through random allocation, received one of three workshops: minimal treatment control (Group 1; $n = 17$), collaborative planning only (Group 2; $n = 19$), or the full intervention i.e., collaborative planning and need supportive communication (Group 3; $n = 15$). We expected dyads in the two intervention groups to increase their PA more than the control group, and that the addition of need support would lead to the greatest increases in PA. Yet, we found somewhat limited and mixed results depending on whether someone was a mother or a partner. The results showed a positive effect of the intervention in changes on total PA for mothers in the collaborative planning group and for partners in the collaborative planning and need support group at post-intervention (week 4) and follow-up (week 12), compared to the control condition. These effects were small. At the follow-up, compared to the control condition, mothers in the collaborative planning + need supportive group, also scored lower on personal autonomous reasons to exercise, and their partners scored lower on confidence in the mothers' ability to support them. These findings are unexpected, as in the collaborative planning and need support intervention, participants were taught how to support each other's basic needs, so their personal autonomous motivation was hypothesised to have been bolstered. This indicates that the addition of psychological need supportive training for mothers was not beneficial and we cannot make definitive conclusions about which intervention was most helpful.

The purpose of the present qualitative study was to explore the participants' perceived barriers and facilitators to PA and barriers and facilitators to participation in the PEEPS intervention. Exploring the perspectives of mothers and their significant others will offer important insight into why the intervention did not work as expected, and how to adapt it for the future.

Methodology

Epistemological position

We used an interpretive epistemology and held the mothers and their partners as the "experts" of their own experience. Our open-ended questions had no right or wrong answers but provided a framework for the mothers and their partners to describe their experiences in rich detail. We also took a relativist ontological perspective in our analysis. This approach acknowledges that multiple realities exist (i.e., the mothers' and their partners may experience their reality differently), which is grounded in subjectivism.

Participants and procedure

The PEEPS programme: Participants were allocated to one of three conditions. In all three conditions participants attended or watched a recording of a workshop, in which they received recommendations for PA, discussed barriers to being physically active, and set a PA goal. Group 1 did only this, in Group 2 (collaborative planning) the intervention also included content to teach participants how to use implementation intentions to construct plans to be physically active together (e.g., "if it's situation X then we will do Y") or to provide practical support/be physically active simultaneously (e.g., "if it's situation X then I will do Y and my study partner will do Z"). We referred to plans as 'collaborative plans' as we deviated slightly from prior collaborative implementation intention research (e.g., Prestwich et al., 2012) as participants were not required to perform PA together. In Group 3 (collaborative planning + need support), participants were taught how to support each other's basic psychological needs for autonomy, competence and relatedness, in addition to the aforementioned training.

Fifty-six participants from the intervention groups (Group 2, collaborative planning and Group 3, collaborative planning + need support), who had completed the final follow-up, were invited to be interviewed and twenty-seven participants from 19 dyads (a participation rate of 48%) agreed; 11 dyads from Group 2 and 8 dyads from Group 3. Twenty-four interviews were conducted. Participants were interviewed either with their study partner ($n = 6$) or independently ($n = 21$), depending on the participants' choice and their availability.

Participants' ages ranged from 26 to 61 years (18 female, 9 male). Eight participants were first-time mothers, 5 participants were first-time fathers. Seven participants were mothers of 2 children, 4 participants were fathers of 2 children. Two participants were mothers of 3 children. One participant was a grandmother.

The semi-structured interviews included 15 open-ended questions based around topics of (1) motivation to join the study, (2) the study resources received, (3) use of the implementation intention plans, (4) experiences of motivating each other, and (5) their perceived effectiveness of the programme. The participants from Group 3 were also asked specifically how they used the motivation strategies they had discussed in their workshop. There was one face-to-face interview with one dyad, and the other interviews took place by phone. Interviews lasted between 20 and 75 min.

Analysis

All interviews were audio recorded and transcribed verbatim by a 3rd party company, and then coded using Version 11 of NVivo Qualitative Data Analysis Software (2015). Participants were given pseudonyms. Data were analysed using reflexive thematic analysis (Braun & Clarke, 2019), as we aimed to explore patterns in mothers' lived experiences, their behaviours and how they put the strategies into practice (Clarke et al., 2017). We carried out the analysis in six steps.

First, I (the first author) familiarised myself with the data. In step two, I assigned raw data codes to relevant sections of the transcripts. Then I and another author independently coded one transcript and discussed the coding; this author took the role of a 'critical friend'. I then coded all the remaining transcripts. In step 3 initial themes were generated. This step involved the creation of a thematic map which was presented to the second author. We utilized both inductive and deductive approaches to the analysis using established theory to explore principles from SDT (Deci & Ryan, 1985, 2000) and collaborative implementation intentions principles (Prestwich et al., 2005). Coding and its analysis rarely fit clearly into an inductive or deductive approach, and often use a combination of both (Braun & Clarke, 2019, 2021; Clarke & Braun, 2013). Next, I categorised the codes into themes both at the latent and semantic level. In step 4, I (first author) and the second author reviewed and discussed the coding, themes, and interpretation of the data. We discussed and reviewed the identified themes, checking the themes against the transcripts for accuracy. In step 5, I and the second author collaboratively defined and named the themes. Step 6 involved the writing of this report. Step 7 involved the manuscript being reviewed by co-authors.

Methodological rigour

Tracy (2010) proposes eight markers of quality in qualitative research; in the following, we outline how we addressed these using examples from Litchfield and Elliott (2021). *Sincerity* was demonstrated by being honest regarding our inexperience. I (the first author) was not a mother and had thus not had the experience of being physically active post childbirth. During the interviews I created rapport by emphasising that the mothers were the experts, and that I was naive in this area. We also used critical friends to check whether the themes were conceptually accurate and reflected the data and piloted the interview topic guide with experts. It should be acknowledged that I (the primary coder) was a PhD student, and the critical friend was one of my supervisors. As detailed in Smith and McGannon (2018), when there is an implied power deferential between authors, this can influence the coding decisions. The background of the researchers, power, age, and gender may all have influenced the coding (Smith & McGannon, 2018). Aligned with Litchfield and Elliott (2021), *Credibility* was sought by providing rich descriptions of the findings and by spending plenty of time collecting data. We made sure to gather as many accounts as possible by inviting everyone who completed the study to be interviewed. We aimed to demonstrate *resonance* by using verbatim descriptions to provide authentic, clear, and engaging accounts. To establish *rich rigour,* we utilised implementation intentions research and SDT to inform our study. We demonstrated a *worthy topic* and *significant contribution* as this is the first qualitative analysis of a dyadic PA intervention combining implementation intentions with SDT training to promote the PA of postpartum mothers. We sought *meaningful coherence* by using a theoretical framework to inform both the intervention and our analysis, and we had clear objectives which are in line with our theoretical beliefs and assumptions. *Ethical* approval was obtained from the lead author's University.

Results and discussion

It is well established that family, partner support and support from significant others is a key facilitator of PA in the postpartum period and beyond (Albright et al., 2006; Brown et al., 2001; Miller et al., 2002). Dyadic interventions may offer a means to promote PA in this population. However, given, the mixed results from the PEEPS trial (Carr et al., 2021), it is important to consider the unique factors that could influence the success of such interventions. This study explored barriers and facilitators to engaging in PA, and with the PEEPS intervention, for this population of mothers and their significant others. Table 1 presents a complete list of themes and example quotes from the analysis.

Barriers

Eleven themes were identified which represented barriers to participants' engagement with the intervention or PA (see figure S1). We have focused our description on six key themes which we felt more readily illustrated the experiences of what it is like to be a postpartum mother taking part in the PEEPS dyadic PA intervention. Figure S1 presents example quotes of the remaining barrier-relevant themes (which include '*Aversion to the online resources prevents effective engagement'; 'personal financial pressures influencing priorities'; 'medical conditions and injuries prevent full implementation of the plans'; 'disengagement with the intervention due to fatigue'; 'easy to set plans hard to carry them out*').

What you offered up did not match my expectations

Participants in both conditions discussed feeling like they were 'free floating', without clear expectations or strategies to achieve their goals. Although the study was based on SDT principles of free choice and promoting autonomy (Ryan & Deci, 2017), the parents wanted to be told what exercises to do and how often by the researcher. Some participants wanted the researcher to be directive. According to Ryan and Deci (2017), autonomy-supportive structure involves providing clear expectations, feedback and explaining the link between the behaviour and its outcomes; thus allowing regulation of behaviour in relation to these behavioural guides. Autonomy-supportive structure can also enhance feeling of competence (Ryan & Deci, 2017). It is possible that participants would have preferred to receive a list of plans they could choose from and adapt as needed.

Participant in both conditions expected face-to-face exercise classes or group sessions. This misunderstanding may have come from some participants expecting the programme to be similar to others they were aware of: *I saw the word exercise or post-natal sort of type of, you know … With babies and all that, I thought, "Oh-" That, I think even I thought about, you know, the um, Mums and Bubs yoga and all that type of stuff. And I thought it was uh, something of, of … along those lines.'* (Group 2, Father 3, 46y, first time father). Participants also indicated that they felt the lack of face-to-face part was a limitation of the programme: *'I know that it wasn't necessarily, um, that wasn't necessarily part of the description anyway. So it was just my own assumption of, yeah … I thought it would, um, I thought there would be maybe like regular meetings with like other participants as well.'* (Group 3, Mother 7, 34y, first time mother).

Table 1
Themes and Subthemes Relating to Barriers and Facilitators

Themes	Subthemes	Exemplar participant quote
Barriers		
What you offered up did not match my expectations		"Um, obviously yes, you [the researcher] were there for the support and the feedback, but for me it helps if someone goes, okay, every whatever, every day or every second day, you are to do this for this long and you will see this result in X amount of days, weeks" (Collaborative planning, Mother 12)
	Priorities of postpartum parents are incongruous with the objectives of the intervention	"You totally forget that it's even there, and then you don't stick to the programme… It's still- That exercise programme still sits underneath ... It's poorly lit- poorly- very poorly visible underneath" (Collaborative planning + need supportive communication, Father 6)
The intervention and its materials were too onerous, repetitive or tedious		"No, I would say for the planning stage, I know that's what the programme is about, but it did get a little bit tedious. …It was a bit of, a bit, um, there was a bit of repetition in it." (Collaborative planning, Father 4)
	Accelerometers or measures were an extra burden	"would sort of, um, you know, brush it against my baby, a bit, when I was changing her nappy, or picking her up. Or if I was going out to a work meeting or something, I've got this big jaggy thing on my wrist." (Collaborative planning + need supportive communication, Mother 10)
Difficulty engaging with the intervention due to lack of motivation		"I'm very hard to motivate. I've really, really struggled with everything. So, um, it, you know? I think, I think he would take a lot of the, um, uh, um, a lot of the sort of suggestions on that handout. But, um, yeah. I'm just a hard nut to crack I guess." (Collaborative planning + need supportive communication, Mother 7)
	Engagement and motivation associated with choice of study partner	"Interviewer: Can you just clarify again ... why you wanted your sister? Mother 6: I guess cos we've got a, you know, a closer relationship. And, um, we could exercise together. And, um ... you know, we've both got kids at the same age, so ... that would've made it easier." (Collaborative planning, Mother 6)
Superficial understanding of motivation is a barrier to fully implementing the strategies		"I'm not really one of these like, "Come on, keep going", you know, I don't respond to that at all. And [my partner] knows that, so probably the less that he says is better." (Collaborative planning + need supportive communication, Mother 5)
Inappropriate use of controlling motivation strategies outside the bounds of the intervention		"I will, uh usually find or source, um, a workout that I've got ready to go, just in case I can't get to the gym. And I will make Lisa um, do that as well, whether or not she likes it (laughs)." (Collaborative planning + need supportive communication, Mother 9)
Perception of physical activity as an imposition		"I'm not sure. I just ... I think he maybe didn't, didn't like exercise. I'm not sure. It's hard to know. He felt like he had a bit too much on his plate perhaps and felt like this exercise was, um, being imposed upon him rather than something that he was choosing to do." (Collaborative planning + need supportive communication, Mother 10)
Medical conditions and injuries prevent full implementation of the plans		"when at first when I'd do a plan like you're encouraging five days a week, doing two days in a row. I was trying and it was painful. And I wasn't doing it because I was in was too much pain through it." (Collaborative planning, Grandmother 1)
Disengagement with the intervention due to fatigue		"Obviously sleep deprivation, like we'd be knackered by the end of the day and just wouldn't want to do anything" (Collaborative planning, Mother 1)
Personal financial pressures influence priorities		"Um, but then the issue with the gym thing is ... Well, one is financial. Like if you could go to the gym for free, that would be fantastic." (Collaborative planning, Mother 11)
Easy to set plans, hard to carry them out		"It's pretty thorough. Um, I don't know what you could do to improve it. I think, um, it's all good to have your plans and have everything, you know, and you wanna do this, and everyone want to do this. But just the, you know, everyday life gets in the way of doing all of these plans." (Collaborative planning + need supportive communication, Father 2)
Aversion to the online resources prevents effective engagement		"Yeah, I think it's also depends on the people. I'm not a Facebook person. I rarely check my Facebook page. Um, so maybe it would be good to see what sort of social media or what

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Table 1 (*continued*)

Themes	Subthemes	Exemplar participant quote
		sort of resource, uh, would be best ... would work best for you" (Collaborative planning + need supportive communication, Mother 4)
Facilitators		
Developing personal connection during the intervention is important		"when your both, when you're both committed to a certain time or activity to do it's certainly a bit more motivating" (Collaborative planning, Father 1)
	Motivation was stimulated by familial connections	"it's always good to go for a walk as a family and have some time together without- Not sitting around the dinner table or anything like that that" (Collaborative planning, Father 4)
	Nurturing a sense of connection is important	"Relatedness, definitely, when we go for those walks each week, we have really good conversations and that's just really lovely. So, that's improved" (Collaborative planning + need supportive communication, Mother 10)
		→ Use of a questioning style "Um, it- it made me feel validated, I guess…Because it's- it's always really hard because obviously he's working long hours and then it's all- all about the kids, mainly. So it was nice, it was nice that he'd ask you know, how I was going and if I managed to do what I wanted to do, which was go for a walk… So yeah, it was, it- it, yeah. It- it was nice. (Collaborative planning, Mother 13)
Need supportive statements from partner was an effective motivator		"exercising and, and running like, your heart felt, like, it wanted to explode…because you hadn't done it in such a long time. But, um, you know, he would push me, and he would say nice things to me to make me feel like, uh, you know, better, and I wanna keep going" (Collaborative planning + need supportive communication, Mother 8)
PA is promoted by interesting activities	Reinforcement of intrinsic goals and values for exercise is important for maintaining motivation	"like reminding him, "Oh you'll feel better after you exercise." And, um, um, talking about how we, we were wanting to exercise more 'cause ... and why we both wanted to do that and stuff like that." (Collaborative planning + need supportive communication, Mother 2)
	Intrinsic motivation fostered by enjoyment	"And I just really love walking. It's, it's my favourite type of exercise, and there was a really nice bush track near our house. So, it just ticked a lot of the boxes, you know?" (Collaborative planning + need supportive communication, Mother 10)
	Intrinsic motivation fostered by stimulation and relaxation	"I was just gonna say, for some people like myself, you need mentally stimulating stuff; not just it's fun. Like, there's things which are fun but are not mentally stimulating- … But yeah, it's just gotta be somehow- try to incorporate mentally stimulating and even accountable stuff." (Collaborative planning + need supportive communication, Father 6)
	Motivation derived from valuing health and fitness	"we do value the health, we do value our ... each other's health because we both want to be around for a long time. So we talk about that all the time. You know, wanting to be fit and healthy for our children." (Collaborative planning + need supportive communication, Mother 5)
Physical representations of the intervention to remind them are desirable		"Doing, um, I guess having those little, um, tools to do more explicit visual manner. Like a, like a calendar I mean that we can something, I think, would have been helpful for me" (Collaborative planning + need supportive communication, Mother 7)
Factors that were both a barrier and a facilitator		
A focus on weight loss and appearance-related goals was a double edged sword		**Facilitator:** "I think like in my mind- I really, really wanted to lose the pre-pregnancy weight. Like I really ... And that's why I stayed in it. Because even though I found it difficult, I still had in my mind that, you know, I wasn't happy with the fact that I was still wearing maternity clothes." (Collaborative planning + need supportive communication, Mother 8) **Barrier:** "I do remember one time I pointed out that he seems to be focusing a little bit too much in some, some areas and not others. So, um, and again, I mean, he was, you know? He was actually happy at what he was, what he was saying and then I kind of, um, ruined it by saying, "Oh. Well, um, you know? You need to make sure that it's balanced and, you know?" Um. And from that, he actually then engaged with

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Table 1 (*continued*)

Themes	Subthemes	Exemplar participant quote
		the, the trainer at his gym to have like a, have his, um, uh, um, routine reviews. Um. To make sure that he was, you know, having a more balanced workout I guess. But, um, yeah. I mean he wasn't really asking me. And I think the way in which I said it wasn't necessarily, um, supportive." (Collaborative planning + need supportive communication, Mother 7).
Work, study, or chores can be useful tools to develop or enact a plan but may sometimes inhibit progress		**Facilitator:** "I think most of the ones was, um, work, um, going for a walk when I got home from work, on the days that I didn't work late or anything like that. Um, just, yeah, I get home and we'd, we'd take [daughter's name] in the pram and, and go for a walk for half an hour or 45 minutes, whatever it might be, or even if it was a bit later, we could go for about ten minutes." (Collaborative Planning, Father 4)
		Barrier: "he's been working about 80 hours a week. So, you know, by the time he gets home at 10:00 pm, 11:00 pm, it's too late" (Collaborative planning, Mother 13)
Weather conditions are a significant influence on motivation		**Facilitator:** ""Let's go enjoy a bit of sun or let's go take a break," I mean, I think that ... To me that-that's quite high value." (Collaborative planning, Father 3)
		Barrier: "The only other time I've had problems if it's been pouring with rain three days in a row or something. I don't like walking in the rain. You know?" (Collaborative planning, Grandmother 1)
Convenience, quality, and locality of places to exercise affects motivation		**Facilitator:** "So I think that has encouraged me a lot more having, you know, knowing that the free classes are there, and it's close to where you live. Um, has definitely motivated me more to do it." (Collaborative planning + need supportive communication, Mother 8)
		Barrier: "and they moved. It was five minutes down the road from our place, and then the fitness class changed to, like, 20 minutes away-…And then they go, "Oh, they've stopped coming" (Collaborative planning, Mother 11)

Table 1 (*continued*)

Themes	Subthemes	Exemplar participant quote
	Convenience associated with living with study partner	**Facilitator:** "Well, first of all, we are partners. We do pretty much everything together. We spend the most time together, except when I'm at work. And it makes it easier, when the other person is around you most of the time, to do things together, and to plan things together" (Collaborative planning, Father 7)
		Barrier: I think we'd still choose each other. We're still pretty, um, new in the area that we live in so I-... don't really have any local friends, um, to ask. (Collaborative planning + need supportive communication, Mother 2)
Childcare provision can be helpful… if you have it		**Facilitator:** "I would say my confidence is probably a bit, it probably increased a bit because I know that I could leave baby with [study partner] to get things done and stuff." (Collaborative planning, Mother 15)
		Barrier: "Um, so one aspect um whether the baby slept well the night before, um and whether or not I have a kid home during the day, 'cause I have one at school full-time and one at school in kindy, so she goes two and a half days a week. And then I have the baby at home, so making a plan for each set day, in my head I had said, "Well no, I won't be able to do this because um there's too many variables." (Collaborative planning + need supportive communication, Mother 9)
Commitment and accountability increased but for some we did not meet their requirements		**Facilitator:** "I think it's just the fact that it was written down and that's because it-it was sort of a motivation-" (Collaborative planning, Mother 13)
		Barrier: "I don't know if you've ever done, um, Weight Watchers. But Weight Watchers, they, they get together. Um. And they talk about their progress, their challenges. Or, um, and I think that face to face, um, uh, and I know it would be really hard because everybody, it would be really hard to get everybody in it and be probably a bit of a logistical nightmare. But- Um. For me, I think what it would have helped me, um, engage with it a little bit more would have been that pressure of knowing that I, at some point I actually

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Table 1 (*continued*)

Themes	Subthemes	Exemplar participant quote
		have to see people and have to talk about it. You know? Um. Yeah. Um. Otherwise it was just too easy to, you know? It was never, I never made a conscious decision not to do it. It was always like, okay. Like, that's right. I've got to, I've got to get on to this. And it just never happened. (Collaborative planning + need supportive communication, Mother 7)
Predictability and structure is crucial to effective implementation of plans		**Facilitator:** "Having a set routine, like, made us more likely to do it, and not having a set routine made- made us less likely to do it." (Collaborative planning + need supportive communication, Father 6)
		Barrier: "I guess that was, that was a various () but then, that's- that's kind of been worked through so that's not a problem anymore. So probably now it is a time to really look at the motivation side. Yeah, because I think else, um, yeah I think there was just, a lot of, like, effort was going into the scheduling." (Collaborative planning + need supportive communication, Mother 3)
	Disruption to routine can be difficult to manage	**Facilitator:** "Um, I don't know that anything made it easier. I just, I liked that, um, I mean, with the plan, the way it was structured, it, sort of, you had a plan for, for everything. Um, like, uh, on ... well like because, um, 'cause he does shift work so we, we had sort of written up a plan of like, well, when he's on day shift, this is our plan and when he's on night shift, this is our plan. And we thought about like, um, oh, 'cause we don't really have normal weekends, so we thought about well, when he's working, um, then this is our plan. When it's his days off this is our plan. Um, so I think that just made it easier to, um, plan that all out- ... at the beginning. I don't think we would have necessarily done that normally ourselves. Instead of just saying like, "Oh, we'll go for a walk three times a week", but then not think about all of those things. Because of the way that the planning worksheet was done up- ... um, uh, we, I think we did like proper planning. Um, and I guess that was, um, what as we were doing that we were thinking, "Oh, like, this is a good idea actually." (Collaborative planning + need supportive communication, Mother 2)
		Barrier: "Yeah. I guess actually being active, 'cause, I mean, we, we made the plan and that was fine. And then it's just, um, yeah, actually being active when, when-... sort of your schedule changes. Like when I was, um, when I went to the funeral. I mean- " (Collaborative planning + need supportive communication, Mother 2)
Habitual behaviours can either be a barrier or a facilitator		**Facilitator:** "Takes three weeks to form a habit, so what you want to do is start- get those three weeks behind you, and you should be up and running" (Collaborative planning, Father 5)
		Barrier: "And then with [study partner] um, I don't know. Like I said, I think she just stopped, just because ... I don't know. They moved and it wasn't convenient, and then it got colder, and then- She got a bit of a habit of not doing it, and there you go. She- she now doesn't do it." (Collaborative planning + need supportive communication, Father 6)

Recruitment materials for similar programmes should emphasise how the programme can provide a scaffold in which to structure PA and make clear that it is not a prescribed, group-based and instructor led exercise or weight management programme. Intervention content could more directly address how participants use the programme structure to become more active without group or instructor support.

Participants also struggled to fit PA into their schedule, as it required self-motivation which was often lacking. Participants discussed expecting to be '*spoon fed*' (Group 2, Father 3, 46y, first time father) with prescribed activities and wanted the *'pressure of knowing that I, at some point I actually have to see people and have to talk about it.'* (Group 3, Mother 7, 34y, first time mother). It is noteworthy that Mother 7 alludes to a preference for 'pressure' which would usually be considered to lead to more extrinsic than intrinsic motivation to be active (Ryan & Deci, 2020). Consequently, without this group environment the intervention did not meet their needs, as the interventions required participants to exercise at home. Although SDT predicts that individuals should thrive in environments that promote choice and personal decision-making (Ryan & Deci, 2017), the need for accountability and commitment that comes from a face-to-face exercise class was difficult to replicate at home. Participants discussed the importance of goals and would have preferred that the researcher checked in on them which might have made them feel more accountable while doing their home exercises. However, following up with participants on a regular basis is time intensive which may have cost implications and may not be sustainable for implementations of such programs outside of research conditions.

The intervention and its materials were too onerous, repetitive or tedious

Some participants reflected that they found the intervention to be laborious. Participants in Group 3 remarked that their workshop felt too long. One mother emphasised how the intervention would benefit from an increased focus on key expectations. Mother 4 suggested:

> *'… it wasn't until the end of the workshop that I got, "Oh, okay, so you expect us to do these things at home, or to use these motivational things at home." Um, so probably it would be a lot better that if it was shorter and just emphasizing the, "Listen to this, because this is expected from you to do, uh, so you need to understand it."'* (Group 3, Mother 4, 41y, mother of 2).

Parents also alluded to how the workshop could be divided into smaller modules to be completed over a few days. This would help accommodate childcare duties related to being a parent. There were mixed opinions regarding the materials, particularly the planning resources. Some participants tackled their childcare barriers by using the plans to take it in turns to look after the children/perform household chores, so they each could exercise or have personal time. In these instances, they were asked to write down their plan, for not only how they would be more active but also what they would do to help their partner. However this effectively doubled the amount of plans participants needed to write down and remember, which was seen as tedious. For example, Father 4 remembered thinking during the planning stage: *'didn't I just answer this? Or this is the same except it's what I think the other person will be doing'* (Group 2, Father 4, 33y, first time father).

Some participants felt frustrated with the planning resources and alluded to the long-winded nature of the plans to explain why it did not work for them; they would have preferred a clear direction. For example, one mother stated:

> '*And we're both sort of to the point people, um, whereas, you know, we had to make up the sort of, if this happens, then we do this, and, and you know, then if that doesn't happen, uh, I don't know. It seemed a bit long winded…If that makes sense, rather than, "Right, do this"'* (Group 2, Mother 12, 31y, first time mother).

However, this view was not held by all participants. Others described the materials as simple or basic. For example, Mother 3 commented that [the resources were] *'very simple and straightforward and- I feel like it's easy to remember'* (Group 3, Mother 3, 35y, mother of 2). The perceived complexity of the resources may have depended on individual differences in preferences or circumstances. For example, for those with unpredictable schedules (e.g., shift workers) the number of back up plans required meant that the participants had to make an unmanageable number of plans:

> *'[study partner] could be working a morning. He could be working an afternoon. So you'd have to have like 50 million plans of, "If this …" You know, "If it's this day, and this is happening, then we'll do this." Like it just …So our plans probably weren't as thorough as they, as the plan sort of intended for them to be.'* (Group 2, Mother 11, 30y, first time mother).

Participants struggling to make plans for when their schedule changed contrasts with Bösch et al. (2022) findings. The majority of older adults in their sample thought about situations in which enacting plans could be difficult (e.g., work obligations, doctor appointments, holidays) and made unprompted elaborate coping plans. It is possible that perceived freedom to make spontaneous changes may differentiate between those who feel able to adapt plans (e.g., older adults with less commitments (and those who find it less easy to adapt (e.g., new parents).

Difficulty engaging with the intervention due to lack of motivation

Some participants described an overall sense of amotivation that did not shift during their engagement with the intervention. Participants mentioned that their partner would use the motivational strategies, but they would not find them effective as they perceived themselves to be *'a hard nut to crack.'*. In some cases both dyad members were similarly amotivated and referred to themselves as *'the same type of people.'* which made it hard for them to motivate themselves or each other. The finding of lack of motivation is not surprising, as previous research has found very few postpartum women consider exercise a priority and family care and domestic duties take precedence (Saligheh et al., 2016).

Engagement and motivation associated with choice of study partner was a sub-theme of 'lack of motivation'

Some participants felt, in hindsight, that they would have engaged more with the joint plans or motivation strategies if they had chosen a different study partner. Reasons for this included the partner (often the father) not being engaged with the study, or because their living circumstances prevented them from exercising together, or because they had a closer relationship with someone else. Notably, participants felt if their study partner had been someone in a similar situation to them this would have facilitated exercising together:*' … you know, we've both got kids at the same age, so … that would've made it easier.'* (Group 2, Mother 6, 40y, first time mother).

Superficial understanding of motivation is a barrier to fully implementing the strategies

The interviews also revealed that participants had a superficial understanding of what constituted a motivational technique; their descriptions did not align with the 'need supportive style' that the intervention was designed to promote. Some participants had the view that motivating their partner meant cheering them on, suggesting that the SDT principles incorporated into the intervention were not salient. *'I'm not really one of these like, "Come on, keep going", you know, I don't respond to that at all. And [my partner] knows that, so probably the less that he says is better.'* (Group 3, Mother 5, 35y, mother of 2). This type of support has been described by SDT researchers as 'need indifferent' (Quested et al., 2018). Negative connotations associated with spouses "nagging" their partners, may also help explain why some participants felt reluctant to implement the motivational strategies as they felt like they were pestering their partner. This finding is supported by the literature, Beverly and Wray (2010) conducted focus groups about exercise adherence in couples aiming to manage Type 2 Diabetes. Spouses emphasised that there is a fine line between encouragement and nagging your partner to exercise. Indeed, nagging along with having different goals for exercise, has been linked to feeling frustrated with the spouse, not enough skill/knowledge, or being unwilling to exercise. Open communication is postulated to be a way to resolve these issues according to participants in Beverly and Wray's focus groups. It may have been beneficial for the intervention to directly address how to provide need support or resolve issues in ways that avoid perceptions of "nagging".

When using the deductive approach some elements of the mothers' experiences may have been misinterpreted. It could also be argued that the deductive approach drifts from our epistemological position of striving to understand the participant's own voices and understandings of how mothers and their partners negotiate being more physically active during the mother's postpartum period. Perhaps, mothers are putting the needs of their family first and being so timepoor, simply do not have the time or mental energy to discuss PA difficulties in an empathetic and caring way or to create an environment where PA is fun and enjoyable . "Nagging" their partner or cheering them on while engaging in PA, may be quicker and easier for mothers who are already at the limit of their mental resources. In these respects, perhaps implementing need supportive strategies as taught in this intervention is not practical for some time-poor postpartum mothers.

Inappropriate use of controlling motivation strategies outside the bounds of the intervention

There was an indication from the interviews that the intervention did not adequately address participants' tendency to use controlling motivation strategies. For example, Mother 9 stated:

> *'I will, uh usually find or source, um, a workout that I've got ready to go, just in case I can't get to the gym. And I will make [my study partner] um, do that as well, whether or not she likes it (laughs).'* (Group 3, Mother 9, 34y, mother of 3).

However, participants across both conditions also recognised the inappropriateness of using controlling strategies with their partner: *'Like, you- you work for somebody, you go- and they've got a job- You're like, "Come on, mate. You do your job. Hurry up and do your job." Versus you can't say that to your wife.'* (Group 3, Father 6, 33y, father of 2). However, as this quote illustrates it was not the intervention that made him realise it was inappropriate, but instead social norms. Wood and Kasser (2020) found that partners who experienced unconditionally positive and non-judgemental spousal regard felt supported and appreciated. Perhaps, in the PEEPS programme the training needed to focus more extensively on how to avoid controlling language, in addition to how to be need supportive, and how to facilitate closeness between themselves and their partner.

Perception of physical activity as an imposition

Some participants agreed to take part in the study primarily to please their study partner and were not fully engaged with it. These more controlled regulations did not appear to shift during the intervention. This may have been more the case when the mother would have preferred to sign up with someone else, but had to settle for their second choice of partner. For instance, Grandmother 1 discusses how their daughter 'told her to do it' and so she signed up 'for her sake' (Group 2, Grandmother 1, 61y). This feeling of obligation regarding PA is not nuanced to our study. Thorsen et al. (2021) found PA was seen as a "necessary evil". Quotes from individuals with type 2 diabetes illustrated that participants were repeatedly informed by health professionals, family, and friends that they are obliged to be physically active and it is a necessity. PA interventions must compete with negative societal perceptions of PA as a chore; this issue could perhaps be addressed and discussed during interventions to encourage participants to engage with more autonomous reasons to participate.

Facilitators

Four themes were identified which described facilitators of participants' engagement with the intervention or with PA ('*Physical representations of the intervention to remind them are desirable'; 'PA is promoted by interesting activities; 'Developing personal connection during the intervention is important'; 'Need supportive statements from the partner was an effective motivator'*). Two sub-themes were identified which explained how a personal connection formed or improved during the intervention is important. These were '*nurturing a sense of connection is important*' and '*motivation was stimulated by familial connections*':

Nurturing a sense of connection is important

In both conditions participants described using the planning task to schedule walking together as they enjoyed the conversations with their study partner when walking and this created an opportunity to experience feelings of relatedness: *'Relatedness, definitely, when we go for those walks each week, we have really good conversations and that's just really lovely. So, that's improved'* (Group 3, Mother 10, 40y, first time mother). This theme also illustrated that feeling close to the study partner was an important facilitator of PA, and subsequently feeling close was easier when participants were able to exercise together. Segar et al. (2017) also identified a sense of connection as important to becoming physically active, as it created an opportunity to discuss their feelings, goals, daily priorities, values/beliefs, regarding being physically active. Collectively this research along with our findings highlights that a sense of connection is a critical component to foster in dyadic PA interventions.

The participants' use of an SDT-based communication style was identified as a way to create a sense of connection. Participants in both conditions highlighted their study partners' use of need supportive strategies such as 'checking in' on how they were doing with their PA plans and participants felt this helped them to feel valued. Some participants said that their partner stopped 'checking in' with them once they realised that they were carrying out the steps in their plans habitually. Mother 13 described that she still managed to carry out the plans without this motivational support from their partner as she was self-driven. This suggests that partner support may have been important in helping initiate regular PA and once the behaviour was established she was autonomously motivated to sustain it. *'Um, it was because I was actually doing, you know, I followed the plan and exercising a lot-… I wasn't actually motivated [by my partner] a lot because I was quite motivated within myself to do it.'* (Group 2, Mother 13, 29y, mother of 2). Wood and Kasser (2020) found that spouses who created a space for their partner to have a voice in what they did and how they did it, offered a platform for more autonomous and self-determined motivation.

Motivation was stimulated by familial connections

Parents in both conditions often felt motivated to exercise because they could involve the whole family:

> *'Yeah, it, um, yeah. If I had a bad day, or a really busy day, most of the time if I came home and [study partner] was ready to go for a walk or ready to go and do something, I'd, I'd perk up a bit, you know? I'd go, okay, yeah. Let's go and do it. I would be … Because especially with the walking with [our daughter], it's always good to go for a walk as a family and have some time together without- Not sitting around the dinner table or anything like that when, when, yeah, you're just sitting there and trying to clean up after [our daughter] if she's throwing food, or whatever. And so, um, it's good to go out and yeah, and do something and yeah, get the blood flowing a bit, and yeah.'* (Group 2, Father 4, 33y, first time father).

Wittels et al. (2022) also found the mothers in their interview study had a desire to make PA a family event, rather than being active on their own.

As shown in Figure S2, two sub-themes were experienced by the participants which explained how PA is promoted by interesting activities. Participants felt that they were motivated from valuing health and fitness (see Table 1 for an example quote). The second sub-theme was 'reinforcement of intrinsic goals is important for maintaining motivation'. We discuss this theme in detail here as one of the primary purposes of our intervention was to increase intrinsic motivation for PA.

Reinforcement of intrinsic goals and values for exercise is important for maintaining motivation

Participants attempted to promote feelings of autonomy in their partner by highlighting values, intrinsic goals for exercise, or positive feelings they would experience from exercise. For example, some participants reminded their study partner why they had wanted to be more active and highlighted the benefits they would experience from exercise:

> *'Um, and being caring. I think I did a lot more of the highlighting intrinsic goals. Um, um, like reminding him, "Oh you'll feel better after you exercise." And, um, um, talking about how we, we were wanting to exercise more 'cause … and why we both wanted to do that and stuff like that.'* (Group 3, Mother 2, 26y, first time mother).

Participants also reminded themselves about the benefits of PA, for instance, Mother 12 discusses how in the back of her mind she felt walking would make her feel better:

'It helps if, even if I had a bad day with [our daughter] or something, and yeah, [study partner] had come home and been like, "Yeah, let's go for a walk, hun." I'd sort of, you know, most of the time I'd hesitate or try and get out of it, make some sort of excuse. But um, a lot of the time, ultimately I think in the back of my head, I was like, no, it's, it, it's good, it'll probably make me feel a bit better.' (Group 2, Mother 12, 31y, first time mother).

In contrast, some participants used more extrinsic reasons to motivate themselves, for example referring to their external appearance:

'when [study partner] and I were both pregnant, it was usually cake that motivated us. A lot, and I still, to this day, um, I don't call it baby weight. I call it cake weight. And that's what I'm trying, trying to get rid of.' (Group 3, Mother 9, 34y, mother of 3).

Mother 8 also discusses how her partner would motivate her by emphasising in the appearance-related benefits of PA:

'I think [study partner] would say nice things to me as well, like, you know? Um, you're losing weight. You look good. Hmm. All right, okay.

Interviewer: So how helpful did you find that when like he'd say, "Now you are losing weight. You look good." Was that motivation do you think?

Mother 8: Um, it-it made me feel good, and it made me feel like I wanted to continue, um, uh, exercising. Yeah. Yeah. And I'd feel really good after an exercise.'

This was not a strategy encouraged in the intervention, and it transpired that Mother 8 (and perhaps their study partner) did not actually engage with the intervention materials:

Mother 8: Um, I actually didn't use it at all, to tell you the truth, yeah.… 'I did read it, I did read through that but only once. Yeah.'

Factors that were perceived as both a barrier and a facilitator

Eight themes were identified which some participants perceived to be a barrier while others perceived them to be a facilitator (see Table 1). We have focused here on four key themes which we felt gave us a unique perspective of what it is like to be a postpartum mother taking part in our dyadic PA intervention, please refer to Figure S3 for example quotes of the remaining themes (which include '*Weather conditions are a significant influence on motivation*'; '*Convenience, quality, and locality of places to exercise affects motivation*'; '*Predictability and structure is crucial to effective implementation of plans*'; '*Habitual behaviours can be either a barrier of a facilitator*').

A focus on weight loss and appearance-related goals was a double edged sword

Many participants from both groups described being motivated by weight loss. Participants perceived fitness changes as harder to track and less personally satisfying than monitoring weight loss. Participants discussed how the goal of weight loss kept them engaged with the intervention, and perhaps made them less likely to drop out of the study. Focusing on weight and appearance, however, may have been a barrier to adopting the need supportive motivation strategies. For instance, our motivation worksheets encouraged dyads to highlight intrinsic goals for exercise engagement (e.g., feeling better after exercise), instead of highlighting extrinsic goals for exercise engagement (e.g., looking better to others). Some participants actively tried to avoid focusing on weight loss, and adopted a motivational strategy that rewarded improvement:

'So we're trying not to focus on um, centimetres lost or weight loss-… we, we do a fitness test at the beginning of our challenges. And we do a fitness test at the end of our challenges. And that's to see how much you've improved… [my partner] *and I had um, a sock bit. Um, so that's a pair of exercise socks. Nothing too exciting…* [for] *who, who got the best improvement on their fitness test. Not who got a higher score on anything-… but, the best improvement on it. Um, and it's, it's based, it's based on the fact that you get to wear the socks'* (Group 3, Mother 9, 34y, mother of 3).

Mothers sometimes referred to concerns with their appearance such as pregnancy weight as a motivator for signing up to the study. There is a dichotomy between researchers who want to promote inherent interest and value in PA, while some parents are primarily concerned with engaging in PA to lose maternal weight and "baby fat". Even though the programme was designed to encourage participants to focus on internal satisfaction and interest in PA, participants often referred to their dissatisfaction with their external appearance, for example, *'I wasn't happy with the fact that I was still wearing maternity clothes.'* (Group 3, Mother 8, 37y, mother of 2). This statement is not unexpected, as the discourses around motherhood in the media is often thought to contribute to weight-stigma about postpartum and pregnant women's bodies. Nippert et al. (2021) in their study of 123 pregnant and postpartum women found common and frequent weight stigma experienced to be explained by three key themes, 1) how pregnant women's bodies should ideally look, 2) pressure to "bounce back" to the pre-pregnancy appearance, 3) celebrities being praised for having the ideal pregnant body or returning to their pre pregnancy appearance. Nippert et al. (2021) also found that women living with overweight or obesity were rarely portrayed in the media, "ideals" for weight and weight loss were unrealistic and did not refer to medical guidelines, and women discussed weight in a negative light, often focusing on its association with adverse maternal-child health outcomes. These findings highlight potential reasons for a focus on body shape amongst this population.

Future interventions may be strengthened via including content to empower women to have a more positive body image, to help women move away from thinking about weight loss or fitting into pre-pregnancy clothes. For example, by empowering women to appreciate one's own body "stretch marks and all", and how powerful a mother's body is for growing a child. Arindita (2020) conducted a qualitative content analysis of the storytelling elements used in a women's body positivity in a campaign called #BodyProudMums. One such story included how stretchmarks and weight-gain are common occurrences for postpartum women, but there is beauty in motherhood so the new body should be embraced (Arindita, 2020). The concepts in these stories reflect the importance of body appreciation, acceptance, and love. One subtle way to increase body positivity, may be to be more mindful of the language and images used in flyers and study resources, to make sure they represent the idea that a mother's body should be appreciated.

Work, study, or chores can be useful tools to develop or enact a plan but may sometimes inhibit progress

Work commitments or chores were a prompt to be active for some, and a barrier to PA for others. Some dyads used their partner returning home from work as a cue to implement their plan. Participants also identified housework or chores as a way to fulfil their PA targets, which meant that even when not sticking to the plans, they managed to engage in PA. Chores and other home activities were perceived to be more convenient than other types of PA. For example, Father 5 discussed how his preferred exercise plan was to go kayaking [inconvenient] but instead his usual exercise consisted of *'Well the usual things, as far as my exercise, so you know pushing the lawn mower around. I take pride in my lawn- uh you know, through the summer, I manage to do that every weekend.*' (Group 2, Father 5, 40y, father of 2). This finding aligns with findings from Hamilton and White's (2010) interview study, some mothers

reframed their beliefs about housework by considering ways in which chores could be done to achieve their PA for the day (e.g., cleaning more vigorously or turning the radio up to dance around the house). Engaging in chores together, may also be a way to involve children in family PA. Lora et al. (2017) conducted a focus group study and one finding was that fathers supported healthy eating and PA behaviour in their children. Supportive PA behaviours included asking the children to participate in household chores and/or playing sports.

Childcare provision can be helpful… if you have it

Some participants found the demands of childcare meant being active was not possible for them. They alluded to feeling like they were 'putting out fires' or juggling too many demands. Participants described a lack of control and too many obstacles with childcare which prevented them from exercising stating 'Well no, I won't be able to do this because um there's too many variables.' Postpartum mothers may benefit from interventions that allow them to choose preferred activities while teaching them how to overcome barriers (Mailey & Hsu, 2019).

The present findings, however, suggest that the PEEPS intervention helped some participants to address the barrier of childcare by identifying opportunities to offer practical support for one another, such as taking it in turns to look after the children, so their study partner could exercise. Some participants used looking after the children, so their partner could exercise, as a part of their plan. This aligns with the literature that points to the critical role of partner support as an enabler in the PA of mothers (Saligheh et al., 2016; Miller et al., 2002). Some participants in Group 3 described childcare support as more useful than attempts at motivational support:

> *'Um, just … even just things like, um, you know, getting the girls breakfast so I can get ready to go … or um, you know, just things like that is a, is a big help, which he, he does all time. We're definitely 50/50, so that's no problems, that … but that's something that I would appreciate more like than, "Come on, you got to go to the gym"* or *"Come on, you know, get ready or don't eat that or don't", you know. So he, yeah. He knows the right things to do.'* (Group 3, Mother 5, 35y, mother of 2). This aligns with findings from Saligheh et al. (2016) interview study, in which participants described partner support as the "most reliable source of support" and vital in enabling them to exercise.

Commitment and accountability increased but for some the intervention did not meet their requirements

Sometimes, participants felt that "commitment to something" (Group 3, Mother 9, 34y, mother of 3) locked them into a particular course of action, so it became difficult to change the plans when other commitments got in the way or due to the chaotic nature of caring for children. Mother 9 discussed thinking *'well we've got to do this'* which reflects a sense of obligation, and suggests planning could have led to introjected motivation for PA, which can be associated with negative emotional contingencies.

Some participants adopted strategies to implement more flexible plans, realising plans needed to be adapted at short notice if goals were to be achieved. Grandmother 1 described strategies they implemented to pre-empt and address disruption to plans *'And I usually have a plan B and a plan C and a plan D. In case things go wrong (laughs). And that's my personality type, so no. That's why I didn't have a problem with it at all'* (Group 2, Grandmother 1, 61y). However, it's important to note that Grandmother 1 wasn't a mother of a young child, and as alluded to earlier in light of the findings of Bösch et al. (2022), it may be more practical for an older, non-parent to adapt plans. For Mother 9, circumstances were far more complicated:

> *'Um, so one aspect um whether the baby slept well the night before, um and whether or not I have a kid home during the day, 'cause I have one at school full-time and one at school in kindy, so she goes two and a half days a week. And then I have the baby at home, so making a plan for each set day, in my head I had said, "Well no, I won't be able to do this because um there's too many variables".*

Suggestions for future research

In light of the findings, we offer several recommendations for future research to help promote PA during the postpartum period.

The women in our study were from Perth, Australia, a major city in one of the most urbanised nations. A study by Dharod et al. (2011) involved low-socioeconomic status mothers in a rural area in Maine, they found from four focus group discussions, barriers to PA such as a long distance to area resources or no organised activities for adults. It would also be interesting to see if the barriers and facilitators experienced by postpartum mothers in rural areas differ to those in urbanised nations.

Many participants in our study were motived to sign up so they could lose their pregnancy weight. Researchers should explore how to improve body positivity in the postpartum and pregnancy periods. Future studies could also uncover the mechanisms behind wanting to lose baby weight, to see whether it's the postpartum mother's own fitness goals, the media, or the influence from close others, that is initiating this drive. Once the mechanisms are understood, they can be targeted to try and reframe the mothers' outlook of excess baby weight as something positive.

Starting a PA intervention during pregnancy, rather than during the postpartum period, may be helpful for mothers to develop and maintain PA, which may mean they are more likely to incorporate PA into their lives once the baby arrives, rather than starting a completely fresh activity. If mothers start to be more active during pregnancy, then they may develop confidence and realise they enjoy PA. Future studies should focus on activities that are safe for newly pregnant women (e.g., walking/swimming), or recruit pregnant women after the first trimester.

LIFE-Moms involved seven trials for pregnant women living with overweight or obesity (Phelan et al., 2020), and found a reduction in postpartum weight retention. However, many barriers/facilitators for postpartum mothers might not be generalisable to pregnant women. For pregnant women, social support plays an enabling role for PA promotion, and the barriers of tiredness/lack of time were also identified (Harrison et al., 2018). However, Harrison et al. (2018) identified only few environmental factors. Perhaps for postpartum mothers the environmental barriers are more important (e.g., work, childcare, and financial constraints). Future studies should interview pregnant women to see if the barriers and facilitators to PA differ to postpartum women.

Some participants would have preferred to be paired with a physically active role model who could inspire them to be more active. Ginis et al. (2013) conducted a systematic review, of 10 published studies, to determine the effects of peer-delivered PA interventions on PA behaviour. They found, in terms of increasing PA, peer delivered interventions are just as effective as professionally delivered interventions, and more effective than control conditions. In their review, the studies utilised peers in a variety of ways e.g., leading fitness classes, delivering behaviour skills training, providing advice/feedback, social support. Peer mentors can impact motivationally relevant determinants of behaviour including self-efficacy (Bandura, 1997) and self-determination (Ryan & Deci, 2017), and they can teach PA behaviour change skills and provide support if others within healthcare do not have the expertise or time (Ginis et al., 2013). Perhaps in our interventions, as participants were paired with someone who was similarly inactive, they did not increase their self-efficacy as their partner was not role modelling physically active behaviours or teaching them the behavioural skills to be more active post child-birth. Future studies could pair the mothers with another physically active mother who can role model PA. Most of the research with role modelling PA involving

mothers, has focused on how mothers need to act as role models for their children (e.g., Murtagh et al., 2018) so there is a clear research gap in this area.

Strengths and limitations

This study contributed to the literature by scrutinising an intervention which had unexpected and mixed results, and exploring why that might be. We explored barriers and facilitators to two dyadic interventions, both of which involved setting plans. This allowed us to see whether the motivation training had more benefits or drawbacks, compared to the planning training on its own. By interviewing mothers and their study partners, we were able to reflect on a range of perspectives and experiences from an under-researched population.

Many practical challenges were experienced. The presence of the study partner in the dyad interviews was a strength as it widened the breadth of perspective reflected in the study. However it may also have limited participants' responses, if they had focused on socially desirable responses due to their study partner's presence. We only interviewed study 'completers' which means that the findings may not be generalisable to those who discontinued the study.

Conclusion

This study provides insight into the mixed findings from the PEEPS trial (Carr et al., 2021). Interviews with study participants including both postpartum mothers and their study partners has revealed a number of barriers and facilitators to PA engagement as well as practical considerations for future dyadic interventions involving this population. Findings show that we need to learn from the experiences of women who are postpartum and their study partners, to develop interventions that suit their needs. Future dyadic interventions would benefit from adopting a co-production methodology from the outset, so that the needs and views of this population can be more readily addressed in intervention design.

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Data availability statement

The data from this study is available on request from the corresponding author, RMC. Because they contain information that could compromise the confidentiality and privacy of the research participants, the data are not publicly available.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ajsep.2023.07.003.

Appendix

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