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Multiple mediation analysis of the peer-delivered Thinking Healthy Programme for perinatal depression: findings from two parallel, randomised controlled trials

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Background

Low-intensity psychosocial interventions have been effective in targeting perinatal depression, but relevant mechanisms of change remain unknown.

Aims

To examine three theoretically informed mediators of the Thinking Healthy Programme Peer-delivered (THPP), an evidence-based psychosocial intervention for perinatal depression, on symptom severity in two parallel, randomised controlled trials in Goa, India and Rawalpindi, Pakistan.

Method

Participants included pregnant women aged ≥18 years with moderate to severe depression, as defined by a Patient Health Questionnaire 9 (PHQ-9) score ≥10, and were randomised to either THPP or enhanced usual care. We examine whether three prespecified variables (patient activation, social support and mother–child attachment) at 3 months post-childbirth mediated the effects of THPP interventions of perinatal depressive symptom severity (PHQ-9) at the primary end-point of 6 months post-childbirth. We first examined individual mediation within each trial ($n = 280$ in India and $n = 570$ in Pakistan), followed by a pooled analysis across both trials ($N = 850$).

Results

In both site-specific and pooled analyses, patient activation and support at 3 months independently mediated the intervention effects on depressive symptom severity at 6 months, accounting for 23.6 and 18.2% of the total effect of THPP, respectively. The intervention had no effect on mother–child attachment scores, thus there was no evidence that this factor mediated the intervention effect.

Conclusions

The effects of the psychosocial intervention on depression outcomes in mothers were mediated by the same two factors in both contexts, suggesting that such interventions seeking to alleviate perinatal depression should target both social support and patient activation levels.

Declaration of interest

None.

Keywords

Depressive disorders; psychosocial interventions; low- and middle-income countries; behavioural activation; mediation analysis.

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Depression is the leading cause of disability among women worldwide.[1] Psychosocial interventions, including cognitive, behavioural and interpersonal therapies, have been effective in targeting perinatal depression.[2,3] However, the growing field of treatment evaluation, including interventions delivered by non-specialist providers (NSPs),[4] has rarely evaluated how these treatments work, which may affect their replication and scale-up. This is particularly true for the field of perinatal mental health, where effective psychosocial interventions exist, are recommended as first-line interventions by international guidelines (the World Health Organization's Mental Health Global Action Programme)[5] and have been successfully implemented by NSPs, including peers. Mediation analysis is a technique to evaluate the theoretical basis of interventions to shed more light onto this so-called 'black box'[6] of relevant treatment factors.[7] Investigation of the theoretically informed mediators of treatments may illuminate how these treatments operate, guide clinicians to predict individual patient trajectories and guide researchers to develop more effective interventions.[7,8]

This study examined the role of three potential and theoretically informed mediators within the South Asian Hub for Advocacy, Research and Education on Mental Health (SHARE) trials, supported by the National Institute of Mental Health (NIMH).[9,10] The goal of SHARE was to adapt the Thinking Healthy

Programme (THP)[11] for delivery by peers (called the Thinking Healthy Programme Peer-Delivered; THPP) in India and Pakistan. The THP was originally developed and evaluated in Pakistan[11] and is recommended by the World Health Organization for the treatment of perinatal depression in low-resource settings (http://www.who.int/mental_health/maternal-child/thinking_healthy/en/). Unfortunately, the delivery of THP was hampered by the existing demands on community health workers.[12] Two parallel trials examined the effectiveness of the THPP in Goa, India (hereafter referred to as THPP-India) and Rawalpindi, Pakistan (THPP-Pakistan).[13] Peers, defined as mothers living in the same community as mothers participating in the intervention, were found to be an acceptable and feasible delivery agent within both of these settings.[14]

The theoretical foundation and relevant mediators of THPP

THP was originally designed as an individual, 16-session, cognitive–behavioural therapy that was delivered by community health workers.[15] Using simplified cognitive and behavioural elements, the intervention primarily focused on three key relationships: the woman's relationships with herself, her family and her infant.[11] As well as retaining a core emphasis on these three areas, the content of THPP was modified to include a stronger

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emphasis on behavioural activation, as this was found to be more feasible for delivery by peers.[16] Behavioural activation is a parsimonious approach that is easy to understand and implement;[17] it has been successfully implemented by other NSPs, including lay counsellors, nurses, midwives and undergraduate students, to effectively reduce depressive symptoms in general and perinatal populations.[18–21] THPP conceptualises behavioural activation as the degree to which women (pregnant and postpartum) reportedly engaged in a variety of activities – including those pertaining to the mother's personal well-being; eliciting social support from spouse, family and friends; and her perceived attachment to her developing infant – and their sense of accomplishment in completing these activities.

Consequently, and in line with the theoretical emphasis on relationships with self, other and baby, we selected three potential mediators to explain the pathways of change underlying THPP. These were patient activation; perceived support (hereafter referred to as social support) from one's spouse, family and community; and mother–child attachment. These three variables have been found to significantly influence depression outcomes in perinatal populations,[20,22–24] and both patient activation[25,26] and social support[27,28] have been found to mediate the effects of behavioural activation–oriented treatments on depression outcomes.

Analysis of mediation effects is important whether or not there is an overall treatment effect because it sheds light on different aspects of the intervention, such as whether the intervention affected the mediator and whether the mediator is related to the outcome. It is also possible that the test of mediation can have more statistical power than the test of the overall intervention effect. Because mediation analyses do not require a direct effect of the intervention on long-term outcomes (see *Method*), the examination of potential mediators is key in illuminating causal pathways irrespective whether an intervention is effective.[29]

In this study, we aimed to test the theory of THPP by conducting a rigorous mediation analysis within two parallel, randomised controlled trials (RCTs). Specifically, we examined whether three theoretically informed variables (patient-reported activation, social support and mother–child attachment) at 3 months post-childbirth mediated the effects of the THPP intervention on perinatal depressive symptoms at 6 months post-childbirth.

Method

Setting, participants and design

The study was conducted in two locations: the semi-urban North District of the state of Goa, India and Kallar Syeddan, a rural subdistrict of Rawalpindi in the province of Punjab, Pakistan. Participants included pregnant women in the second or third trimester, aged ≥18 years with moderate to severe depressive symptoms, as defined by a Patient Health Questionnaire 9 (PHQ-9) score ≥10.[30] Potentially eligible participants were screened for depression with a locally validated version of the PHQ-9[11,31] after providing written informed consent for screening (or witnessed informed consent/audio recordings for illiterate participants).

In THPP-India, an individual RCT with 1:1 allocation, stratified by place of residence (rural versus urban) was conducted for a total sample of N = 280 participants. In Pakistan, a cluster RCT with 1:1 allocation, comprising 40 village clusters stratified by 11 union councils, was conducted with a total sample of N = 570 participants. Participants were recruited from routine healthcare settings, including two antenatal clinics and two primary health centres in Goa, and from the registers of the community-based Lady Health Workers (LHWs) across the rural subdistrict of Kallar Syeddan in Pakistan.

Mothers were randomised to either the THPP interventions or enhanced usual care (EUC). Ethical approval was obtained from the Institutional Review Boards at the University of Liverpool, the London School of Hygiene and Tropical Medicine, the Human Development Research Foundation and Sangath Center (the implementing institutions of each trial in Pakistan and India, respectively) and the India Council of Medical Research. Both trials are registered on Clinicaltrials.gov: identifiers NCT02104232 for THPP-India and NCT02111915 for THPP-Pakistan. The trials protocols and results been described in full elsewhere.[9,10,13]

Treatment arms

THPP

The intervention for moderate to severe perinatal depressive symptoms being assessed in these trials was the THPP. As mentioned, THPP is the adapted (peer-delivered) version of the THP that was originally developed and evaluated (based on delivery by government-employed LHWs) in Pakistan.[11] In both sites, THPP comprised up to 14 sessions of behavioural activation, each lasting up to 45 min. The intervention began in the antenatal phase and lasted up to 6 months postnatally, with the most active phase of treatment concluding by the end of the first trimester. The core strategies used by the peers, focusing on the three areas of personal well-being, relationship with the infant and relationship with significant others, were active listening, collaboration with the family, guided discovery using pictures and stories, homework and behavioural activation (identifying and replacing unhealthy behaviours with healthy ones and practising them).[16] THPP-India was implemented primarily in participants' homes and individually randomised, and THPP-Pakistan was conducted in a community setting with woman randomised in village clusters to avoid contamination.

In both sites, THPP was delivered by peers, defined as women with children, a similar sociodemographic background as participants and good communication skills,[14,16] who were recruited from the local community through word of mouth, particularly from key informants such as community health workers, women's self-help groups and community elders. Recruited peers underwent 1 week of classroom-based training that included learning the THPP content, general counselling skills, confidentiality issues and interactive learning involving role-play. This was followed by competency assessments that determined the selection of peers for the trial. Peers were initially supervised by expert trainers, followed by a cascade model of training using peer-led supervision. In THPP-India, 37 peers were trained and 26 were selected for the trial; in THPP-Pakistan, 66 peers were recruited and selected for the trial. Their mean age and education levels were 37.85 years (range, 27–50 years) and 11.85 years (range, 9–15 years), respectively, in India, and 28.0 years (range, 21–45 years) and 6.6 years (range, 0–14 years), respectively, in Pakistan.[16]

EUC

Participants received EUC in both the intervention and control arms. In both arms, EUC comprised the following: (a) informing participants about their diagnosis of depression; (b) in Pakistan, informing depressed participants about ways to seek appropriate healthcare (i.e. by going for assistance to their LHWs, the primary health centre or the tertiary health centre, which is the Institute of Psychiatry, Rawalpindi, Pakistan); (c) in India, providing gynaecologists with the findings of the screening results for perinatal depression; (d) providing the primary healthcare centres and the gynaecologists with the adapted World Health Organization Mental Health Global Action Programme treatment guidelines for

perinatal depression[32]; and (e) providing an information sheet about how and where to seek healthcare from, including local community health workers, primary health facilities and tertiary care facilities, both during pregnancy and beyond.

Measures

Outcome

Our study outcome was depressive symptom severity scores on the PHQ-9 at 6 months post-childbirth, as assessed by independent evaluators who were blind to treatment status. Similar to other mediation analyses,[33] this variable was selected over the trials' other primary outcome of remission status because depressive symptoms offered a continuous score, which provides more variability in our regression analyses.[34]

Potential mediators

Three separate scales are used to assess the three *a priori* mediators at the 3-month post-childbirth outcome assessment.

(a) *Patient activation*: The PREMIUM Abbreviated Activation Scale (PAAS) is a five-item scale, originally developed and used in a separate trial of a brief behavioural activation treatment (the Healthy Activity Program) trial,[26] and is based on the Behavioural Activation for Depression Scale.[35] PAAS includes five indicators of behavioural activation – a treatment factor that is explicitly targeted in the THPP trial – such as the mother's self-report of her engagement with a variety of activities ('Did you engage in many different activities?' and 'Were you an active person and accomplished the goals you set out to do?'), and associated pleasure ('Did you do things that were enjoyable?' and mastery ('Are you content with the amounts and types of activities you did?'). The final item included a reverse question: 'Did you spend long periods thinking over and over about your problems?'. All five items are assessed on a scale of 0 ('not at all') to 5 ('yes, completely') for a total continuous score of 25. In both settings, the PAAS at 3 months showed good internal consistency ($\alpha = 0.801$ in THPP-India and $\alpha = 0.811$ in THPP-Pakistan) and good concurrent validity with social support at 3 months ($r = 0.341$, $P < 0.001$ in THPP-India and $r = 0.367$, $P < 0.001$ in THPP-Pakistan).

(b) *Social support*: The Multidimensional Scale of Perceived Social Support (MSPSS) is a 12-item scale for assessment of mothers' perceived social support from one's spouse, family and community.[36] This scale has been widely used and previously validated in current study contexts.[11,37] Mothers are asked to rate the availability of social support on a five-point Likert scale, ranging from 1 ('strongly disagree') to 5 ('strongly agree'), for a total continuous score ranging from 1 to 60. Sample items include 'I get the emotional help and support I need from my family'. In our study, this scale showed excellent internal consistency ($\alpha = 0.862$ in THPP-India and $\alpha = 0.853$ in THPP-Pakistan) and excellent predictive validity between social support between baseline and 3 months ($r = 0.489$, $P < 0.001$ in THPP-India and $r = 0.358$, $P < 0.001$ in THPP-Pakistan), and social support between and 3 and 6 months ($r = 0.449$, $P < 0.001$ in THPP-India and $r = 0.359$, $P < 0.001$ in THPP-Pakistan).

(c) *Mother–child attachment*: The Maternal Postnatal Attachment Scale assesses mother's reported attachment to the child and satisfaction with parenting.[38] The original scale was reduced to seven culturally relevant items, as determined by local clinical experts, to rate the mother's feelings, thoughts and relationship to her baby after birth. Sample items include rating one's competence or enjoyment when interacting with the baby.

For example, 'When I interact with my baby, I feel…' very incompetent (scored 1) to very competent (scored 5). As in the original scale, all items score from 1 to 5, with a higher score indicating a higher degree of maternal attachment to her baby (total continuous score of 35). The scale has been adapted for the Pakistan setting,[39] and shows sound internal consistency ($\alpha = 0.791$ in THPP-India and $\alpha = 0.793$ in THPP-Pakistan) as well as good concurrent validity with social support at 3 months for both sites ($r = 0.225$, $P < 0.001$ in THPP-India and $r = 0.115$, $P < 0.01$ in THPP-Pakistan).

Baseline sample characteristics related to the patient (age, education, marital status, occupation, number of children, chronicity (duration of depressive symptoms) and PHQ-9 score) were all examined as potential covariates.

Data collection

Independent interviewers assessed primary outcomes at the 3- and 6-month post-childbirth end-points. These time-points were selected in the larger trials to estimate the active phase of THPP and to examine its potentially sustained effects, respectively. These data were recorded using tablets that were uploaded in real-time to a server with data being reviewed by independent data managers.

Analyses

Our study was a secondary mediation analysis within the context of two parallel RCTs. Mediation conditions were met if the regression models (described below) demonstrated that there were significant effects of the independent variable on the proposed mediator ($X \rightarrow M$) and of the proposed mediator on outcome scores ($M \rightarrow Y$), adjusted for the independent variable,[40] where significance was defined as $P < 0.05$. It is possible for mediating effects to be present even if there is no overall effect of the independent variable on the dependent variable ($X \rightarrow Y$).[29] An intention-to-treat analysis was conducted and multiple imputation methods were used to account for missing values. Using SAS 9.4 software steps PROC MI and PROC MIANALYZE, five imputed data-sets were created and the model averaged results across the five iterations. To ensure consistency across trials, data was analysed at the individual participant level, while controlling for the cluster-level variable in the regression analysis. Mplus version 8.1[41] was used to conduct mediation analyses.

Individual mediation pathways

First, means and 95% CIs were estimated for baseline variables, followed by means, 95% CIs and *t*-tests for each mediating variable and depression outcomes at 3 and 6 months post-childbirth. Second, because measures of patient activation and mother–child attachment were not collected at baseline, we used baseline social support scores in the model. Baseline social support scores were significantly correlated with patient activation ($r = 0.248$, $P < 0.001$ in THPP-India and $r = 0.161$, $P < 0.01$ in THPP-Pakistan) and mother–child attachment ($r = 0.195$, $P < 0.01$ in THPP-India and $r = 0.166$, $P < 0.01$ THPP-Pakistan) at 3 months post-childbirth.

Next, we used multiple linear regression modelling to estimate models whereby the dependent variable was PHQ-9 depressive symptoms at 6 months post-childbirth. In each trial, we examined three individual pathways to determine whether patient activation, social support and mother–child attachment mediated the effects of THPP-India or THPP-Pakistan on depressive symptoms. To do this, we first examined the effects of treatment arm (THPP versus EUC) within each trial on the three proposed mediators followed by the examination of effects of the three proposed mediators on

Table 1 Baseline characteristics of participants

Variable, mean (95% CI) unless otherwise indicated	THPP-India (N = 280)	THPP-Pakistan (N = 570)	Pooled (N = 850)
Age	25.18 (24.63–25.71)	27.05 (26.65–27.44)	26.43 (26.11–26.75)
Education level, n (%)			
No formal education	34 (12%)	107 (19%)	141 (17%)
Up to primary	120 (43%)	39 (7%)	159 (19%)
Up to secondary	90 (32%)	333 (58%)	423 (50%)
Beyond secondary	36 (13%)	91 (16%)	127 (15%)
Marital status (% married)	100%	99.6%	99.9%
Parity, n (%)			
Primiparous	119 (43%)	102 (18%)	221 (26%)
Multiparous	161 (57%)	468 (82%)	629 (74%)
Occupation, n (%)			
Does not work outside of home	237 (85%)	533 (94%)	770 (91%)
Works outside of home	43 (15%)	37 (6%)	80 (9%)
PHQ-9 score (0–27)	13.38 (12.98–13.77)	14.69 (14.38–14.99)	14.26 (14.01–14.50)
MSPSS score (0–7)	5.29 (5.16–5.42)	3.93 (3.82–4.05)	4.38 (4.28–4.48)

THPP, Thinking Healthy Programme Peer-delivered; PHQ-9, Patient Health Questionnaire 9; MSPSS, Multidimensional Scale of Perceived Social Support.

depressive symptom outcomes. This resulted in the examination of six pathways, in which we controlled for baseline PHQ-9 and social support scores as well as patient education levels. In THPP-Pakistan, we also controlled for clusters in these regressions. The variance inflation factor (VIF) was assessed for each independent variable within each model to estimate multicollinearity (VIF ≥ 5).

Finally, if mediation conditions were met, we assessed individual mediating pathways using the Monte Carlo method for assessing mediation (MCMAM).[42] In this approach, a distribution of the indirect effect was used to estimate a confidence interval around the observed value of the indirect effect.[43] MCMAM performs better than the Sobel test and comparably with bootstrap approaches,[35,44] and no direct effect is required of the independent variable (in this case, THPP-India or THPP-Pakistan) on the dependent variable (depressive symptoms at 6 months).[29,40] In this study, we computed a 95% CI with 20 000 repetitions. Following the recommendations of Selig and Preacher[45] for MCMAM, non-standardised betas were used for individual mediation analyses.

Pooled analysis

After assessing individual mediators within each trial, we conducted a pooled mediation analysis. This approach was used to ensure that the proposed mediators were first being assessed within their respective trials and did not assume that the relations between the proposed mediators and outcomes will be similar across trials. Data were pooled by two independent statisticians and analysed at the individual participant level. In the pooled analysis and to compare results across a variety of measures, standardised betas are presented. We examined the role of all three potential mediators simultaneously on the same PHQ-9 depressive symptom severity score. Similar to the individual mediating pathways, we controlled for baseline PHQ-9 and MSPSS scores, cluster and patient education levels. Finally, and across all participants (N = 850), we estimated the contribution of each potential mediator on the total effect by dividing each mediating effect by the total effect. The sample size of this study is reasonable to conduct this analysis, where a minimum of 500 observations is suggested.[46]

Results

Participants included those randomised to THPP (n = 140 in THPP-India and n = 283 in THPP-Pakistan) compared with

EUC (n = 140 in THPP-India and n = 287 in THPP-Pakistan). Pooled analyses involved the total sample across the two trials (N = 850). On average, participants across the two trials were 26 years of age (95% CI 26.1–26.8 years; range, 18–45 years); the majority had up to primary and secondary levels of education (75% in THPP-India v. 65% in THPP-Pakistan), were married (everyone except one participant in THPP-India) and had more than one child (82% in THPP-Pakistan and 57% in THPP-India). As expected, fewer women in THPP-Pakistan worked outside of the home than in THPP-India (6 v. 15%). Descriptive scores of variables related to the current analysis are detailed in Table 1. Data were missing at the 6-month follow-up among 10.3% of participants in THPP-India (n = 29) and 13.7% (n = 117) in THPP-Pakistan. No differences were found between participants who remained versus those who dropped out in both trials; similarly, there were no differences between treatment and control conditions. These and other results of each trial have been published elsewhere.[9,10]

Mediational pathways

Descriptive frequencies and t-tests of potential mediating variables and clinical outcomes can be found in Table 2. In each individual site, there were higher patient activation and support scores at 3 months and lower depressive symptoms at both 3 and 6 months post-childbirth among THPP intervention participants compared with EUC participants; however, these differences were not significant for social support scores in THPP-Pakistan or for depression outcomes at 6 months in either individual trial. In addition, there was no significant difference in mother–child attachment scores between arms in either trial.

Individual mediators were analysed within each trial and detailed in Table 3. In both trials, and once correlates were considered in regression models, we found that improved patient activation and social support at 3 months post-childbirth mediated the effects of THPP intervention on reduced depressive symptom severity. This was not the case for mother–child attachment, which was found to have an effect on depressive symptoms but no influence on the effect of the THPP intervention on this variable; thus, no indirect effect was calculated because mediation conditions were not met. There was no evidence for multicollinearity (VIF < 3).

In the pooled analysis, a similar pattern emerged (Fig. 1). Specifically, we found significant indirect effects of both patient activation ($a \times b$ = 0.027, 95% CI 0.016–2.210, P = 0.027) and social support ($a \times b$ = 0.035, 95% CI 0.013–2.059, P = 0.040) at 3 months

Table 2 Raw mean scores (95% CI) of potential intervention mediators and depression outcomes by arm and trial

Variables	THPP-India (N = 140)	EUC (N = 140)	t-Test	THPP-Pakistan (N = 283)	EUC (N = 287)	t-Test	Pooled THPP (N = 423)	Pooled EUC (N = 427)	t-Test (effect size)
Potential mediators									
Patient activation (0–25)	12.54 (11.86–13.23)	11.09 (10.33–11.85)	2.78**	17.59 (17.15–18.03)	16.83 (16.34–17.32)	2.56**	15.81 (15.35–16.26)	14.72 (14.20–15.23)	3.13**
Social support (0–7)	5.65 (5.45–5.83)	5.30 (5.10–5.50)	2.31*	4.53 (4.37–4.68)	4.41 (4.23–4.57)	1.04[a]	4.92 (4.79–5.05)	4.73 (4.59–4.87)	1.94*
Mother–child interaction (0–35)	21.14 (20.87–21.41)	20.90 (20.62–21.18)	1.23[a]	19.21 (19.0–19.4)	19.19 (18.9–19.4)	0.10[a]	17.68 (16.84–18.52)	16.77 (15.89–17.65)	1.47[a]
Depression scores									
PHQ-9 at 3 months (0–27)	4.26 (3.51–5.02)	5.81 (4.78–6.83)	−2.44**	6.16 (5.41–6.90)	7.82 (6.88–8.75)	−2.75**	5.48 (4.92–6.04)	7.08 (6.37–7.79)	−3.51***
PHQ-9 at 6 months (0–27)	3.47 (2.66–4.27)	4.45 (3.56–5.33)	−1.61[a]	6.07 (5.30–6.85)	6.78 (5.97–7.59)	−1.25[a]	5.17 (4.57–5.76)	5.93 (5.31–6.55)	−1.75****

THPP, Thinking Healthy Programme Peer-delivered; EUC, enhanced usual care; PHQ-9, Patient Health Questionnaire 9.
a. Not significant.
*P < 0.05, **P < 0.01, ***P < 0.001, ****P < 0.10.

post-childbirth, suggesting their independent roles in partly mediating the effects of the THPP intervention on depression outcomes at 6 months post-childbirth. This was not the case for the hypothesised mediator of mother–child attachment, which did not result in a significant indirect effect ($a \times b = 0.015$, 95% CI 0.012–1.288, $P = 0.198$). The total direct effect of THPP on PHQ-9 outcomes was standardised $\beta = 0.148$ (95% CI 0.033–0.269, $P = 0.038$), demonstrating a significant effect of the intervention on depression outcomes when pooling the data across the two trials. Furthermore, we observed that social support was found to be the most significant among the two significant mediators across trials. We found that social support and patient activation at 3 months accounted for 23.6 and 18.2%, respectively, of the total effect of THPP on PHQ-9 depressive symptoms at 6 months.

Finally, recent research has suggested the consideration of unmeasured confounders.[46–48] We followed these suggested methods and found that we would require a large correlation ($r = 0.5$ or higher) to remove the mediating effects of patient activation or social support on long-term depression outcomes.

Discussion

This study found that two of the three prespecified variables, patient activation and social support at 3 months post-childbirth, mediated the effects of THPP on depression outcomes at 6 months post-childbirth. Thus, despite varying contexts, the THPP intervention worked through the same mediators in two diverse contexts. This suggests the generalisability of the intervention and emphasises that low-intensity psychosocial interventions seeking to alleviate perinatal depression should focus on improving social support and patient activation levels.

Our results are consistent with THPP's theoretical emphasis on behavioural activation, which suggests that the key to feeling less depressed is to increase enjoyable or fulfilling activities that align with one's values and key relationships.[17] After taking into account relevant correlates, we also found that women who had higher levels of patient activation and social support reported lower depressive symptoms. Furthermore, and in line with previous mediation studies,[25–28,49] these factors were found to independently and concurrently mediate the effects of the THPP intervention on perinatal depressive symptoms. The results add to the interpretation by suggesting that improving patient activation and social support levels within perinatal depression interventions may benefit a reduction in perinatal depressive symptoms. However, none have examined these mediators simultaneously and when delivered by an NSP in community-based settings, or in diverse global and cultural contexts.

We did not find that the THPP intervention influenced mother–child reported attachment. An independent observation of mother–child attachment and interaction, as implemented in other perinatal depression treatment programs,[50,51] may be more reliable than the measure used in our study. Alternatively, this may be owing to the intervention content and delivery lacking an explicit emphasis on mother–child attachment and interactions. These results may reflect the widely inconsistent effects of psychosocial interventions for maternal depression on child development outcomes, and one reason for this may be because there is a lack of emphasis on explicitly targeting mother–child interactions.[28] For example, despite robust and persistent effects on reduced maternal and child mental health outcomes, the original THP trial did not show any positive effects on child growth or developmental outcomes.[52] Similarly, there are few mother–child programmes that have explicitly targeted maternal mental health symptoms.[28] To achieve the integration of mental health services in other services, perhaps a

Table 3 Individual mediating pathways within THPP-India and THPP-Pakistan

| Mediating pathways	THPP-India (N = 280)			THPP-Pakistan (N = 570)		
	β^a	S.E.	F-value	β	S.E.	F-value
1. Patient activation						
a (THPP → patient activation)	−1.36**	0.50	7.68***	−1.91***	0.54	5.64***
b (patient activation → PHQ-9)	−0.28***	0.08	5.65***	−0.34***	0.08	5.17***
a × b [95% CI]	0.38 [0.08–0.78]			0.64 [0.23–1.18]		
2. Social support						
a (THPP → social support)	−0.33**	0.13	15.74***	−0.285*	0.143	8.17***
b (Social support → PHQ-9)	−1.32***	0.32	5.39***	−1.144***	0.295	4.90***
a × b [95% CI]	0.43 [0.09–0.88]			0.33 [0.01–0.74]		
3. Mother–child interaction						
a (THPP → mother–child interaction)	−0.22^c	0.19	2.31*	−0.05^c	0.16	3.85**
b (mother–child interaction → PHQ-9)	−0.06^c	0.21	2.72*	−0.46*	0.18	5.73***
a × b [95% CI]^b	—			—		

THPP, Thinking Healthy Programme Peer-delivered; PHQ-9, Patient Health Questionnaire 9; MSPSS, Multidimensional Scale of Perceived Social Support.
a. Non-standardised betas are presented. Individual pathways controlled for baseline depressive (PHQ-9) and social support (MSPSS) scores, patient education and cluster (for THPP-Pakistan).
b. Did not meet conditions of mediation (X → M or M → Y where $P < 0.05$) and therefore indirect effect was not calculated.
c. Not significant.
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
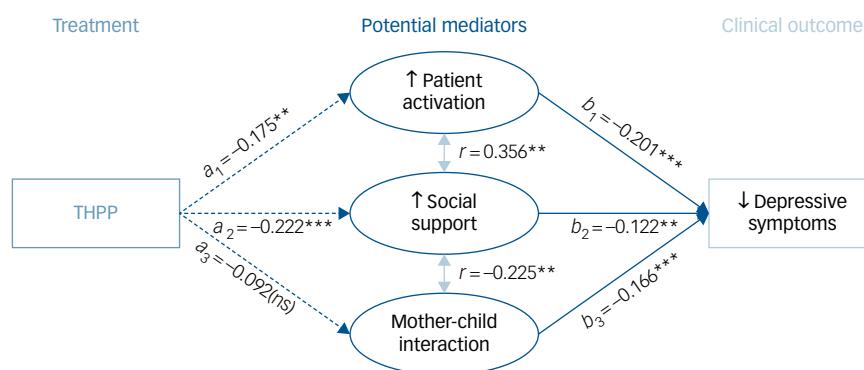
Fig. 1 Multiple mediation analyses across sites (N = 850). Standardised betas are presented. All mediation analyses controlled for baseline depressive (Patient Health Questionnaire 9) and social support (Multidimensional Scale of Perceived Social Support) scores and patient education and cluster (for THPP-Pakistan). r values refer to Pearson correlation. **$P < 0.01$, ***$P < 0.001$. THPP, Thinking Healthy Programme Peer-delivered. ns, not significant.

stronger emphasis on mother–child attachment and interactions is required in maternal mental health interventions to influence both maternal and child development outcomes.

Limitations

We also acknowledge several limitations. First, there may be other potential mediators that may explain the THPP intervention. For example, we did not measure therapeutic alliance between the peer counsellor and participant. Therapeutic alliance is a frequently studied phenomenon in the psychosocial treatment literature[53] and may be particularly relevant for a peer context. In addition, we did not assess how cognitions may have influenced key patient behaviours and depression outcomes. This has been examined in other trials[54] and the interplay of patient cognitions and behaviours may inform how THPP works. Second, all of our measures were based on self-report. As mentioned above, independent observations of mother–child attachment, including the Home Observation Measurement of the Environment (HOME) Inventory[51] or video recordings,[4,9] have been conducted in other low-resource settings[28] and may offer a more valid assessment of mother–child attachment, but we know of no other objective measures for activation or social support. Third, we did not assess

patient activation levels or were unable to assess mother–child attachment levels at baseline. The latter was not possible because THPP began during the antenatal phase. If we had baseline measures of these variables, power to detect mediated effects would have been increased to account for baseline patient variables or potentially explain lack of effects on perceived mother–child attachment. Finally, our results supporting activation and social support as mediators suggest that further investigation is required of these underlying mechanisms of psychosocial interventions for perinatal mental health.[55]

In conclusion, this study contributes to the larger field of psychosocial treatment literature by identifying two key and theoretically informed mediators for perinatal depression. In two diverse contexts, our findings highlight that one's relationship with the self and others plays a key role in alleviating perinatal depressive symptoms. Additional strengths of our study are following key guidelines for mediation,[56,57] including the assessment of multiple potential mediators, the use of a temporal design with hypothesised mediators being assessed at distinct time-points, large sample sizes within RCT designs and adjusting for key variables at baseline. Our findings suggest the generalisability of the THPP across two diverse contexts, and that psychosocial interventions seeking to alleviate perinatal depression should target both social support and patient

activation levels. Finally, peer-delivered interventions have the potential of being more feasible than other interventions and might result in a greater adherence of patients, especially from patients that are more socioeconomically disadvantaged and isolated from the healthcare system.

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psychiatry in music

The Fall: 'Rowche Rumble'

Gary Woods

Released in 1979, 'Rowche Rumble' was the third single from fêted indie stalwarts The Fall. It failed to trouble the regular Top 75 charts but did reach number 31 on the inaugural UK indie chart in January 1980. A perennial champion of the band, the late disc jockey John Peel selected the record within his 'Festive Fifty' in both 1979 and 1980. The song was reputedly inspired by the group's creative force and only constant member Mark E. Smith's former work as a shipping clerk, during which he claimed that an administrative error resulted in him receiving a large consignment of barbiturates from Hoffmann-La Roche that he duly concealed around Manchester for his own recreational consumption.

Rather than the barbiturates, however, the song's subject matter is unmistakably diazepam, with Roche's blockbusting medication's brand name Valium featuring several times in the lyrics. It is suspected that the Swiss pharmaceutical giant's name was deliberately misspelled in the song's title for legal reasons. Coinciding with increasing evidence of the benzodiazepine's addictive potential, the song offers a damning critique of society's contrasting perceptions of prescribed and non-prescribed substances of misuse, Smith observing large numbers of the population as addicted to prescription medications 'while condemning speed and grass'. Smith appears to suggest a conflict of interest between the pharmaceutical industry and the government of the day, the perceived hypocrisy further emphasised via the use of the proverb 'Physician, heal thyself'. In documenting the use of diazepam among middle-aged females, the song shares obvious similarities with the Rolling Stones' 1966 track 'Mother's Little Helper', although Smith's lyrics are significantly darker, referring to 'menopause wives' and portraying the prescribers as cynical and condescending.

Formed in Prestwich, Greater Manchester, in 1976, the band was named after an Albert Camus novel. A founder member, keyboardist Una Baines, and an early manager (Kay Carroll) were both previously employed as psychiatric nurses in Prestwich Hospital, formerly Europe's largest asylum site in the early 20th century. Several of the band's songs feature mentions of psychiatric themes, including depression, paranoid ideation, thought interference, mental hospitals and lobotomies. A long-term heavy drinker and amphetamine user, Smith died of lung and kidney cancer in January 2018.