THE DIFFERENTIAL ROLE OF PRACTICAL AND EMOTIONAL SUPPORT IN INFANT FEEDING EXPERIENCE IN THE UK

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Abstract

Social support is a known determinant of breastfeeding behaviour and is generally considered beneficial. However, social support encompasses a myriad of different supportive acts, providing scope for diverse infant feeding outcomes. Given the vulnerability of postpartum mental health, this paper aims to explore both how support prolongs breastfeeding and which forms of support promote the positive experience of all infant feeding. Using survey data collected online from 515 UK mothers with infants aged 0-108 weeks, cox regression models assessed the relationship between receiving different types of support, support need, and breastfeeding duration. Quasi-binomial logistic regression models assessed the relationship between receiving support, infant feeding mode, and maternal experience of infant feeding. Rates of negative infant feeding experience indicate widespread need for support: e.g. 38% of currently, 47% of no longer, and 31% of never breastfeeding women found infant feeding stressful. Overall, practical support via infant feeding broadly predicted shorter breastfeeding durations and poorer feeding experience; results in relation to other forms of support were more complex. Our findings indicate different forms of support have different associations with infant feeding experience. They also highlight the wide range of individuals beyond the nuclear family on which postpartum mothers in the UK rely.

Keywords

Infant feeding, breastfeeding, social support, subjective experience, cooperative breeding, life history theory

Background

Social support is important for mother-infant outcomes including postnatal depression [1], mother-infant bonding and attachment [2,3], labour progression [4], birth weight [4,5], and breastfeeding behaviour [6]. Evolutionary scholars have recently proposed that human evolution occurred in "an adaptive sociocultural perinatal complex" [7] characterised by extensive social support for the mother-infant dyad, necessitated by the physical and energetic costs of gestation, labour, lactation, and the highly dependent state in which human infants are born and are slow to develop out of. Public health initiatives in high income countries often leverage social support to improve mother-infant outcomes, with some success [8]; however, as the case of infant feeding in the UK highlights, more work is needed to understand how mothers can be best supported. Breastfeeding is the public health gold standard, and while around 75% of UK mothers do initiate breastfeeding [9], at last assessment only 1% of infants were exclusively breastfed for the WHO recommended six months [10]. Under perceived pressure to breastfeed, the emotional wellbeing of women who fail to achieve their breastfeeding goals suffers [11,12]. Non-breastfeeding mothers, who commonly report a lack of support with infant feeding, are also exposed to emotional difficulties [13,14]. While the literature acknowledges that social support comes in different forms, often drawing on one or more of House's [15] four types of support (*informational, instrumental* or *practical, emotional,* and *appraisal*), social support is broadly considered to be uniformly beneficial for physical and mental health [16]. However, these four support types encompass a myriad of different support acts, providing scope for potentially diverse consequences; not all of which are likely to be in line with public health or recipient ideals. To better understand the intersection of social support and infant feeding, here we apply the theoretical framework of evolutionary life history theory (LTH) to detailed data on the support receipt and infant feeding experiences of 515 UK women.

LHT is a capital-based approach that deals with how organisms maximise their genetic fitness (i.e. number of genetic copies in future generations) by extracting resources from the environment, and investing them in survival, growth, and reproduction (encompassing mating and parenting) across the life course [17]. Organisms which make the best use of resources (be that time or energy) during their lives will obtain the highest fitness payoffs. For any individual organism, energy is finite and a given unit of energy can only be invested once,

which results in trade-offs between alternative investment strategies [17]. Further, the propagation of genes in future generations relies not only on the children's survival but also on their condition, as this impacts their future ability to reproduce. This 'biological fitness' of children may be enhanced by parental investment, however such investments necessarily come at a cost to the parent's ability to invest in themselves or other offspring (either current or future) [18]. Thus, under LHT a mother's capacity to invest in reproduction and resulting children is understood to be dependent on her resources (i.e. time and energy). A key implication, for present purposes, is that the receipt of different forms of support will differentially augment a mother's resource availability (or capital), thus likely have varying impacts on maternal investment decisions and their behavioural manifestations, such as infant feeding.

Accordingly, a handful of studies have noted that practical and emotional support have different, opposing, relationships with maternal behaviour; for instance, emotional support was positively associated with breastfeeding duration in Canada [19] and the likelihood of having a second child in the UK [20], while practical support was linked to lower breastfeeding levels in the UK [21] and Japan [22] and decreased likelihood of having a second child in the UK [20]. However, less than ideal proxies for support (e.g. contact frequency [21]) are often used, further masking varied relationships between outcomes and different support acts falling under the umbrella of the same support 'type'. For example, we have previously shown that that both emotional and practical support predicted increased likelihood of breastfeeding at two months in the UK, *except* when practical support involved allofeeding (i.e. individuals other than the mother feeding the infant), which correlated with reduced likelihood of breastfeeding [6].

A LHT approach to understanding maternal behaviour also raises an additional important insight: because mothers are expected to maximise fitness via investment trade-offs, what is 'best' from a public health perspective may not be what is optimal for a mother and her children. Clashes between public health ideals and maternal behaviour often entail the stigmatisation of mothers, which is detrimental to maternal wellbeing; this is amply illustrated by the stigma attached to not breastfeeding [14,23,24], resulting in recent calls for public health approaches to breastfeeding to operate "with the mother in mind" [11]. Therefore,

whilst from a public health perspective it is important to understand which forms of social support encourage the ideal of prolonged breastfeeding [25], it is also crucial to understand which forms of support promote the positive subjective experience of all infant feeding.

Practical support and infant feeding

The form practical support takes is hypothesised to determine the relationship it will have with infant feeding outcomes. As Page et al. (2021)[26] (this issue) and others point out [7,27], support can impact maternal time and energy budgets in two ways. When mothers are *substituted* by others they are 'released' from a proportion of their daily tasks and are able to 'use' this saved energy elsewhere. This is particularly true of help with infant feeding. Lactation is extremely energetically expensive for a mother [28,29], both in absolute terms and in comparison to formula feeding, as only the mother (typically) can breastfeed. Help with bottle feeding (either with formula and to a lesser degree expressed milk) alters the opportunity costs of maternal investment in infant feeding in a variety of ways, for instance: by reducing the energy expenditure associated with lactation; curtailing the mother's time and energy spent holding and feeding the infant; and, though expressing milk requires time and energy, infant feeding becomes more flexible. Such alterations may allow a mother to invest in other tasks, such as caring for other children or resting and recuperation. This contrasts with other forms of practical support, such as help with domestic chores, which *subsidises* the time and energy budget of mothers, affording mothers the option to channel additional resources into their infant – which may result in her breastfeeding for longer.

Whether practical support positively affects maternal subjective experience of infant feeding, impacting postnatal behavioural outcomes and mental wellbeing, is likely dependent on a woman's investment goals. For example, a mother who wants to breastfeed is likely to find practical support which reduces domestic or other childcare tasks beneficial to her infant feeding experience. However, if the only support available to a breastfeeding woman is help bottle feeding (i.e. substituting her role in infant feeding), then this may be experienced negatively. On the other hand, women who are already bottle feeding may find help with it to be beneficial to their infant feeding experience. In short, receiving practical support is not necessarily an indication of its being experienced positively.

Emotional support and infant feeding

Emotional support, whilst widely considered in the public health literature, is less commonly dealt with in the evolutionary life history literature. There are two primary ways in which emotional support may influence maternal investment decisions: 1) emotional support from an individual may act as an indicator of the likelihood of future practical (or other) support being available from that individual *if needed* [16], thereby allowing mothers to take investment 'risks'. 2) Emotional support may act as a resource itself, as proposed by Myers (2017)[30], replenishing a mother's emotional reserves lost to emotional engagement with her child or other areas of her life, thus subsidising maternal 'emotional energy budgets' and safeguarding maternal emotional wellbeing.

In relation to infant feeding, access to emotional support is an important determinant of psychological wellbeing, which in turn has several relevant impacts. For instance, maternal emotional distress disrupts the milk flow of breastfeeding mothers and reduces milk volume by inhibiting the let-down reflex [31], resulting in infants of breastfeeding women with lower stress levels having both higher milk intake and weight gain [32]. Maternal cortisol is also thought to interfere with oxytocin and prolactin regulation, which may negatively impact breastfeeding outcomes [31]. As such, emotional support is likely to positively correlate with breastfeeding duration, and it may be particularly important when a mother is exposed to other psychosocial stresses.

Emotional support is also likely to be an important in helping mothers feel positive about infant feeding, irrespective of how they choose to do it. In WEIRD (Western, educated, industrialised, rich, and democratic) contexts, infant feeding decisions have become highly politicised, with mothers reporting experiencing stress and guilt with both breast and bottle feeding [23]. Breastfeeding is widely encouraged by health professionals for the good of mothers and babies; however, the manner in which the 'Breast is Best' message is conveyed is often critiqued as unrealistic and pressurising [33]. Mothers who plan to breastfeed and cannot are at increased risk of postnatal depression [12] and mothers who bottle feed often experience stigma [14,23,24]. Mothers who do breastfeed are also not spared the experience of psychosocial stress [23,33,34], for instance experiencing judgement for doing so in public. Therefore, emotional support from mothers' social networks should also play an important

role in maternal subjective experience of infant feeding, particularly if she planned to breastfeed but then either did not or ceased to do so early on.

Hypotheses and predictions

To assess the relationships different forms of support have with infant feeding decisions and experiences, we use data collected from 515 mothers with young infants in the UK via an online survey. Self-report data was gathered on the receipt of practical support – help with childcare, help with household tasks, receipt of material objects relating to the baby, financial support, and allofeeding – and the level of emotional support received from a variety of potential supporters, and a range of demographic information. Studies relating to social support and mother-child health outcomes typically focus on support from the partner or maternal grandmothers. Yet, previous analysis [6] of data from the same survey revealed that support was received from a wider range of 'informal' supporters. Thus here, we explore support received from a wider range of individuals than is typically considered in the public health literature to test the following predictions relating to the duration of both exclusive and any breastfeeding and the subjective experience of infant feeding:

P1: The receipt of practical support that substitutes a mother's role in infant feeding will *negatively* predict breastfeeding duration, while practical support that increases a mother's time or energy in other ways will *positively* predict breastfeeding duration.

P2: Emotional support will positively predict breastfeeding duration.

P3: Practical support will positively predict positive maternal experience in relation to infant feeding unless it hinders a mother's infant feeding desires; therefore, infant feeding mode will moderate the relationship between allofeeding and maternal experience (such that the positive relationship will be stronger in bottle feeding mothers) but not the relationship with other forms of help.

P4: Emotional support will positively predict positive maternal experience in relation to infant feeding, irrespective of feeding mode.

Methodology

Data

We perform analysis on data we collected via an online survey (https://osf.io/dybup/), designed to gather infant feeding data from mothers in the UK whose youngest child was ≤24 months. The survey was designed with these research questions in mind; however, the predictions and analysis plan were fully developed and pre-registered [35] after data collection. Participants were recruited via convenience-sampling using social media (Facebook and Twitter) and forum-based parenting websites (Netmums) between December 2017 – February 2018. Although convenience-sampling is likely to entail recruitment bias, it is time and cost efficient [36]. On the survey landing page, readers were informed that the survey included some questions about infant feeding, with an explicit statement that it did not matter how infants were being fed. IP-address checks prevented multiple entries. Of the 883 responses, 719 participants both lived and gave birth in the UK within 108 weeks of survey completion. 515 participants from this eligible sample provided data on all relevant control variables and social support across all extant supporters. The sample characteristics are discussed below and can be found in more detail in Table S1-5.

An overview of our variables, and the survey questions used to derive them, can be found in Table 1. We consider practical support in the form of domestic, financial, material and minding as support which may *subsidise* breastfeeding, and allofeeding as *substitutive* support. Receipt of practical and emotional support was reported from the following sources, if applicable: the participant's partner, their own mother, father, brother(s), sister(s), their partner's mother and father, and friends. Where participants reported that a given supporter was not applicable, this is scored as equivalent to their having been applicable but not providing support. Due to previous analysis [6], we anticipated few women would not receive most types of support from at least one supporter. As our measure of practical support contains no estimate of quantity, it is not meaningful to create a composite measure of support; therefore, we run separate models for different supporters, thus exposing variance in the receipt of support. While our models are not independent, the majority of correlations of a given type of support between supporters are of small to medium effect size, with the exception of allofeeding (see File S1).

Table 1. Overview of variables and the survey questions used to derive them.

Variable	Survey question(s) and *response options and handling*
Infant feeding related measures	
Intention to breastfeed	I planned to breastfeed my baby(ies). *Select if applies*
Breastfeeding initiation	Did you ever breastfeed your youngest child(ren) (including expressing)? *Yes, No, Prefer not to say*
Duration of any breastfeeding	Did you ever breastfeed your youngest child(ren) (including expressing)? *Yes, No, Prefer not to say* Are you currently providing any breastmilk to your youngest child(ren), either exclusively or alongside formula and/or solids? *Yes, No* Approximately, how long did you provide any breastmilk your youngest child(ren)? *Specify number and select unit (days, weeks, months)*
Duration of exclusive breastfeeding	Did you ever breastfeed your youngest child(ren) (including expressing)? *Yes, No, Prefer not to say* Are you still exclusively breastfeeding your youngest child (i.e., no formula or other foods)? *Yes, No* Approximately, how long did you exclusively breastfeed your youngest child(ren)? *Specify number and select unit (days, weeks, months)*
Maternal subjective experience	How would you describe your overall experience around feeding your youngest child(ren)? Please tick all that apply. *Option list included: 'enjoyable' and 'rewarding' (positive), and 'stressful' and 'emotionally draining' (negative). Response options are treated separately as they do not necessarily tap the same latent constructs, e.g., it may be possible to find infant feeding both rewarding and stressful.*
Social support measures	
Practical support	Thinking back to the first few weeks after giving birth to your youngest child(ren), did the people listed below do any of the following things regardless of how helpful it was? Please tick all that apply. *Option list included: 'housework/chores around the house' (domestic), 'money for me and/or my child(ren)' (financial), 'gave me gifts and things for me and/or my child(ren)' (material), 'fed my baby(ies)' (allofeeding), 'generally looked after my baby(ies)' (minding). Assessed as a binary variable reflecting whether a given type of support was received or not.*
Emotional support	Thinking back to the first few weeks after giving birth to your youngest child(ren)…how emotionally supported did you feel by the following people? '*Very supported*', '*supported*', '*neither supported nor unsupported*, *unsupported*, *very unsupported*, *not applicable*'.
Demographic measures	
Year of birth	In what year were you born (yyyy)? *Open textbox*
Number of children	In total, how many children do you have? *Prefer not to say, 1, 2, 3, 4, 5, 6, 7, 8 or more*
Child age at the time of survey (weeks)	What date did you give birth to your youngest child(ren) (day/month/year)?
Work status at the time of study	Are you currently employed (including maternity leave)? *Yes, No* If yes, are you currently on maternity leave? *Yes, No*
Highest level of educational attainment	What is your highest qualification level? *GCSEs or equivalent, AS/A-levels or equivalent, Graduate or equivalent, Postgraduate or equivalent, Other*
Perceived financial status	How would you describe your current financial situation? *Living comfortably, Doing alright, Just about getting by, Finding it quite difficult, Finding it very difficult, Prefer not to say*

Statistical analysis

The following analytical approach reflects, for the most part, the plan pre-registered at https://osf.io/b4yx2. Minor deviations were necessitated in response to the unforeseen nature of the data, a full discussion of which can be found in the SI. All analysis was conducted using R version 3.4.2 [37].

Testing predictions re. breastfeeding duration – 1-2

We assess breastfeeding duration in two sets of cox regression models, run using the Survival package [38]: first assessing the hazard of ceasing to breastfeed exclusively prior to six months (n = 386) and second the hazard of ceasing to breastfeed at all prior to 20 months (n = 479). To maximise policy relevance, we assess the hazard of ceasing to exclusively breastfeed before six months and of ceasing to breastfeed at all prior to 20 months. Stopping breastfeeding completely can take anywhere between a few weeks and several months. Women may thus be aiming to comply with public health recommendations (of 24 months) and yet fall short (or run over) due to the variable nature of the act of stopping.

Our independent variables of interest are the receipt of various types of practical support and level of emotional support. We employ a range of potential control variables: participant's year of birth, subjective financial status, educational attainment, and number of children (including the focal child). For model selection details see the SI.

The pre-registered analysis found several conflicting results (see File S2). A potential explanation is that while we hypothesised that our models would capture the 'benefits' of receiving support, they may also be capturing an underlying 'need' for support. To assess whether *being in need* of support was confounding our results, we conducted a post hoc analysis exploring the moderating effect of need. We created a need variable by splitting subjective financial status into a binary variable where *low need* = 'Doing alright' and 'Living comfortably' and *high need* = 'Just about getting by', 'Finding it quite difficult', 'Finding it very difficult', and 'Prefer not to say'. For model selection details see the SI. Allowing for interactions typically increased the variance captured by the models (Table S6), thus the post hoc models are reported below.

Testing predictions re. maternal subjective experience – 3-4

We assess whether practical and emotional support predict finding infant feeding to be '*enjoyable*', '*rewarding*', '*stressful*', or '*emotionally draining*' using quasi-binomial logistic regression models (n = 515), built using the glm function in the R Stats package and using the Pearson estimate to adjust the standard errors [39].

While emotional support is predicted to be universally beneficial to experience, the utility of practical support is predicted to depend on a mother's infant feeding desires. To test this, we employ interaction terms between each type of support and infant feeding mode at the time of reporting.

Our independent variables of interest are the receipt of various types of practical support, level of emotional support, and their interaction with infant feeding mode. We employ a range of potential control variables as before, with the addition of participant's current work status and focal child's age as both are likely to impact feeding experience. For model selection details see the SI.

Interpretation

We follow recent calls [40–42] to implement guidance from the American Statistical Association to not interpret our findings with regard to p-values meeting a specified alpha (commonly 0.05) or confidence interval's not encompassing the null. Instead, we describe our data, focus on the point estimates (i.e. the values most compatible with the data) from our models, and view confidence intervals as 'compatibility intervals', acknowledging that all values falling within their limits are also fairly compatible with the data [40].

The above approach emphasises paying attention to all findings, not just 'significant' ones – however our modelling strategy produces a large number of results. In order to strike a balance between transparency and volume, we choose to focus in more detail on the results of our experience models which are both more novel in terms of the literature and appear to suffer less from low statistical power. Our full results can be seen in the SI (File S2 for duration models and File S3 for experience models).

Results

Sample characteristics

The average age of mothers in our sample is 34 years. As discussed elsewhere [6], a disproportionate number are educated to a postgraduate level (43%), compared to the general UK population; however, more variation is apparent in perceived financial status, with 45% reporting 'doing alright', and similar proportions reported 'living comfortably' to those experiencing financial concern (28% vs. 26%). For full demographic statistics see Table S1.

Receiving domestic and child-minding support from partners was extremely common, at 95% and 83% respectively (Table S2). Partners were also the most likely providers of all other forms of practical support apart from material support, which was most likely to come from the participant's own mother (77%), followed closely by friends (69%) and partner's mothers (62%) (Table S2). Only 3% of participants did not have a partner, and 93% of participant's reported feeling either emotionally supported or very supported by a partner (Table S3). 90% of participants planned to breastfeed and 93% initiated (Table S4). Of women whose infant was aged six months or over at the time of survey (n = 404), 68% breastfed for at least six months – 57% exclusively (Table S4); breastfeeding duration characteristics are in Table S5.

Women who initiated breastfeeding, but were not necessarily still breastfeeding, reported lower rates of positive experience (*enjoyable* 65% vs. 80%, *rewarding* 70% vs. 86%) and higher rates of negative experience (*stressful* 47% vs. 38%, *emotionally draining* 46% vs. 42%) compared to the subsample who were still breastfeeding (Table S7). Women who planned to breastfeed but stopped breastfeeding prior to eight weeks (n = 78), reported worse experience still – *enjoyable* 32%, *rewarding* 28%, *stressful* 71%, and *emotionally draining* 60%. The small number of women who never breastfed (n = 37), on the other hand, reported rates of: *enjoyable* 74%, *rewarding* 54%, *stressful* 31%, and *emotionally draining* 11%.

Breastfeeding duration

The only measure of support showing a clear trend across supporters was allofeeding, which as predicted was associated with shorter *exclusive* and *any* breastfeeding durations (Figure 1 and S3). There is some evidence for a moderating effect of need in relation to some supporters, such that the hazard of stopping was greater when need was high, though CIs

overlapped; for example, the participant's partner's father (*exclusive* Hazard Ratio (HR): low need = 4.990; high need = 22.904) (Figure S3). The risk of stopping *exclusive* breastfeeding was relatively consistent over time for all supporters except partners, from whom allofeeding had a larger effect in the first eight weeks (HR: 0-8 weeks = 14.870; 8 weeks+ = 1.969) (Figure S3). The HRs for *any* breastfeeding moved closer to 1 over time in association with support from the participant's own mother, partner, and partner's father (Figure 1). Over time the lower bound CI (LCI) estimates dropped below 1, potentially indicating a reduced hazard of stopping in later time periods with support from the participant's father (*exclusive* LCI = 0.656) and partner's father (*any* LCI = 0.206); however, as allofeeding by grandfathers was rare, this is likely an artefact of low statistical power (Table S3).

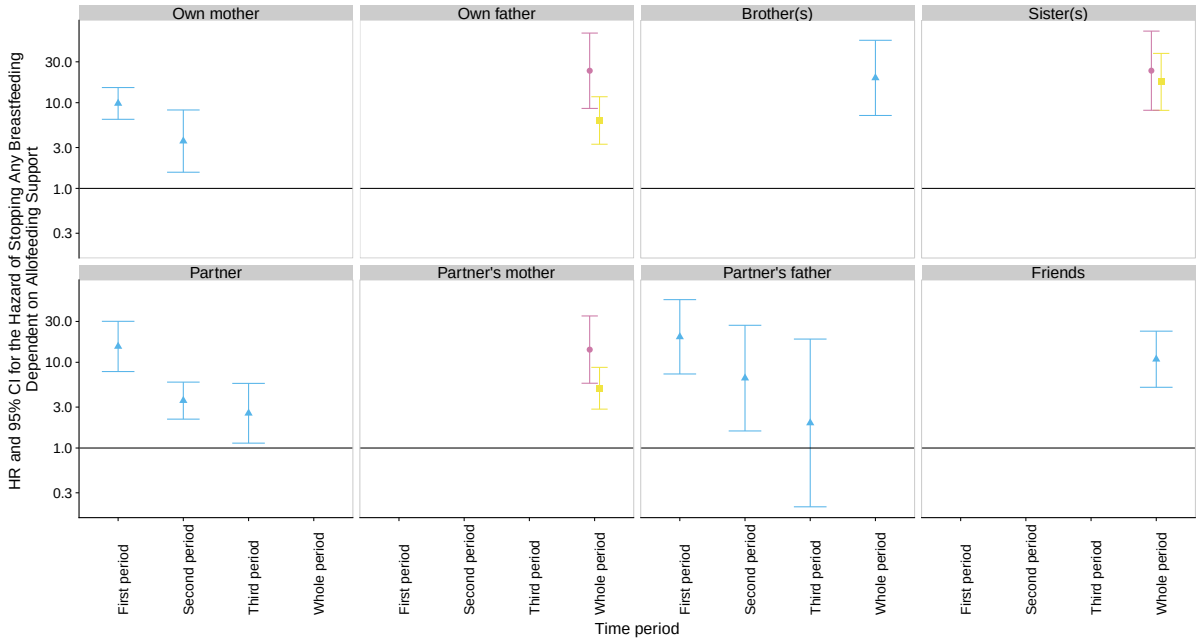

Figure 1. Plot shows the hazard ratios (HR) and 95% confidence intervals (CI) for the relationship between the receipt of allofeeding support and stopping *any* breastfeeding. HRs varying by need are indicated by purple circles (high) or yellow squares (low), those irrespective of need are blue triangles. HRs varying by time are labelled first, second, or third period for convenience; the duration of time encompassed in these periods varies by support, see File S2 for details. Estimates above 1 indicate an increased hazard of stopping over time, those below indicate a reduced hazard.

Firm statements are difficult in relation to the rest of our duration results, as the width of the majority of the CIs indicate widespread power issues due to a combination of sample size, an inability to adequately control for moderating effects of need, and a lack of granularity in our

support measures. However, we encourage interested readers to explore the SI figures for themselves (Figures S1-7).

Maternal subjective experience

Due to small sample sizes associated with allofeeding by most supporters (Table S2) we were unable to test prediction 3 – *infant feeding mode will moderate the relationship between allofeeding and maternal experience but not the relationship with other forms of help* – fully in all models. However, as predicted, the data indicated that allofeeding by the participant's own mother was associated with increased odds of finding infant feeding *stressful* (Odds Ratio (OR): breastfeeding = 8.309, not breastfeeding = 0.908) and *emotionally draining* (OR: breastfeeding = 3.959, not breastfeeding = 0.722) *if* breastfeeding (Figure 2). Otherwise, we find little evidence of a moderating effect of infant feeding mode in relation to allofeeding, with allofeeding being most compatible with negative experience.

Figure 2. Plot shows the odds ratios (OR) and 95% confidence intervals (CI) for a given marker of the subjective experience of infant feeding dependent on the receipt of allofeeding support from the participant's own mother, partner, or partner's mother. ORs varying by feeding mode are indicated by purple squares (breastfeeding) or yellow circles (not breastfeeding), those irrespective of feeding mode are blue triangles. Estimates above 1 indicate increased odds of a given experience, those below indicate reduced odds.

More broadly, results indicate our prediction was potentially overly simplistic in relation to our expectation that feeding mode would not interact with non-allofeeding practical and emotional support (Figure S8-25). Various interactions between feeding mode and support are hinted at by the differing direction of the point estimates, though confidence intervals

often overlap – we draw attention to the more convincing examples of where this is the case below, otherwise estimates highlighted are irrespective of feeding mode.

While CIs for many predictors across our models indicate widespread power issues, some repeating patterns and narrower CIs give pause for consideration. For instance, in line with predictions, material support from the partner is most compatible with increased odds of finding feeding *enjoyable* (OR = 2.182) and *rewarding* (OR = 1.912), and lower odds of finding it *stressful* (OR = 0.589) (Figure 3). However, in relation to other supporters the prediction was less clearly supported.

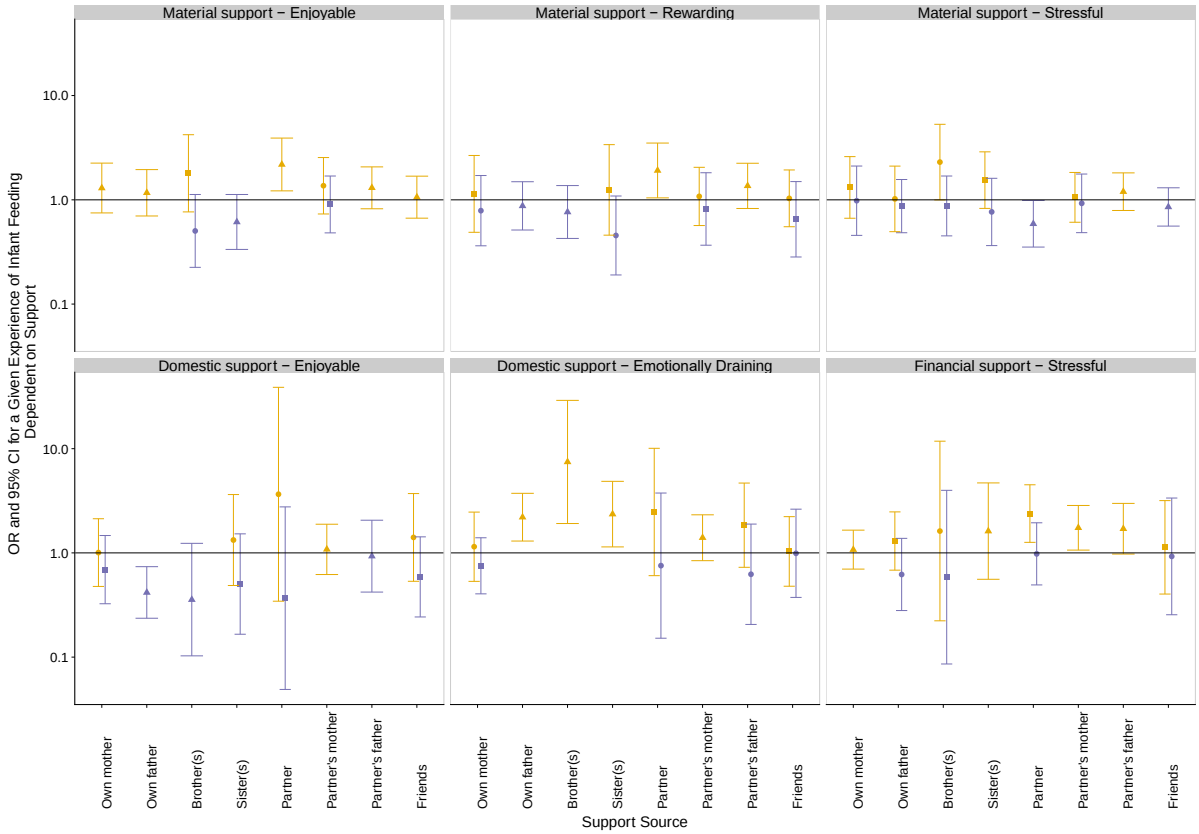

Figure 3. Plots show the odds ratios (OR) and 95% confidence intervals (CI) for a given experience of infant feeding dependent on support. ORs varying by feeding mode are indicated by squares (breastfeeding) or circles (not breastfeeding), those irrespective of feeding mode are triangles. Estimates above 1 (mustard) indicate increased odds of a given experience, those below 1 (purple) indicate reduced odds.

Emotional support also appears broadly predictive of lower odds of finding feeding *emotionally draining* (Figure 4) as anticipated, with the strongest results in relation to support from the participant's brother(s) and partner's father. However, point estimates diverge in

relation to support from the participant's own parent's, sister(s), and friends indicating the opposite conclusion is most compatible for these sources.

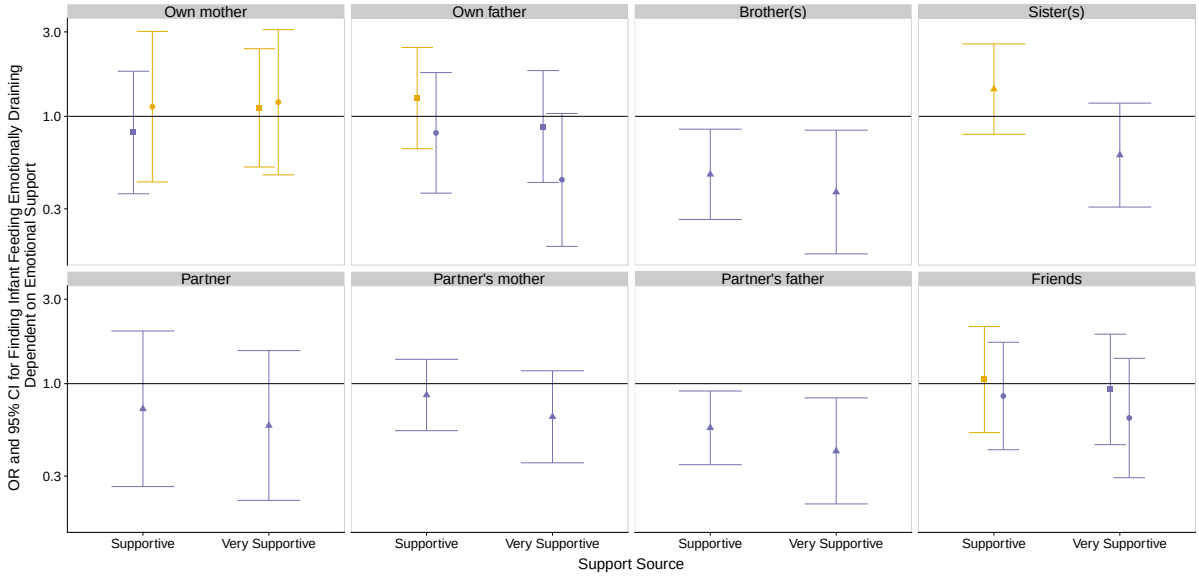

Figure 4. Plots show the odds ratios (OR) and 95% confidence intervals (CI) for finding infant feeding emotionally draining dependent on emotional support. ORs varying by feeding mode are indicated by squares (breastfeeding) or circles (not breastfeeding), those irrespective of feeding mode are triangles. Estimates above 1 (mustard) indicate increased odds of a given experience, those below 1 (purple) indicate reduced odds.

Contrary to predictions, receiving domestic support broadly appears to have associations with reduced *enjoyment* (Figure 3) and increased *stress* (Figure S9) and feeling *emotionally drained* (Figure 3): most clearly, domestic support from one's own father is predictive of lower odds of *enjoyment* (OR = 0.417), and higher odds of finding feeding *emotionally draining* when coming from one's own father (OR = 2.202) and siblings (OR: brother(s) = 7.461, sister(s) = 2.356) (Figure 3).

Financial support also appears to be unexpectedly broadly associated with increased odds of finding feeding *stressful* (Figure 3) – most clearly when coming from the partner's parents (OR: partner's mother = 1.742, partner's father = 1.706) and the partner if breastfeeding (OR: breastfeeding = 2.386, not breastfeeding = 0.979).

See Table S8 for model comparisons.

Discussion

While our results point to a complex picture of support, they nonetheless highlight the importance of a broad range of support acts in relation to infant feeding experiences among mothers in a high-income setting. Levels of breastfeeding were higher in our sample than would be expected in the UK, with 93% initiation compared to ~75% in the general population [9], and 68% versus 34% breastfeeding at six months [10]. This is likely partially explainable by the disproportionate rate of university education among our participants [43]. Yet, despite the relatively high levels of prolonged breastfeeding, it is noteworthy that this did not guarantee a positive subjective experience relating to infant feeding: Of women who were currently breastfeeding, 38% reported finding the overall experience of infant feeding stressful and 42% found it emotionally draining, emphasising the widespread need for support.

Unsurprisingly, of women who planned to breastfeed and stopped breastfeeding early (measured at eight weeks in line with Public Health England (2019)[44] key performance indicators), only 31% report finding infant feeding enjoyable and 29% rewarding, compared to 71% stressful and 60% emotionally draining. This is in line with findings that unfulfilled breastfeeding goals put women's emotional health at risk [12,45] and are potentially indicative of the stigma attached to formula feeding in the UK and the dearth of support for mothers who are not breastfeeding. However, beyond the negative experience associated with stopping "early", women who were not breastfeeding at the time of survey, but had breastfed for more than eight weeks, also reported lower rates of positive, and higher rates of negative, experience. This likely reflects a range of factors, including not only unmet feeding goals but also, for example, difficulties linked to introducing both formula and solid foods and 'missing' the act of breastfeeding. Together, these findings bolster recent calls for support interventions to look beyond breastfeeding mothers and to provide more support to those who decide, for whatever reason, not to start or to stop breastfeeding [11,13,46,47].

Overall, our models support the underlying contention that social support should not be treated as a univariate entity, with uniform outcomes, as predicted by an evolutionary capital-based understanding of investment behaviour. Our most compelling findings, which relate to allofeeding, are illustrative of this; while social support is often broadly construed as

beneficial in terms of public health, allofeeding is associated with shorter durations of breastfeeding and poorer subjective experience of infant feeding. Allofeeding, at least with formula, may encourage breastfeeding cessation because it allows mothers to avoid incurring the energy and time costs of breastfeeding. However, the cessation of breastfeeding may also encourage offers of help with infant feeding; prospective data is required to understand the direction of causality, though it seems likely to vary by individual. It is a limitation of our data that we do not know whether allofeeding was with expressed milk or formula. Our measures of support were intended to capture support received in the first few weeks post birth, therefore it is interesting that the impact of reported allofeeding extends across the twenty months analysed. This may indicate the retrospective reporting of support was influenced by current experience, or that the early introduction of bottled milk (either expressed or formula) alongside breastfeeding always increases the likelihood of stopping from then on; the former is potentially more likely in light of evidence that limited early formula feeding is not correlated with stopping [48].

Our findings also bolster previous studies which have found, for example, that breastfeeding duration is shorter when fathers are more directly involved in breastfeeding [19] and perform more infant care activities such as getting up with the baby in the night (potentially implying feeding activities) [21]. Here we also find that partner help with childminding is associated with shorter durations of exclusive breastfeeding amongst mothers who reported feeling financially comfortable, whereas when financial security was low this association reversed (Figure S2). While we predicted that support such as childminding would subsidise maternal resources leading to longer breastfeeding durations, breastfeeding is just one way in which mothers may decide to invest their spared reserves; this highlights the need to view maternal behaviour holistically, rather than as a series of unrelated acts.

We find limited evidence for our expectation that practical support predicted improved maternal experience, unless it hinders a mother's infant feeding desires. Breastfeeding mothers were more likely to find infant feeding stressful and emotionally draining when their own mothers provided support by feeding the baby. While allofeeding by partners appears largely compatible with poorer experience irrespective of feeding mode, this may be reflective of the sample's high level of intent to breastfeed or simply that mother's preferred

to feed their infant's themselves. Other forms of non-allofeeding support showed variable relationships with experience.

Mothers who received domestic support from their fathers and siblings were more likely to report finding infant feeding emotionally draining; perhaps reflecting the detrimental impact of *needing* such support. Unexpectedly, financial support appears to be broadly associated with increased odds of finding feeding *stressful*; most clearly when coming from the partner's parents and, if breastfeeding, the partner. Again, a needs-based explanation seems plausible, though why we see a potential interaction between feeding mode and partner support is unclear. While material support from the partner was most compatible with positive experience, results in relation to other supporters were less clear; this may be due to differing usefulness or sentimentality of goods being transferred by different supporters. Finally, as anticipated, emotional support appears broadly predictive of lower odds of finding feeding *emotionally draining*, with the strongest results in relation to support from brothers and partners' fathers. However, point estimates diverge in relation to support from the participant's own parents, sisters, and friends indicating the opposite conclusion is most compatible for these sources; as these are the most highly rated emotional supporters beyond the partner, this may also be indicative of participants turning to these individuals when in need.

Limitations and future research recommendations

Beyond the results regarding allofeeding, our main take away is that future research is required, as our research questions remain largely unanswered. It is evident from our analyses that more granular measures of support, which capture both quality and quantity are required as our blunt, binary measures of support receipt may encompass too much noise. Additionally, our measure of emotional support was general to the early postnatal period, rather than specific to infant feeding. The support given to mothers specifically in relation to infant feeding has been found to be influenced by a supporter's own experiences of infant feeding [49]. While we assume that a mismatch between a mother's desires and a supporter's ability to empathise would result in a lower emotional support rating, other factors may have come into consideration and retrospective reporting is also not ideal.

Alongside better measures of social support, such studies need replication with large and more representative samples. Statistical power, as indicated by wide confidence intervals, is clearly an issue in parts of our analysis. Size of effect seems likely to vary across support type, and we may simply not have a large enough sample to detect small effects. Our sample lacks diversity, in two important ways: first, our participants overwhelmingly planned to breastfeed, meaning we can say little about the experiences on women who never intended to breastfeed. Such women may be more exposed to stigma surrounding formula feeding and have poorer feeding experiences as a result; alternatively, they may be more confident in their decision not to breastfeed and more likely to positively experience feeding [50]. Secondly, our sample is WEIRD, containing primarily White, university-educated, partnered women. Our argument is based on time and energy, thus theoretically, we expect support to be important to all women; however, this requires testing. We also expect the utility of time/energy transferred or released by a given type of support to be independent of its source. Indeed, conceiving of 'support as support', irrespective of who is comes from, is likely to encourage more inclusive support-based interventions which harness the potential in a woman's existing social network. However, there may well be local sociocultural norms and other environmental circumstances that moderate relationships between support and feeding outcomes which are important to understand [7].

Finally, our results highlight the importance of considering the need for support; here we conducted post hoc analyses using perceived financial status as a proxy for need, but future work should employ a more rounded marker. Potential moderation effects of infant feeding mode are also suggestive of the differential need for support between breastfeeding and non-breastfeeding mothers, which deserves further exploration.

Conclusion

By taking a capital-based approach to social support, we hope to encourage the idea that 'support is support', irrespective of who it comes from. A nuclear family bias in public health research often causes both the full scope of maternal social support networks to be elided and some supporters to be considered more important than others, which risks stigmatising "non-traditional" family forms. While our data lacks variance for well-established supporters, we see clearer effects for those whose support varies more within the sample, such as

brothers and father's-in-law. Interventions, then, should focus on improving the quality and quantity of support from whomever is best placed to help, rather than targeting specific individuals. This approach would be both more inclusive and as, if not more, effective in supporting maternal wellbeing and helping women meet their infant feeding goals. Finally, while further research with improved samples is required it is evident that the type of practical support given has important relationships with infant feeding outcomes. Research further unpicking these relationships is urgently required as many still assume that support necessarily promotes public health goals and benefits recipients, which evidentially is not the case.

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Does your article include research that required ethical approval or permits?: Yes

Statement (if applicable): Ethics approval was granted by the University College London Research Ethics Committee: Ethics Application 11479/001: Social Support and Feeding Your Baby. Details of this approval can be seen at: https://osf.io/jcrv7/

Data

Does your paper present new data?: Yes

Statement (if applicable): Data are available at: https://osf.io/juyh8/ The code for the analysis in this paper is available at: https://osf.io/juyh8/ The survey questions from which the data stem are available at: https://osf.io/dbtpy/

Conflict of interest

We declare we have no competing interests

Authors' contributions

Statement: SM conceived of the study with the help of AEP and EEH. SM wrote the original pre-registration document, AEP and EEH commented on all subsequent drafts. EEH led the survey design and data collection, SM and AEP assisted equally. SM led the analysis, AEP assisted. SM wrote the original manuscript, AEP and EEH commented on all subsequent drafts.

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