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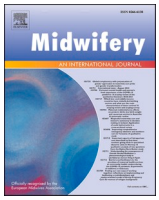

Research Article

Partner and professional support are associated with father-infant bonding: A cross-sectional analysis of mothers, midwives, and child health nurses' influence on primiparous and multiparous fathers of infants in Sweden

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ABSTRACT

Objective: To assess if received professional and social support are associated with father-infant bonding among primiparous (first-time) and multiparous (multi-time) fathers.
Background: Early father-infant bonding predicts several positive child outcomes. However, while received professional and social support positively impacts fathers' transition into parenthood, little research has tested if these factors are associated with a stronger father-infant bond.
Methods: In total, 499 fathers (296 primiparous and 203 multiparous) of infants (aged 0–12 months) completed a cross-sectional online survey between November 2018 and March 2020. The survey included items related to socio-demographics, having a planned pregnancy, postnatal midwifery support, child health nurse support, child health center attendance, and social support. The parent-infant bonding questionnaire (PBQ) was used to assess the father-infant bond. Multiple linear regression models were estimated for the total sample and based on paternal parity. Missing data were managed through multiple imputation procedures.
Findings: Fathers reported fewer bonding disturbances if they received support from their partners, postnatal midwives, child health nurses, and attended more child health visits. Primiparous fathers reported fewer bonding disturbances when receiving support from their partners, postnatal midwives, and the child health nurse. However, multiparous fathers had more bonding disturbances than primiparous fathers and received less professional and partner support.
Conclusions: Receiving more partner and professional support is associated with less father-infant bonding disturbances. To encourage a better father-infant bond, clinicians should invite and support all fathers, regardless of parity, as they transition to parenthood.

Introduction

Fathers promote family health and positive infant outcomes across several domains (Cabrera et al., 2018; Schoppe-Sullivan and Fagan, 2020; Yogman and Eppel, 2022). Due to significant socioeconomic and cultural changes, paternal involvement in childcare has substantially increased, especially in higher-income countries, leading to a growing interest in men's perinatal mental health, the father-child relationship, and their influence on early child development (Baldoni et al., 2022; Craig and Mullan, 2010). Over the past two decades, fathers have been more involved in childrearing activities, such as feeding and bathing their baby, and also in providing affective, emotional, and cognitive support (Baldoni and Giannotti, 2022; Cabrera, 2020). Since the development of the father-infant bond is a key foundation for future positive parenting and early child development (Brockington et al., 2006; Le Bas et al., 2020), further research on factors that are associated with strengthening the father-infant bond are warranted.

The parent-infant bond is defined as the degree to which parents show positive affective responses, cognitive evaluations, and actions toward their infant (Kinsey and Hupcey, 2013). Previous research suggests that fathers start bonding with their child during the prenatal period (de Waal et al., 2023), especially when they can physically hear their baby's heartbeat or see their baby's images via ultrasound scans (Wells, 2016). Following childbirth, bonding opportunities are

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enhanced via psychological, affective, and behavioral components such as sustained face-to-face gazing, emotional expressions (e.g., smile, affective moods) and via body contact (e.g. holding, baby massage, hugs) (Scism and Cobb, 2017). This active participation in childcare and direct involvement in the dyadic father-infant interaction may support an adaptive reorganization of the neuroendocrine system that modulates the expression of paternal caregiving during the transition to parenthood (Abraham and Feldman, 2022). Specifically, higher levels of paternal involvement in childcare and father-infant bonding are associated with neural activations of the parental brain network and significant changes in hormonal levels (e.g., oxytocin, vasopressin, testosterone) underlying human caregiving behaviors in fathers (Giannotti et al., 2022; Storey et al., 2020).

On the other hand, impaired parent-infant bonding is associated with a deteriorated marital relationship and increased negative feelings, including anger, hostility, and impulsivity toward the infant, as well as depressive symptoms in both mothers and fathers (Brockington et al., 2006; Kerstis et al., 2016; Wells and Jeon, 2023). More longer-term research shows that impaired parent-infant bonding is linked to child behavioral disturbances and decreased executive functioning, suggesting relevant implications for clinical practice with families (De Cock et al., 2017; Fuchs et al., 2016). As such, having a strong father-infant bond is important for family adjustment and early child development. However, prior research has mainly focused on mothers, with little known about the factors associated with father-infant bonding (Scism and Cobb, 2017; Wells and Jeon, 2023).

Professional and social support

Social support refers to the multifaceted assistance, encouragement, and resources provided by social networks, family, friends, and the community to fathers as they navigate their parental roles and responsibilities (Castillo and Sarver, 2012). Meanwhile, professional support refers to the emotional, informational, and instrumental support provided by a clinician, such as a midwife or nurse, regarding helping fathers cope with their transition into parenthood and fathering. During prenatal, perinatal, and postnatal visits, midwives and child health nurses routinely meet expectant and new parents, allowing them the opportunity to offer and provide professional support during a critical transition period (Fisher et al., 2018). These visits allow reproductive and child health professionals to provide useful information aimed at promoting paternal engagement, as well as responsive and sensitive parenting (Baldoni and Giannotti, 2022). They may also collect important information regarding parental functioning, preventing severe perinatal psychological distress and impaired parent-infant bonding (Baldoni et al., 2022). Social support, and in particular, greater levels of partner support, has been shown to be a protective factor against paternal postnatal depression symptoms (Wells and Aronson, 2021a).

However, literature reviews have stated that fathers may lack adequate professional and social support (Wells, 2016; Xue et al., 2018), as they receive less support from child health professionals than mothers throughout early childhood years (Wells et al., 2017). The benefits of received professional support of primiparous fathers has been more documented in the literature due to research (and clinical) perceptions of them needing more support, primarily due to their lack of parenting experience (Hrybanova et al., 2019; Shorey et al., 2017; van Vulpen et al., 2021). However, multiparous fathers may struggle to spend time, including quality time, with their new infant, if they spend more time parenting the older sibling; thus, they might have less opportunities to bond with their newborn.

Importantly, both professional and social support can promote improved parental mental health (Racine et al., 2020; Wells and Aronson, 2021b), which in turn is associated with parent-infant bonding (Nonnenmacher et al., 2016; Wells and Jeon, 2023). However, data on fathers are still scarce. More studies are needed to evaluate the role of professional and social support in fostering father-infant bonding. Additional factors such as parity should also be considered, since previous data has found that primiparous fathers usually receive more professional support from midwives and child health nurses than multiparous fathers (Wells and Aronson, 2021b), and because previous research has not investigated the role of parity on father-infant bonding.

Aim

The aim of the current study is to explore if perceived higher levels of received professional support (prenatal midwife, postnatal midwife, and child health nurse), as well as social support (partner, friends, family, and the Internet) are associated with fewer father-infant bonding disturbances for both primiparous and multiparous fathers.

Methods

Sample

Data for the current study were retrieved from the (removed for peer review) study. Participants came from Region Stockholm, Sweden. A subset of the collected variables, relevant for the current study, focused on fathers' perceptions of received professional and social support and their self-reported father-infant bonding. A total of 499 fathers of infants (0–12 months of age) were collected via two cohorts: Cohort 1: November 2018 –January 2019 and Cohort 2: December 2019 –March 2020.

Procedure

Paid Facebook advertisements were used to recruit participants. Four advertisements were run in total, where two advertisements were run per cohort. Each advertisement included a picture of a father with his infant, the university logotype, and a simple question addressed to potential participants. One advertisement emphasized parental satisfaction ('Are you a new father and satisfied with your new life as a parent?') and displayed a happy/smiling father-infant dyad, while the other emphasized parental dissatisfaction ('Are you struggling with your parental role?') and displayed a tired/frustrated father-infant dyad. At the bottom of each advertisement was a sentence that read, 'Participate in our survey on the father visits at the child health centres (CHCs)'. These advertisements ran simultaneously for Cohort 2 and ran simultaneously for Cohort 1 from the first week until mid-December, after which only the dissatisfied advertisement as was between mid-December and January due to that advertisement attracting more participants.

After clicking the Facebook advertisement, participants were redirected to an online survey. On the first page of the online survey, participants were shown an information letter and consent form, including a link to more information located on a university website, and advised that by clicking "next" they were consenting. The consent form stated that the survey was i) voluntary, ii) that they could drop-out at any time for any reason without further explanation, iii) that their data was anonymous unless they chose to enter an email address to further follow-up, iv) that their data would be stored according to proper ethical guidelines, and v) that they had a right to find out what information is registered about them. Inclusion criteria consisted of (i) identifying themself as a father, (ii) having an infant (0 to 12 months) and (iii) being able to complete the survey in Swedish. Participants did not receive any direct incentives for completing the survey. The current study was granted ethical approval by the (removed for peer review). Completing the questionnaires for these items took around 15 min.

Measures

Socio-demographic variables

Fathers' age (continuous), paternal parity (primiparous or

multiparous), household income (under 15,000 SEK per month and then going in increments of 10,000 SEK until 105,000 SEK or more), born in Sweden (no = 0, yes =1), planned pregnancy (no = 0, yeas = 1), infant age (<6, 6, 7, 8, 9, 10, 11 or 12 months), and number of children in the family (continuous).

Social support

Four items related to fathers' perceived received social support included: In my parenting role, I often receive support from i) my partner, ii) family, iii) friends, and iv) the Internet. All four items had a binary (no = 0, yes =1) response option. The items were included as separate variables (they did not comprise a scale).

Professional support

One item related to participants' perceived received support from the postnatal midwife: "I received enough support from the staff (mainly midwives) in relation to the care after childbirth." The item was scored on a Likert-scale from 1–7, where 1 = completely disagree and 7 = completely agree.

When the child is between 0 and 5 years old, new parents visit the CHCs, where they see a child health nurse. Regarding child health nurse-led professional support, seven items were asked on their overall perceptions of support: i) The child health nurse gives me the best possible support in my parenting, ii) The child health nurse shows engagement to my parenting, iii) The child health nurse has provided me with useful and practical information about my child's breastfeeding/feeding, iv) The child health nurse has given me useful and practical information about how I take care of a newborn baby, v) I receive good responses from the child health nurse, vi) I find that there is the opportunity for me to raise questions about being a parent with the child health nurse, and vii) I find that I get answers to my questions from the child health nurse. All items were scored on a Likert-scale from 1–7, where 1 = completely disagree and 7 = completely agree. After summing the seven items, the child health nurse support scale demonstrated excellent internal consistency (Cronbach's $\alpha = 0.93$). A principal component analysis suggested that the scale was unidimensional, and a confirmatory factor analysis (CFA) indicated significant loadings on all items and good model fit ($\chi 2 = 15.6$, df = 14, $p = 0.335$; CFI = 0.998; TLI = 0.997; RMSEA = 0.015 [90% CI = 0.000, 0.047]).

Father-inclusive child health center visits

Starting in 2017, Region Stockholm nurses should explicitly invite fathers to three visits: i) the home visit, taking place during the infant's first week, ii) a three-to-five week visit (later adapted to a one-to-three week visit), and iii) a three-to-five month visit. Following national guidelines (Rikshandboken Barnhälsovård (The National Handbook of Child Health Care), 2019), both parents should be invited to the first two visits, while only the father/child were invited to the third visit. Three binary items (no = 0, yes =1) asked if fathers had been invited to each of the three visits, respectively, by the child health nurse. Three more binary items (no = 0, yes =1) asked if fathers attended each of these three visits, respectively.

Father-infant bonding

Father-infant bonding was measured using the Parent-infant Bonding Questionnaire (PBQ). The PBQ consists of four subscales and 25 items, with six response options ranging from 0 = always to 5 = never. The PBQ has been validated (Brockington et al., 2006) and used with fathers in Sweden (Edhborg et al., 2005; Kerstis et al., 2016; Wells and Jeon, 2023). In the current data collection three subscales were used: i) impaired bonding (12 items), ii) rejection and anger (7 items), and anxiety about care (4 items). The fourth subscale, incipient abuse, has shown very low sensitivity and is not recommended to use (Brockington et al., 2006). A total PBQ score was therefore created summing the three subscales, where higher scores indicated increased bonding difficulties. The PBQ had good internal consistency in the current study (Cronbach's $\alpha = 0.87$).

Analysis

Data were collected in two waves from 499 unique participating fathers with infants up to 12 months of age. There were 247 fathers in wave one and 252 fathers in wave two. T-tests and chi-square tests indicated no significant differences between the fathers in the two waves in regard to infant's age, the number of children in the family, planned pregnancies, infant's disability, family structure, or immigration status. Therefore, the waves were merged for subsequent analysis.

There was less than 20 percent missing data on all variables, but the data were not missing completely at random according to an analysis with the missing_compare function in the R package finalfit (Harrison et al., 2020). This suggested that the patterns of missing data on certain variables were associated with specific responses or tendencies on other variables. Therefore, multiple imputation was performed with the R package mice (Van Buuren and Groothuis-Oudshoorn, 2011). Multiple imputation offers a unique possibility to account and control the uncertainty stemming from patterns of missing data, thereby producing more reliable results than other imputation or deletion methods (Rubin, 2004). Predictor variables were selected through the function "quickpred" from the complete data material. Missing data for the variables related to fathers' experiences of the child health nurse were imputed using attendance as a predictor variable since missingness on these variables depended on whether or not the fathers had attended the visits. The multiple imputation produced 100 complete data sets through 20 iterations. Convergence was checked through trace plots and appeared to be excellent.

An initial regression model for the complete sample included total bonding disturbances as the dependent variable and father's age, infant's age, household income, birth in Sweden, support from partner, support from family, support from friends, support from the Internet, the number of invitations to CHC visits, the number of attended CHC visits, support from the child health nurse, and support from the postnatal midwife as independent variables. The assumptions of linear regression (linearity, normality of residuals, and homoscedasticity) were tested by applying the pooled regression coefficients from the analysis of the imputed data sets to a regression model based on the original data set. It was noticed that the regression model deviated from being linear and that the residuals were non-normally distributed. These issues were addressed by performing a square root transformation of the scale for total bonding disturbances and logarithmic transformations of the scale for total support from the child health nurse and of the variable for support from the postnatal midwife (Afifi et al., 2007).

For each of the samples of the study (the total sample, the subsample of primiparous fathers, and the subsample of multiparous fathers) model selection procedures were applied to maximize model fit while considering model parsimony. The models with the highest pooled adjusted R^2 were considered to have the best combination of model fit and parsimony (Anderson-Sprecher, 1994). In the first step of the model selection procedure, all independent variables were included in the initial regression model for each sample. The independent variables were father's age, infant's age, household income, birth in Sweden, support from partner, support from family, support from friends, support from the Internet, the number of invitations to CHC visits, the number of attended CHC visits, support from the child health nurse, and support from the postnatal midwife. Thereafter, the variables that explained least unique variance were dropped one at the time until the highest possible value of the pooled adjusted R^2 was received. This procedure resulted in models with different sets of independent variables for the different samples. The significance of each model was tested through

pooling of the *F* statistics received from ANOVAs for each imputed data set, using the function "micombine.F" in the R package miceadds (Robitzsch et al., 2020).

Spearman's correlation coefficients were computed for the correlations between total bonding disturbances and the individual scale items measuring support from the child health nurse. These correlation coefficients were computed because the scale items measuring support from the child health nurse were too strongly correlated with each other to be included as separate independent variables in the same linear regression models (where they would have caused multicollinearity issues). The correlation analysis was based on the unimputed (original) dataset since Spearman's correlation coefficients are non-parametric and have no variance that can be pooled.

Results

Descriptive statistics for the variables included in the multiple linear regressions are presented in Table 1. Primiparous fathers were younger (Cohen's $d = 0.67$, $p < 0.001$), had older infants (Cohen's $d = 0.18$, $p = 0.045$), had more often perceived received support from their families (Cramer's $v = 0.21$, $p < 0.001$), and had more often perceived received support from their friends (Cramer's $v = 0.10$, $p = 0.034$) than multiparous fathers. Also, primiparous fathers reported fewer bonding disturbances (Cohen's $d = 0.28$, $p = 0.003$), more invitations to CHC visits (Cohen's $d = 0.56$, $p < 0.001$), more attendance at CHC visits (Cohen's $d = 0.61$, $p < 0.001$), and more perceived support from child health nurses (Cohen's $d = 0.26$, $p = 0.006$).

Correlations between father-infant bonding and child health nurse support

Table 2 presents Spearman correlation coefficients for correlations between the scale for total bonding disturbances and the scale for support from the child health nurse. In the total sample and in the subsample with primiparous fathers, total bonding disturbances were negatively and significantly correlated with each scale item measuring perceived support from the child health nurse (all $r_s < -0.15$, and all $p < 0.010$). In the subsample of multiparous fathers, there were significant negative correlations between total bonding disturbances, and the scale item measuring a welcoming treatment from the child health nurse ($r_s = -0{,}15$, $p = 0.036$) and the scale item measuring the extent to which the

Table 1
Descriptive statistics for the variables included in the regression models, separated for primiparous and multiparous fathers.

	Range	Total sample ($n = 499$)		Primiparous fathers ($n = 296$)		Multiparous fathers ($n = 203$)		Cohen's *d*	Cramer's *v*	*p*[a]
		Freq (%)	M (SD)	Freq (%)	M (SD)	Freq (%)	M (SD)			
Demographic and pregnancy variables										
Fathers' age (years)	22–51		34.68 (5.08)		33.44 (4.73)		36.70 (5.01)	0.67		<0.001***
Infant's age (categories)	1–8		3.05 (2.41)		3.23 (2.50)		2.79 (2.25)	0.18		0.045*
Household income (categories)	1–10		6.45 (2.03)		6.45 (2.03)		6.67 (2.11)	0.10		0.258
Born in Sweden										
Yes		450 (90.2)		265 (89.5)		185 (91.1)			0.03	0.554
No		49 (9.8)		31 (10.5)		18 (8.9)				
Planned pregnancy										
Yes		422 (84.6)		250 (85.0)		172 (85.6)			0.01	0.868
No		73 (14.7)		44 (15.0)		29 (14.4)				
Social support										
partner										
Yes		462 (94.7)		283 (95.9)		179 (92.7)			0.07	0.125
No		26 (5.3)		12 (4.1)		14 (7.3)				
family										
Yes		357 (71.5)		238 (80.7)		119 (61.7)			0.21	<0.001***
No		131 (26.8)		57 (19.3)		74 (38.3)				
friends										
Yes		274 (56.1)		177 (60.0)		97 (50.3)			0.10	0.034*
No		214 (43.9)		118 (40.0)		96 (49.7)				
the Internet										
Yes		129 (26.4)		86 (29.2)		43 (21.2)			0.08	0.092
No		359 (73.6)		209 (70.8)		150 (77.7)				
Professional support										
Number of invitations to CHC visits	0–3		1.70 (1.17)		1.96 (1.11)		1.33 (1.53)	0.56		<0.001***
Number of attended CHC visits	0–3		2.10 (0.85)		2.30 (0.77)		1.81 (0.89)	0.61		<0.001***
child health nurse	0–42		30.68 (10.76)		31.80 (10.61)		29.07 (10.79)	0.26		0.006**
postnatal midwife	0–6		4.53 (1.73)		4.55 (1.77)		4.50 (1.67)	0.03		0.751
Bonding disturbances										
Bonding disturbances	0–62		13.34 (8.73)		12.38 (8.16)		14.76 (9.34)	0.28		0.003**

Note. The data are based on the unimputed data set.
[a] The p-values are based on chi-square tests for the categorical variables and t tests for the scale variables.
* $p < 0.05$,.
** $p < 0.01$,.
*** $p < 0.001$.

Table 2
Spearman correlation coefficients between support from the child health nurse and total bonding disturbances.

	Correlations with total bonding disturbances among all fathers ($n = 499$)	Correlations with total bonding disturbances among primiparous fathers ($n = 296$)	Correlations with total bonding disturbances among multiparous fathers ($n = 203$)
Scale: Total support from the child health nurse	−0.25***	−0.31***	−0.11
Item 1: The child health nurse gives me support	−0.23***	−0.34***	−0.04
Item 2: The child health nurse shows engagement for my parenting	−0.21***	−0.26***	−0.12
Item 3: The child health nurse has provided me with information about breastfeeding	−0.16***	−0.17**	−0.09
Item 4: The child health nurse has provided me with information about care	−0.18***	−0.26***	−0.01
Item 5: The child health nurse treats me in a welcoming manner	−0.18***	−0.19**	−0.15*
Item 6: The child health nurse allows for questions about parenting	−0.21***	−0.24***	−0.14
Item 7: The child health nurse answers my questions	−0.23***	−0.25***	−0.18*

Note. The Spearman correlation coefficients were calculated based on the unimputed (original) dataset.
* $p < 0.05$,.
** $p < 0.01$,.
*** $p < 0.001$.

child health nurse answered the fathers' questions ($r_s = -0.18$, $p = 0.011$). There were no other significant correlations in the subsample of multiparous fathers.

Professional and social support and father-infant bonding

Table 3 presents the pooled multiple linear regression models with total bonding disturbances as the dependent variable. Model 1 presents the results based on the total sample, including both primiparous and multiparous fathers ($n = 499$). The ANOVA for Model 1 was significant ($F(8, 400) = 10.48$, $p < 0.001$), and it explained about 15 percent of the variance in the scale for total bonding disturbances ($R^2 = 0.148$, adjusted $R^2 = 0.135$). As indicated by Model 1, more frequent bonding disturbances were reported by fathers who more often perceived received support from the Internet (β = 0.13, 95% CI [0.04, 0.21], $p = 0.003$). Also, Model 1 indicated that less frequent bonding disturbances were reported by fathers who more often perceived received support from partners (β = −0.18, 95% CI [−0.26, −0.09], $p < 0.001$), perceived received more support from postnatal midwives (β = −0.15, 95% CI [−0.24, −0.06], $p < 0.001$), perceived received more support from child health nurses (β = −0.15, 95% CI [−0.25, −0.06], $p = 0.001$), and attended more CHC visits (β = −0.16, 95% CI [−0.25, −0.06], $p = 0.001$).

First-time fathers' received professional and social support and infant bonding

Model 2 indicates the results for primiparous fathers ($n = 296$). The model ANOVA was significant ($F(7, 288) = 10.12$, $p < 0.001$), and the model explained nearly 20 percent of the variance in the square root of total bonding disturbances ($R^2 = 0.200$, adjusted $R^2 = 0.181$). According to Model 2, more frequent bonding disturbances were reported by primiparous fathers who more often perceived received support from the Internet (β = 0.12, 95% CI [0.01, 0.22], $p = 0.026$), and less frequent bonding disturbances were reported by primiparous fathers who more often perceived received support from partners (β = −0.22, 95% CI [−0.33, −0.11], $p < 0.001$), as well as more perceived support from postnatal midwives (β = −0.20, 95% CI [−0.31, −0.09], $p < 0.001$), and the child health nurse (β = −0.20, 95% CI [−0.31, −0.08], $p = 0.001$).

Multi-time fathers' received professional and social support and infant bonding

Model 3 presents the results for multiparous fathers ($n = 203$). The model ANOVA was significant ($F(8194) = 3.00$, $p = 0.003$), and it explained about 11 percent of the variance in the square root of total bonding disturbances ($R^2 = 0.112$, adjusted $R^2 = 0.076$). Model 3 indicated that more frequent bonding disturbances were reported by multiparous fathers who more often perceived received support from the Internet (β = 0.14, 95% CI [0.00, 0.28], $p = 0.044$), and less frequent bonding disturbances were reported by multiparous fathers who more often perceived received support from the partner (β = −0.15, 95% CI [−0.29, −0.02], $p = 0.030$) and attended more CHC visits (β = −0.19, 95% CI [−0.32, −0.05], $p = 0.009$).

Discussion

The present study investigated the associations between received professional and social support and father-infant bonding disturbances. The findings suggest that fathers reported fewer bonding disturbances if they perceived support from postnatal midwives, child health nurses, and their partners. All forms of support from the postnatal midwife and child health nurse were associated with less frequent bonding disturbances among primiparous fathers. In contrast, more often received partner support and attending more CHC visits, but not perceived received professional support, was associated with less frequent bonding disturbances for multiparous fathers.

Professional and partner support promotes father-infant bonding

Previous research highlights that both mothers (Nakić Radoš et al., 2024) and fathers (de Cock et al., 2016) have stronger infant bonds with their first child, perhaps because they do not need to split their attention between multiple children. The current study indicates that professional support may help fathers form stronger bonds with their infants. However, while primiparous fathers seem to benefit from all received child health nurse support items, multiparous fathers only benefited from being treated in a welcoming manner and having their questions answered. Additionally, primiparous fathers reported stronger infant bonds than multiparous fathers. Therefore, the current standardized advice from the postnatal midwives and child health nurses seem to benefit primiparous fathers more than multiparous fathers regarding infant bonding. Further tailored efforts by health care professionals may be needed to better support multiparous fathers' infant bonding. For

Table 3
Multiple regression models with the total bonding disturbances as the dependent variable.

	All fathers (n = 499)				Primiparous fathers (n = 296)				Multiparous fathers (n = 203)			
		95% CI				95% CI				95% CI		
	β	From	To	P	β	From	To	p	β	From	To	p
Fathers' age (year)												
Infant's age (categories)	0.05	−0.03	0.13	0.235					0.08	−0.05	0.22	0.215
Household income									−0.09	−0.22	0.05	0.218
Born in Sweden												
Planned pregnancy	0.06	−0.03	0.14	0.171					0.13	0.00	0.27	0.057
partner	−0.18	−0.26	−0.09	<0.001***	−0.22	−0.33	−0.11	<0.001***	−0.15	−0.29	−0.02	0.030*
family					−0.08	−0.19	0.03	0.141	0.08	−0.05	0.22	0.241
friends												
the Internet	0.13	0.04	0.21	0.003**	0.12	0.01	0.22	0.026*	0.14	0.00	0.28	0.044*
Number of invitations to CHC visits	0.06	−0.03	0.16	0.191	0.12	0.00	0.24	0.059				
Number of attended CHC visits	−0.16	−0.25	−0.06	0.001**	−0.08	−0.19	0.04	0.196	−0.19	−0.32	−0.05	0.009**
Total support from child health nurse	−0.15	−0.25	−0.06	0.001**	−0.20	−0.31	−0.08	0.001**				
postnatal midwife	−0.15	−0.24	−0.06	<0.001***	−0.20	−0.31	−0.09	<0.001***	−0.13	−0.27	0.00	0.051
Pooled F for ANOVAs	10.48			<0.001***	10.12			<0.001***	3.00			0.003**
Pooled R^2	0.148				0.200				0.112			
Pooled adjusted R^2	0.135				0.181				0.076			

Note. Variables with empty rows were excluded from the final models through stepwise elimination procedures based on the adjusted R^2 statistic. Only standardized regression parameters are presented.
* $p < 0.05$,.
** $p < 0.01$,.
*** $p < 0.001$.

example, clinical professionals may want to try advising multiparous fathers on how to manage the stress and anxiety that comes with parenting multiple children, engage and support both parents on coparenting multiple children, and help improve fathers' familial coping and resource management skills (de Cock et al., 2016). Additionally, professionals and partners might think of ways to include and involve multiparous fathers in rearing their new infant, as the quantity and quality of time fathers spend with their children enhances their bonding (Nakić Radoš et al., 2024; Suzuki et al., 2022). However, more research is needed to understand what mechanisms, if any, professionals can deliver to multiparous fathers to strengthen their infant bond.

Child health professionals can be important supportive figures for new parents as they transition to parenthood (Fisher et al., 2018; Wells, 2016). In Sweden, both midwives and child health nurses provide health promotion and prevention services, including specifically asking and talking about the father-infant relationship as part of the 3–5 month visit (Rikshandboken Barnhälsovård (The National Handbook of Child Health Care), 2019). Currently, there are three primary postnatal visits to which the father should be explicitly asked to join: the home visit, occurring typically in the first week after birth, a 1–3 week visit, and the 3–5 month visit, where both parents are invited to the first two visits and only the father should be invited to the third visit (Odonde et al., 2022; Rikshandboken Barnhälsovård (The National Handbook of Child Health Care), 2020). Attending visits and receiving professional support, especially for primiparous fathers, is associated with reduced bonding disturbances in fathers. Since paternal-infant bonding is important for the father and child and predicts later father-involvement (Brockington et al., 2006; Le Bas et al., 2020), having fathers attend and participate in more pediatric child health visits may benefit fathers, as well as his child. However, the cross-sectional nature of the study only allows us to explain associations and not the directionality of the findings; therefore, further research is necessary to help determine the directionality of the findings.

Finally, the current study found an association between more often received Internet-based support and increased bonding disturbances; suggesting that fathers benefit more from professional and partner support than Internet-based laymen support. Fathers who use the Internet for support may lack strong social support networks. However, while there are many support groups on social media sites, there is also a relationship between social media usage and mental health issues (Yoon et al., 2019). Since depression symptoms can impact father-infant bonding (Wells and Jeon, 2023), it may be that those fathers with mental health issues were more likely to utilize Internet-based support, but more research is necessary to confirm this speculation.

Since a strong father-infant bond predicts important child outcomes, such as improved socio-emotional development (Ramsdell and Brock, 2021), and because inadequate professional support toward fathers predicts worsened child socio-emotional development (Ramsdell and Brock, 2021), clinical efforts should be made to ensure that fathers, including multiparous fathers, receive high quality professional and partner support.

Infant bonding with primiparous and multiparous fathers

Clinical care can be better delivered if tailored to different groups. While the literature often tailors clinical advice based on parental sex, more research is also exploring parental differences based on parity (Bohne et al., 2022; de Cock et al., 2016). The parity of the parent may be an important factor, as primiparous parents may face different parental obstacles compared to multiparous parents. For example, within the parity literature, primiparous parents are more often researched and are perceived as needing more professional support than multiparous parents (Baldwin et al., 2018; Hrybanova et al., 2019; van Vulpen et al., 2021). However, some recent literature on fathers' parity has shown that while first- and multiparous fathers were equally as likely to report depressive symptoms, primiparous fathers were much more likely to receive professional and social support than multiparous fathers (Wells and Aronson, 2021b).

In the current study, multiparous fathers were more likely to develop bonding disturbances than primiparous fathers. They were also less often invited to child health visits, less often attended the visits, and received less support from the child health nurses compared to primiparous fathers. These findings imply that primiparous fathers generally receive more adequate and more useful professional support than multiparous fathers regarding infant bonding. Multiparous fathers may bond less with their infant than primiparous fathers because, while primiparous fathers are splitting childrearing time more today than previous generations (Bakermans-Kranenburg et al., 2019), they may interact and play more with their first-born, while the mother breast-feeds and childrears the new infant. Since Swedish parental leave

research highlights that the amount of parental leave taken is not a stable predictor of father-infant bonding (Schaber et al., 2021), the quality of father-infant interactions may be more important to develop stronger bonds. Multiparous fathers may therefore benefit from clinicians encouraging both parents to have multiparous fathers spend time engaging in quality childrearing practices with their infant to better bond with them. In addition, clinicians may need to re-think the support and advice they give and differentiate how they support primiparous verses multiparous fathers, as their current levels of support, except for warming greeting and answering their questions, did not significantly reduce multiparous fathers' bonding disturbances. Additionally, fathers may struggle with bonding with their infant if they have depressive symptoms (Trautmann-Villalba et al., 2023; Wells and Jeon, 2023) or a weakened coparenting relationship (Schaber et al., 2021; Wells and Jeon, 2023); therefore, clinicians may seek ways to promote fathers' mental health and strengthen the coparenting relationship to further encourage the father-infant bond.

Strengths and limitations

To our knowledge, this is the first study assessing the associations between professional and social support on father-infant bonding in Sweden. Furthermore, we assessed these associations based on paternal parity, allowing for a clearer understanding of the types of support first- and multiparous fathers may have regarding bonding with their infant. However, our sampling method via recruiting through social media advertisements makes it difficult to discern the total representativeness of the sample. For example, while we controlled for several demographic and parental factors in the regression models, there are other potential covariates that were not used, such as father involvement or fathers' psychological well-being. Additionally, while living in the same household may be relevant, this item was not incorporated in the model as nearly 99% of participants reported living together with the child's mother.

In addition, the cross-sectional design only allows for associations and is therefore not causal. We therefore relied on empirical evidence and theory to guide our interpretation that greater professional and partner support helped strengthen the father-infant bond. However, it is possible that fathers with stronger bonds are more likely to attend and receive professional support and have better coparenting relationships than those with bonding disturbances. Future research therefore might further confirm/challenge our current findings and/or use causal models to better determine the directionality of the findings. For example, future research could examine the interplay between the quantity of visits attended and the quality of received professional care in relation to paternal bonding. Based on the current study's findings, there are several hypotheses that are worth testing: Hypothesis 1: Observed, rather than perceived, support will yield similar outcomes, where greater levels of observed received professional and social support will be associated with greater father-infant bonding. Hypothesis 2: The more fathers feel they can (and do) receive professional and partner support, the more capable and confident (i.e. higher self-efficacy) they will feel in childrearing. Hypothesis 3: Primiparous fathers who receive higher levels of professional and partner support will exhibit stronger bonding with their infants compared to those with lower support levels. Hypothesis 4: All fathers, but especially multiparous fathers, who are invited to and participate in more perinatal and child health visits will have strengthened father-infant bonds compared to those are not invited or participate to a lesser extent. Hypothesis 5: The use of continuous scales to measure social support will reveal a positive correlation between the strength of social support and the quality of father-infant bonding. Hypothesis 6: Prenatal interventions targeting paternal depression and anxiety will lead to enhanced paternal bonding postnatally, as measured by validated bonding scales.

Another potential limitation is that the data are self-reported. It might therefore be that those with stronger bonds feel like they received more professional and partner support because of their strong infant bond. Objectively observed studies regarding received support could be helpful in better understanding the amount of support fathers receive. However, this is much more costly and invasive relative to self-reported data, and therefore less feasible. Additionally, the social support variables are dichotomous (yes/no) and therefore, we do not know the strength of those supports. Greater details may be found if a continuous scale of social support were used in future research. Lastly, the current study only uses data from fathers, and as such, dyadic or triadic models cannot be used, but may lend additional important insights.

Finally, the model selection procedures, which removed independent variables in a stepwise manner while maximizing the pooled adjusted R^2, might be called into question for producing biased estimates and underestimating parameter standard errors. At the same time, these procedures offered a structured approach to model selection and contributed to model parsimony. In other words, the model selection procedures involved a tradeoff between the risks of bias and underestimated standard errors, on the one hand, and the benefits of structure and parsimony, on the other. Replication attempts based on other empirical samples are needed to decide the robustness of the statistical findings produced through the given model selection procedures.

Conclusion

The current study revealed that there is an association between father-infant bonding and received professional and social, especially partner, support. However, these findings were different based on paternal parity, where primiparous fathers received more professional and social support than multiparous fathers, and multiparous fathers were less bonded to their new infant than primiparous fathers. Since parent-infant bonding predicts later parent involvement and several positive child outcomes, clinicians should seek ways to further promote the father-infant bond, including by having fathers meet clinicians postnatally at least three times during the infants' first six months, as well as be encouraged to spend time with and care for their infant. Clinicians should be aware that there are differences between first- and multiparous fathers' ability to bond with their infants, where multiparous fathers may require additional clinical support. Clinicians might also discuss with mothers and fathers about the importance of the father-infant bond and encourage fathers to spend more time caring for their infant.

Ethics

The Stockholm Regional Ethics Board granted ethical approval for the current study (dnr: 2018/889–31/5).

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CRediT authorship contribution statement

Michael B. Wells: Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Michele Giannotti:** Writing – review & editing, Writing – original draft, Conceptualization. **Olov Aronson:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

No conflicts of interest to report.

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