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Parenting sense of competence among chinese parents of premature infants: a cross-sectional study

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Abstract

Background Parenting sense of competence is not only indispensable to the wellbeing of the parents of premature infants, but is also pivotal to the overall development of these infants. This study examined the level of parenting sense of competence and its associated factors in Chinese parents of preterm infants.

Methods This cross-sectional study was performed at a university teaching hospital in Fuzhou (China) from December 2021 to April 2022. Data were collected using the Parenting Sense of Competence Scale, Edinburgh Postnatal Depression Scale, Social Support Rating Scale, Parenting Care Knowledge Subscale, Parenting Care Skill Subscale, and a sociodemographic questionnaire.

Results A total of 401 Chinese parents were included in the analysis. The average parenting sense of competence scale score was 70.93 ± 13.06. After controlling for demographic characteristics, parenting knowledge ($\beta = 0.149$, $P = 0.013$), parenting skills ($\beta = 0.241$, $P < 0.001$), social support ($\beta = 0.184$, $P < 0.001$) and depression ($\beta = -0.272$, $P < 0.001$), were significantly associated with the parenting sense of competence score, and explained 43.60% of the variance in this score.

Conclusions Chinese parents of preterm infants were found to have a moderate parenting sense of competence. This could be further improved through efforts aimed at reducing depressive symptoms and increasing parenting knowledge, parenting skills, and social support.

Keywords Competence, Premature birth, Parents, Social support, Depression, Cross-sectional study

Background

With advancements in preterm infant care, the survival rate of vulnerable preterm infants has improved significantly over the past few decades in China [1]. However, compared with healthy full-term infants, surviving preterm infants are more likely to experience a heightened risk of short- and long-term impairments in neurological, sensory, cognitive, and behavioral development [2]. Research widely supports parenting quality as a critical social factor for optimizing the overall development of preterm infants [3]; an important predictor of the parenting quality is parenting sense of competence [4].

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Parenting sense of competence refers to the parents' personal evaluation of their capacity to care for their infants (usually conceptualized as perceived self-efficacy in parenting) as well as their contentment with their parenting role [5]. Acquisition of parenting sense of competence is increasingly being considered a modifiable determinant of parental role adaptation; this has significant for improvement of parenting quality as well as the cognitive and social improvement of preterm infants [6]. Parents with a low level of parenting sense of competence are more prone to feeling disinterested in interacting with their vulnerable infants; this may hamper the parents' opportunities for bonding with their child and hinder their transitioning to parenthood [7]. Conversely, a strong parenting sense of competence has been shown to foster positive childrearing practices and parent-infant attachment [8]. Therefore, comprehensively understanding parenting sense of competence and its associated variables, and accordingly devising effective interventions for improving the overall development of preterm infants is crucial.

Most studies on parenting sense of competence have focused on parents of full-term infants or infants with specific problems, such as, autism, multiple sclerosis, and intellectual disability [9–11]. Only few studies have investigated parenting sense of competence among parents of preterm infants [12]. Furthermore, these studies have certain limitations, for instance, they have small sample sizes, samples comprising mothers alone or focused on investigations performed only during hospitalization and at early discharge. For example, Koliouli et al. found that parenting sense of competence was worse among fathers of preterm infants exhibited worse sense of than among those of full-term infants; however, their study comprised 48 fathers [13]. Furthermore, a cross-sectional survey revealed that age, monthly per capita household income, and parenting experience influenced parenting sense of competence [14]. However, Duan et al. reported that monthly per capita household income did not affect parenting sense of competence among mothers of preterm infants [15].

Evidence from other populations (e.g., parents of healthy infants or parents of children with "special" diseases) has shown that social support, depression, and family functioning are also associated with parenting sense of competence [16–18]. However, to our knowledge, related studies on parents of preterm infants have primarily focused on the relationship between parenting sense of competence and depression or social support. For instance, Wu et al. found a significant negative correlation between depressive symptoms and parenting sense of competence among preterm primiparous mothers at 3 months postpartum [19]. Furthermore, some studies have demonstrated that augmenting parental knowledge and skills could improve parenting sense of competence [20, 21]; however, the associations among these factors have not been studied extensively. Therefore, we performed this cross-sectional study, to investigate the level of parenting sense of competence and its relationship with the above-mentioned factors among parents of preterm infants. We hypothesized that parenting sense of competence in these parents is related to a various demographic (e.g., gestational age and education level), psychological (depressive symptoms), and sociocultural (social support and family functioning) factors. Accordingly, our study had the following three objectives:

1. To establish the level of parenting sense of competence among parents of preterm infants within the first year after preterm birth.
2. To evaluate whether the sociodemographic characteristics of preterm infants' and their parents' are associated with parenting sense of competence.
3. To examine the relationships among depressive symptoms, social support, family functioning, parenting knowledge, parenting skill, and parenting sense of competence.

Methods

Study design, setting, and participants

This cross-sectional study was performed between December 2021 and April 2022 at a university teaching hospital in Fuzhou (capital of the Fujian Province, southeast China). Fuzhou has a population of approximately 8.42 million, and this hospital records more than 3,000 births annually.

The study sample comprised parents of preterm infants. The inclusion criteria were as follows: (1) age > 18 years, (2) ability to read and complete the questionnaires, (3) having infants born between 25 and 37 weeks of gestation, and aged less than 1 year at the time of inclusion. The exclusion criteria were as follows: (1) presence of cognitive dysfunction, or a family history of psychiatric illness and (2) having premature infants diagnosed with genetic abnormalities, cerebral palsy, or a congenital disability (e.g., cleft lip and palate or deafness).

Sample

The sample size was calculated using the Power Analysis and Sample Size software. With alpha set to 0.05, a sample size of 395 was found to have 80% power for detecting an effect size (f^2) of 0.02 in multiple regression analyses. Accordingly, the 401 parents included in the final study sample provided sufficient power or detecting minimum effect sizes.

Measurement

Parenting sense of competence were measured using the Chinese version of the Parenting Sense of Competence

Scale (C-PSOC), C-PSOC comprises 17 items that are divided into the perceived parental role competence subscale (PSOC-E; eight-items) and the parenting satisfaction subscale (PSOC-S; nine-items). Each item is scored on a 6-point Likert scale, with scores ranging from 1 (strongly disagree) to 6 (strongly agree). The scores of all items are summed to obtain the overall PSOC score (range: 17–102). The score ranges for PSOC-E and PSOC-S are 8 to 48 and 9 to 54, respectively. A higher score indicates a higher competence and parenting satisfaction. In a previous study, the Cronbach's alpha was 0.87 and the internal consistency ranged from 0.78 to 0.88 [6]. In this study, the Cronbach's alpha was 0.93.

Parental depressive symptoms were evaluated using the Edinburgh Postnatal Depression Scale (EPDS). The EPDS is the most popular instrument for screening depression throughout the perinatal period [22]. It comprises 10 items, and each item is from 0 to 3; thus, the overall score ranges from 0 to 30, with higher scores indicating more severe depressive symptoms. Cut-off scores of 10 and 13 have been recommended to indicate high levels of depressive symptoms in fathers and mothers, respectively. In a previous study, the Cronbach's alpha was 0.78, and the test retest reliability was 0.90 [23]. In the present study, the Cronbach's alpha was 0.86.

Social support was measured using the Social Support Rating Scale (SSRS); this instrument is commonly used to assess an individual's personal social support within Chinese communities [24]. It is a 10-item, three-dimensional self-reporting instrument that assesses subjective support, objective support, and support utilization. Seven items are rated on a 4-point Likert scale, with scores ranging from 1 to 4 ; the remaining three items are rated by calculating the number of support sources. Higher scores indicate a greater level of social support. The SSRS has exhibited high reliability and validity for use among Chinese parents in a previous study, with Cronbach's alpha values of 0.73 and 0.75 for Chinese mothers and fathers, respectively [25]. In the present study, the Cronbach's alpha value was 0.83.

Family functioning was evaluated using the Family "Adaptability, Partnership, Growth, Affection, and Resolve" Index (APGAR) (APGAR). Compiled by Smilkstain [26], it is a self-administered questionnaire that assesses an individual's satisfaction with their family functioning. The instrument comprises five questions, one each on adaptation, partnership, growth, affection, and resolution; the response to each is scored on a 3-point Likert scale (0=hardly ever, 1=occasionally, and 2=almost always). The overall scores range from 0 to 10; scores of 8–10, 4–7, 0–3 suggest positive, moderate family dysfunction, severe family dysfunction, respectively. In a previous study, the Cronbach's alpha was 0.87 [27]; in this study, the Cronbach's alpha was 0.89.

Parenting knowledge and skills were evaluated using the care knowledge and care skills subscales of the Premature Infant Care Competence Scale for Parents in transition (PICCS), respectively. Developed by Zhao in 2020 [28]; the complete PICCS is a 35-item instrument, and each item is rated on a 5-point Likert scale. The care knowledge and care skills subscales comprise 13 and 11 items, respectively; these are related to common knowledge and skills pertaining to the daily care of premature infants, respectively. Each item is rated from 1 (completely know) to 5 (completely do not know), with higher scores indicating a higher level of parenting knowledge and skills. In our study, the Cronbach's alpha coefficients for the care knowledge and care skills subscales were 0.95 and 0.94, respectively.

Using a sociodemographic data sheet, the following parental data were obtained: age, occupation status, educational level, and monthly household income (per person). Furthermore, the infants' data (e.g., sex and age) were also collected.

Data collection and procedures

The data were collected by two trained researchers (L.H and BY.Z) at a preterm infant follow-up clinic. To ensure an accurate and consistent data collection process, the researchers explained the survey's purpose and procedure to the parents once they met the inclusion criteria and assured them that all data would be kept confidential. After receiving written informed consent, the parents were invited to complete the five self-reporting instruments (which required approximately 15–20 min).

Statistical analysis

Data were analyzed using IBM SPSS Statistics 26.0 (version 26.0, IBM Corp, Armonk, NY, Stata Corp U.S.A.). Descriptive statistics were computed to describe parental characteristics. Since our data were non-normally distribute of our data, non-parametric tests were used to compare PSOC score, and parental sociodemographic characteristics. Spearman correlation analyses were performed to explore the relationships between the PSOC score and continuous variables. A multivariate linear regression was performed as follows to identify variables that were independently associated with the PSOC score ($P < 0.05$). In Model 1, PSOC score was considered the dependent variable, while significant sociodemographic factors ($P<0.15$ in the univariate analysis) were considered the independent variables. In Model 2, parenting knowledge, parenting skills, social support, family functioning, and depression were analyzed as predictors. Finally, Model 3 was adjusted to control for potential confounders (e.g., gender, monthly income per capita, and education degree).

Results

Demographic characteristics of the participants

Throughout the recruitment period, 452 eligible parents were contacted; among these, 51 parents (11.3%) declined participation for personal reasons (e.g., lack of time). The remaining, 401 parents completed the survey (response rate of 88.7%). Among these, 184 (45.90%) were fathers and 217 (54.10%) were mothers. The mean age of the parents was 31.93 years (range 20–46 years, standard deviation [SD]=4.61), whereas the mean age of their non-participating spouses was 32.28 years (range: 18–49 years, SD=4.81). Most parents and their non-participating spouses had obtained at least a high school degree (parents: 82.00%, spouses: 82.5%); furthermore, most were public officials (parents: 59.40%, spouses: 70.00%). Most preterm infants were in the least serious preterm category, with most categorized as having a moderate/late gestational level (gestational age: 32–36 weeks). The detailed demographic characteristics of the participants are presented in Table 1.

Level of parenting sense of competence

The descriptive statistics of the parenting sense of competence are presented in Table 2. The mean PSOC score was 70.93 (SD=13.06; range: 40.00-102.00). The mean PSOC-E score was 34.57 (SD=6.58; range: 18.00–48.00), whereas, the mean PSOC-S score was 36.36 (SD=8.20; range:16.00–54.00).

Correlations among the scores for PSOC, SSRS, parenting knowledge and skills, and APGAR

As shown in Table 3, the scores for SSRS, APGAR, the parenting knowledge subscale, and the parenting skills subscale were significantly and positively correlated with the PSOC score ($P<0.001$). However, the EPDS scores were significantly negatively correlated with the PSOC scores ($r = -0.484$, $P<0.001$).

Factors associated with the PSOC scores

Univariate analysis revealed that gender ($P=0.039$), time since discharge ($P=0.023$), monthly income per capita ($P=0.003$), education degree ($P=0.033$), spouse's education degree ($P=0.033$), and spouse's occupational status ($P=0.005$) were significantly associated with parenting sense of competence (see Table 1).

The results of the multiple regression analysis are shown in Table 4. In Model 1, gender, time since discharge, monthly income per capita, education degree, spouse's education degree, and spouse's occupational status together accounted for 7.20% of the variance in the PSOC score. In Model 2, depression ($\beta = -0.295$, $P<0.001$), social support ($\beta=0.202$, $P<0.001$), parenting knowledge ($\beta=0.150$, $P=0.014$), and parenting skills ($\beta=0.212$, $P<0.001$) were significantly associated with the PSOC score; the model explained 39.40% of the variance in this score. Finally, in Model 3, (after controlling for demographic characteristics), depression ($\beta = -0.272$, $P<0.001$), social support ($\beta=0.184$, $P<0.001$), parenting knowledge ($\beta=0.149$, $P=0.013$) and parenting skills ($\beta=0.241$, $P<0.001$) were significantly associated with the PSOC score; the model explained 43.60% of the variance in this score. Moreover, there was no multicollinearity in the independent variables in any of the three regression models.

Discussion

To the best of our knowledge, this study is the first to investigate the level and predictors of parenting sense of competence among parents of preterm infants within the first year of preterm birth in China. We found that parents of premature infants showed a moderate parenting sense of competence. We also found that of all demographic variables, only the monthly household income (per person) was a significant predictor of parenting sense of competence among parents of preterm infants. Further, a core finding of this study was that depression, social support, parenting knowledge, and parenting skills were the key factors for parenting sense of competence, and that these variables collectively contributed to 43.6% of the variance in the PSOC score. This is a new insight into clinical care practice; compared with relying on one of these variables, a comprehensive assessment of social support, depression, parenting knowledge, and parenting skills may be more accurate and useful.

Our findings revealed that these parents exhibited a moderate parenting sense of competence; the PSOC score obtained in our study (70.93±13.06) is lower than that obtained in a recent study on Chinese parents of healthy full-term infants [29]. In another study, the mean PSOC score for Spanish parents of full-term infants was 77.77 [10], which is also higher than obtained in this study. Compared with full-term infants, most preterm infants are typically admitted to the neonatal intensive care immediately at birth. This interruption in the development of a healthy parent-infant attachment, along with prognostic uncertainty and a prolonged separation between the parents and their infants, may lead to a decline in parenting sense of competence [13]. Notably, the level of overall parenting sense of competence in this study was significantly higher than that in Wu et al. in China (mean maternal PSOC score: 59.32), although both studies had the same study design and involved the same measurement tool [19]. This significant difference may be explained by the differing study populations. Wu et al. investigated primiparous mothers of preterm infants at 3 months postpartum, while we investigated parents of preterm infants. Owing to inadequate childcare experience, first-time mothers of preterm infants

Table 1 Demographic characteristics of participants (n = 401)

Variables	N (%)	Medium (Q1, Q3)	P
Gender			
Male	184 (45.90)	69.00 (64.00, 81.00)	Z = -2.069, *P* = 0.039*
female	217 (54.10)	67.00 (61.00, 77.00)	
Baby gender			
boy	237 (59.10)	68.00 (61.00, 80.00)	Z = -0.583, *P* = 0.560
girl	164 (40.90)	69.00 (63.00, 78.00)	
Multiple Birth			
No	311 (77.60)	68.00 (62.00, 77.00)	Z = -1.259, *P* = 0.208
Yes	90 (22.40)	69.50 (61.75, 86.00)	
Type of delivery			
Normal vaginal delivery (NVD)	176 (43.90)	68.00 (61.00, 76.75)	Z = -0.563, *P* = 0.574
Cesarean section	225 (56.10)	69.00 (62.00, 80.50)	
Gestation age at birth			
< 24 to < 34	172 (42.90)	67.00 (60.25, 77.00)	Z = -1.836, *P* = 0.066
≥ 34 to < 37	229 (57.10)	69.00 (63.00, 81.00)	
Time since discharge (d)[a]			
≤ 7	104 (25.90)	68.50 (63.00, 77.75)	H = 9.496, *P* = 0.023*
>7 to ≤ 20	98 (24.40)	67.50 (62.00, 82.50)	
>20 to ≤ 40	105 (26.20)	72.00 (62.00,82.50)	
>40	94 (23.40)	66.00 (59.00,73.00)	
Length of hospital stay (d)[a]			
≤ 7	124 (30.90)	68.00 (62.00, 81.00)	H = 1.989, *P* = 0.575
>7 to ≤ 14	115 (28.70)	70.00 (62.00, 79.00)	
>14 to ≤ 30	75 (18.70)	67.00 (60.00, 77.00)	
>30	87 (21.70)	67.00 (62.00, 77.00)	
Birth weight (g)			
< 1500	80 (20.00)	67.50 (63.00, 79.75)	H = 0.309, *P* = 0.857
≥ 1500 to < 2500	227 (56.60)	68.00 (62.00, 77.00)	
≥ 2500	94 (23.40)	69.00 (60.75, 81.00)	
Mode of conception			
Natural conception	338 (84.30)	68.00 (61.75, 78.00)	Z = -1.082, *P* = 0.279
Other [b]	63 (15.70)	69.00 (63.00, 87.00)	
Infant feeding pattern			
Exclusive breastfeeding	154 (38.40)	70.00 (63.00, 81.00)	H = 5.178, *P* = 0.075
Partial breastfeeding	168 (41.90)	68.00 (62.00, 77.00)	
Bottle feeding	79 (19.70)	65.00 (60.00, 79.00)	
Family per capita monthly income (CNY)			
≤ 3000	76 (19.00)	66.00 (61.00, 72.00)	H = 14.224, *P* = 0.003**
>3000 to ≤ 5000	151 (37.70)	67.00 (61.00, 78.00)	
>5000 to ≤ 8000	124 (30.90)	68.50 (63.00, 84.75)	
>8000	50 (12.50)	74.50 (67.00, 84.00)	
Family type			
nuclear family	58 (14.50)	72.00 (65.00, 78.25)	Z = -1.339, *P* = 0.181
Extended family	343 (85.50)	68.00 (61.00, 79.00)	
First time parent			
Yes	243 (60.60)	68.00 (61.00, 78.00)	Z = -0.457, *P* = 0.648
NO	158 (39.40)	68.50 (62.00, 79.00)	
Age			
≤ 25	27 (6.70)	64.00 (59.00, 70.00)	H = 4.856, *P* = 0.183
>25 to ≤ 30	127 (31.70)	67.00 (61.00, 85.00)	
>30 to ≤ 35	163 (40.60)	69.00 (62.00, 78.00)	
>35	84 (20.90)	69.50 (64.00, 80.75)	
Education degree			

Table 1 (continued)

Variables	N (%)	Medium (Q1, Q3)	P
Gender			
Junior middle school or below	72 (18.0)	66.00 (61.00, 71.75)	H = 8.796, *P* = 0.032*
High school or technical secondary school	77 (19.20)	67.00 (62.00, 74.50)	
Tertiary	83 (20.70)	68.00 (61.00, 80.00)	
university or above	169 (42.10)	71.00 (62.50, 83.00)	
Occupational status[c]			
Non-public officials	163 (40.60)	67.00 (61.00, 74.00)	Z = -1.915, *P* = 0.056
Public officials	238 (59.40)	69.00 (62.00, 81.00)	
Parenting experience			
No	256 (63.80)	68.00 (61.00, 78.00)	Z= -0.297, *P* = 0.767
Yes	145 (36.20)	68.00 (62.00, 79.00)	
Spouse's age			
≤ 25	90 (22.40)	67.00 (60.00, 77.25)	H = 3.416, *P* = 0.332
>25 to ≤ 30	66 (16.50)	67.50 (64.00, 79.00)	
>30 to ≤ 35	154 (38.40)	68.00 (61.00, 78.00)	
>35	91 (22.70)	71.00 (64.00, 80.00)	
Spouse's education degree			
Junior middle school or below	70 (17.50)	66.00 (61.75, 72.00)	H = 17.388, P < 0.001***
High school or technical secondary school	84 (20.90)	65.50 (59.25, 71.75)	
Tertiary	88 (21.90)	67.50 (62.00, 80.75)	
university or above	159 (39.70)	72.00 (64.00, 82.00)	
Spouse's occupational status			
Non-public officials c	168 (41.90)	67.00 (61.00, 73.00)	Z = -2.782, *P* = 0. 005**
Public officials	233 (58.10)	70.00 (63.00, 81.00)	
Spouse's parenting experience			
No	254 (63.30)	68.00 (61.00, 78.00)	Z = -0.417, *P* = 0. 677
Yes	147 (36.70)	68.00 (62.00, 79.00)	

Note: a = Grouping according to interquartile spacing; b = Others include artificial insemination or in vitro fertilization; c = Public officials include teacher, civil servant, office staff and Non-public officials include Self-employed, Freelance; Z /H = Mann-Whitney Z test / Kruskal-Wallis H test; * *P* < 0.05, ** *P* < 0.01, *** *P* < 0.001

Table 2 Level of parenting sense of competence (n = 401)

Variables	Medium (Q1, Q3)	Range (Min, Max)	Mean (SD)
PSOC total score	68.00 (62.00, 78.50)	(40.00, 102.00)	70.93 (13.06)
parenting efficacy (PSOC Efficacy subscale)	33.00 (30.50, 38.00)	(18.00, 48.00)	34.57 (6.58)
parenting satisfaction (PSOC Satisfaction subscale)	35.00 (31.00, 41.00)	(16.00, 54.00)	36.36 (8.20)

Note: SD = standard deviations; PSOC = parenting sense of competence scale

Table 3 Correlations between parenting sense of competence and the key variables (n = 401)

Variable	Mean	SD	parenting sense of competence	depression	family functioning	social support	parenting knowledge	parenting skills
parenting sense of competence	70.93	13.06	1.000					
depression	8.39	5.21	-0.484***	1.000				
family functioning	7.54	2.61	0.288***	-0.295***	1.000			
social support	43.50	7.91	0.407***	-0.428***	0.369***	1.000		
parenting knowledge	42.65	9.56	0.445***	-0.307***	0.371***	0.371***	1.000	
parenting skills	40.83	7.42	0.420***	-0.270***	0.301***	0.301***	0.744***	1.000

Note: SD = standard deviations; ***$P < 0.001$

Table 4 Multiple linear regression analysis predicting parenting sense of competence (N = 401)

Variable		Model 1			Model 2			Model 3		
		Beta	P	VIF	Beta	P	VIF	Beta	P	VIF
Gender	Male	Ref	-	-	-	-	-	Ref	-	-
	female	-0.068	0.191	1.118	-	-	-	-0.043	0.315	1.254
Time since discharge (d)	≤ 7	Ref	-	-	-	-	-	Ref	-	-
	>7 to ≤ 20	0.041	0.499	1.530	-	-	-	0.042	0.376	1.541
	>20 to ≤ 40	0.070	0.253	1.541	-	-	-	0.025	0.604	1.605
	>40	-0.061	0.318	1.531	-	-	-	-0.044	0.364	1.587
Family per capita monthly income (CNY)	≤ 3000	Ref	-	-	-	-	-	Ref	-	-
	>3000 to ≤ 5000	0.054	0.460	2.247	-	-	-	0.011	0.848	2.283
	>5000 to ≤ 8000	0.142	0.060	2.344	-	-	-	0.053	0.374	2.398
	>8000	0.149	0.027*	1.879	-	-	-	0.107	0.044*	1.904
Education degree	Junior middle school or below	Ref	-	-	-	-	-	Ref	-	-
	High school or technical secondary school	0.043	0.540	2.012	-	-	-	-0.007	0.892	2.038
	Tertiary	0.066	0.385	2.365	-	-	-	0.074	0.211	2.377
	university or above	0.071	0.440	3.482	-	-	-	0.066	0.365	3.520
Spouse's education degree	Junior middle school or below	Ref	-	-	-	-	-	Ref	-	-
	High school or technical secondary school	-0.048	0.501	2.097	-	-	-	-0.079	0.157	2.121
	Tertiary	0.022	0.796	2.916	-	-	-	0.010	0.883	2.940
	university or above	0.092	0.378	4.469	-	-	-	0.034	0.678	4.501
Spouse's occupational status	Non-public officials	Ref	-	-	-	-	-	Ref		
	Public officials	-0.049	0.509	2.256	-	-	-	-0.024	0.683	2.260
Depression	-	-	-	-	-0.295	<0.001	1.279	-0.272	<0.001	1.422
Family functioning	-	-	-	-	-0.032	0.459	1.207	-0.050	0.250	1.281
Social support	-	-	-	-	0.202	<0.001	1.432	0.184	<0.001	1.501
Parenting knowledge	-	-	-	-	0.150	0.014*	2.383	0.149	0.013*	2.418
Parenting skills	-	-	-	-	0.212	<0.001	2.252	0.241	<0.001	2.428

Note: Model 1: $R^2 = 0.072$, Adjusted $R^2 = 0.038$, $F = 2.143$, $p = 0.009$;

Model 2: $R^2 = 0.394$, Adjusted $R^2 = 0.386$, $F = 51.397$, $p < 0.001$;

Model 3: $R^2 = 0.436$, Adjusted $R^2 = 0.408$, $F = 15.488$, $p < 0.001$;

* $P < 0.05$, ** $P < 0.01$

are often less likely to feel competent and fulfilled in their role as mothers [18].

Contrary to our expectations, no associations were observed between parenting sense of competence and the sociodemographic characteristics of preterm infants. Although the PSOC score of parents of late preterm infants (born after 34 week gestational weeks) were higher than those of parents of moderately, very, or extremely preterm infants, this difference was not statistically significant ($P = 0.066$). Pennell C et al. also obtained similar results; they discovered that the prematurity level did not influence parenting sense of competence [30]. Another study similarly revealed that the occurrence of a preterm birth itself is the main influencing factor for maternal sense of competence [31]. Our findings may be explained by the fact that we evaluated parenting sense of competence during the first year postpartum, and thus, parents of both very preterm and late preterm infants had adequate opportunities to master their parenting skills, and build a sufficient sense of parenting competence within the first few months following birth.

In accordance with a previous study [14], our study revealed that out of all parental sociodemographic factors, the monthly household income (per person) was retained in the final regression model, and was thus, a significant predictor of parenting sense of competence. The average first-year cost of raising a preterm infant is three times higher than that of raising a healthy full-term infant [32]. However, a previous study revealed that only 50% of the mothers of preterm infants return to work after their child is discharged from the hospital [33] ; this further leads to a decrease in their monthly household income. Families with a low income may encounter several barriers [34], that may harm parenting sense of competence and hinder the overall development of premature babies.

As expected, social support was positively associated with parenting sense of competence; this is in line with existing research [35]. A good social network can provide

adequate informational, emotional, and physical assistance to parents of infants, whereas a poor social support can diminish parenting sense of competence by causing parents to feel inadequate in maintaining their roles and responsibilities [36]. In one study, parents were interviewed about their lived experiences of having a preterm infant; most expressed feeling of helpless and inadequate and wished for more information and support from professionals [37]. Therefore, healthcare providers should be fully aware of the diversity of preterm infants and their families and offer support initiatives at multiple levels (e.g., peer support and family-centered care) [38].

The current study has also added to the evidence that advanced parenting skills and parenting knowledge are significantly associated with a better parenting sense of competence among parents of premature infants. Previous empirical evidence has revealed a connection between parenting sense of competence and parenting knowledge and abilities [20]. Based on the social cognitive theory [39], parenting sense of competence can be fostered through four domains, namely: mastery experiences, vicarious experiences, verbal persuasion, and physiological/emotional arousal. Mastery of experiences encompasses parenting skills and knowledge. A high parenting sense of competence implies that parents know how to care for their premature infant, which in turn, requires them to have sufficient parenting knowledge and skills [7]. Donovan et al., found that insufficient knowledge of infant development was associated with reduced parenting sensitivity in mothers [40]. In another study, after parents gained adequate parenting experience, the level of parenting sense of competence followed an increasing trend [21]. Therefore, healthcare professionals should focus on parents with poor parenting knowledge and skills within the first year of a child's birth, and offer professional guidance support, to help them cope with the difficulties of raising premature infants. This could be a rapid and efficient way of boosting parenting sense of competence.

This study also revealed that parents with more depressive symptoms tended to have a worse parenting sense of competence, this was supported by the findings of Ngai et al., who found that depression is a key factor affecting perceived maternal role competence and satisfaction postpartum [41]. Preterm birth puts parents in an unexpected situation; physical and mental fatigue from caring for a preterm infant, can lead to negative changes in the parents' emotions and satisfaction [42]. Martinez-Torteya et al., noted that reducing postnatal depressive symptoms may be a crucial aspect of interventions aimed at improving parenting sense of competence [43]. Therefore, after preterm birth, healthcare providers should screen both fathers and mothers for depression and provide timely and targeted interventions if required.

Better family functioning implies that parents receive considerable family support [17]. In this study, parents with poorer family functioning tended to feel less competent and satisfied in their parenting role. However, although family functioning was significantly related to parenting sense of competence, it was not retained in the final regression model. A recent systematic review indicated that poor family functioning is strongly associated with depression [44], while another study revealed parental depression as a mediator between family functioning and parenting sense of competence [17]. Based on our own and the aforementioned findings, we suggest that instead of considering better family functioning as a factor for higher parental sense of competence, it may be wiser to look at the ways in which family functioning directly or indirectly affects parenting sense of competence among parents of preterm infants.

Limitations

This study has several limitations. The participants comprised a convenience sample from one tertiary hospital in the Fujian Province (China). Therefore, the external validity of our findings may be limited. Furthermore, our study excluded preterm infants with specific diseases; thus, this population needs to be studied further in the future. The cross-sectional nature of this study precluded, causal inferences and precise mediation tests; to investigate causal relationships, additional studies with an experimental or longitudinal design are required. Finally, all the instruments used in this study were self-reported; thus, the risk of reporting bias cannot be ruled out.

Conclusions

This study examined the level of parenting sense of competence and associated factors among Chinese parents of preterm infants. Parenting sense of competence was associated with parenting skills, parenting knowledge, social support and depression. This finding may support the establishment of constructive recommendations for healthcare professionals who clinically implement home-based prenatal and postnatal care. To improve parenting sense of competence among parents of preterm infants, interventional strategies can be adopted that enable the provision of comprehensive knowledge and, social support, to such parents and promote their psychological well-being.

Abbreviations

C-PSOC	Chinese version of the parenting sense of competence scale
PSCO-E	Perceived parental role competence subscale
PSCO-S	Parenting satisfaction subscale
EPDS	Edinburgh postnatal depression scale
SSRS	Social support rating scale
APGAR	Adaptation, partnership, growth, affection, and resolve
PICCS	Premature infant care competence scale for parents in transition
SD	Standard deviation

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Authors' contributions
The manuscript was designed and written by L. Huang, XJ. Wang, and writing-reviewed and edited by GH. Liu, RF. Hu. The data were collected by L. Huang, XT. Li, BY. Zhao, and interpreted by L. Huang, YH. Zhang. All authors read and approved the final manuscript.

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Data Availability
Datasets used and analyzed during this study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The ethics committee of the Maternity and Child Health Hospital in Fujian approved the study protocol (No. 2021YJ067). The procedures used in this study adhered to the principles of the Declaration of Helsinki. All the participants were volunteered for this investigation, and each provided written informed consent before participation in this study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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