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Influence of perceived stress on fertility intention among women of childbearing age without children: multiple mediating effect of anxiety, family communication and subjective well-being

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Abstract

Background In recent years, there has been a significant decrease in the desire to have children among Chinese women of childbearing age, particularly for the first child. This trend has sparked a growing interest in understanding the underlying factors. Although perceived stress has been speculated as an important factor in decreasing fertility intention, the precise mechanism is unclear. The current study, therefore, aims to investigate the psychological mechanisms linking perceived stress to fertility intentions among women of childbearing age without children, a topic of significant relevance and importance.

Methods Data were sourced from Chinese residents' psychology and behavior investigation (PBICR-2022). A multistage random sampling method was applied to recruit eligible participants. The Mplus8.3 software constructed a chain path model among the variables.

Results The median fertility intention was 30(3–60) on a scale of 0 to 100. The mediation analysis revealed a significant negative influence of perceived stress on fertility intention ($\beta = -0.076$, $P < 0.001$). Additionally, a more intricate pattern of chain-mediating effect was observed involving perceived stress, anxiety ($\beta = 0.037$, $P < 0.05$), family communication ($\beta = 0.106$, $P < 0.001$), subjective well-being ($\beta = 0.088$, $P < 0.001$) and fertility intention.

Conclusions Perceived stress not only directly suppressed fertility intention but also indirectly affected it through anxiety, family communication, and subjective well-being. Effective family communication and favorable subjective well-being emerged as factors that could augment fertility intentions among women of childbearing age without children.

Keywords Perceived stress, Anxiety, Family communication, Subjective well-being, Fertility intention

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Introduction

Over the past three decades, one of the most notable demographic shifts has been the marked decline in global fertility rates, except for a few in impoverished rural areas [1]. A research article published in the Lancet in July 2020 projected that by 2100, the global total fertility rate could drop to 1.7, meaning an average of only 1.7 children per woman during her reproductive lifespan [2]. This projection aligns with trends in China, where, by the end of 2023, the total fertility rate had fallen to about 1.0—well below the critical threshold of 1.5 [3]. Such a decline in fertility poses substantial challenges to workforce sustainability, accelerates population aging, and impacts demographic structures, fundamental welfare, and societal progress [4].

China has discontinued the original family planning policy to address this issue and implemented various supportive measures to stimulate fertility. Nevertheless, the outcomes have fallen short of the policy's anticipated effects.

To clarify the phenomenon of low fertility, scholars have conducted extensive research and identified low fertility intention as a reliable birth predictor [5]. Fertility intention refers to an individual's expectations and attitudes toward having children within a specific timeframe [6]. It comprises tempo intentions, which relate to the timing of childbirth, and quantum intentions, which refer to the desired total number of children [7]. Micro and macro-level factors, including individual characteristics, family circumstances, socioeconomic status (SES), and sociocultural environment, can influence fertility intentions [8]. Previous studies have shown that some external stressors, such as labor pains, economic burdens [9], workplace competition [10], and conflicts between work and family [11], are also associated with one's fertility intention. While being a mother is generally a joyful experience for most women, it can also induce stress, which in turn influences their reproductive decisions [12]. However, the specific psychological mechanisms through which perceived stress affects fertility intention remain unclear.

The psychological stress theory posits that perceived stress, by disrupting individuals' equilibrium or exceeding their coping capacity, often triggers anxiety [13]. Anxiety can significantly influence individuals' behaviors and decision-making processes, including their fertility intentions [14]. A study examining China's universal two-child policy revealed that the pressures associated with childbirth led to significant anxiety about having a child among young women, subsequently inhibiting their fertility behaviors [15]. Similarly, another research on the decision to have a third child found that anxiety related to childbirth and parenthood was inversely associated with fertility intentions [16]. These findings implied that anxiety may serve as a mediating variable between perceived stress and fertility intentions; however, this has not yet been verified. Consequently, we hypothesize that acting as an independent mediator, anxiety will demonstrate a positive correlation with perceived stress and a negative impact on fertility intentions. (Hypothesis 1).

In 1980, Skinner et al. proposed the theory of process model of family functioning. This theory posits that the primary objective of a family is to manage various daily tasks, and effective communication within families is crucial for completing these tasks [17]. Having children is regarded as one of the family's fundamental functions and critical tasks. Previous studies demonstrated that under favorable economic conditions, families with effective communication are more likely to be close and express a desire for an expanded family size [18]. However, under unfavorable conditions or when facing significant pressures, whether effective family communication can still influence women's decisions to have children requires further exploration. In light of this, we hypothesize that as an independent mediator, family communication will negatively correlate with perceived stress and positively impact fertility intentions (Hypothesis 2).

Studies exploring the relationship between subjective well-being and fertility behavior have gradually grown over the past two decades. Luppi found that both experienced and anticipated well-being played influential roles in individuals' fertility decision-making [19]. Additionally, subjective well-being has also been linked to perceived stress [20]. When individuals perceive threats to their resources and struggle to adapt to their work environment, their happiness can be adversely affected [21]. However, the potential mediating role of subjective well-being in the relationship between perceived stress and fertility intentions remains uncertain. Therefore, we hypothesize that as an independent mediator, subjective well-being will negatively correlate with perceived stress and positively influence fertility intentions (Hypothesis 3).

In summary, existing studies and theories have identified several critical variables associated with decreased fertility intentions; however, the interaction of these variables with specific mechanisms remains ambiguous. Consequently, we propose that perceived stress will influence fertility intentions through a complex interplay chain of mediating effects involving anxiety, family communication, and subjective well-being. (Hypothesis 4). The complete hypothetical model is depicted in Fig. 1.

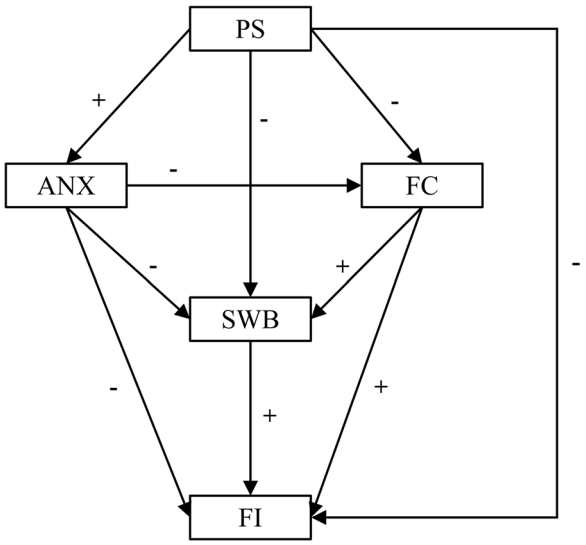

Fig. 1 Hypothetical model**.** PS = perceived stress, ANX = anxiety, FC = family communication, SWB = subjective well-being, FI = fertility intention

Methods

Participants

Since the implementation of China's new birth policy, many studies have shifted focus to the birth of second or third children. However, efforts to increase the birth rates of second or third children in the context of low first-child fertility incur significant costs and result in limited effectiveness and unsustainability. Consequently, this study aims to investigate the first baby fertility intentions of women of childbearing age who do not yet have children. Our data are derived from a large-scale cross-sectional survey, "Psychology and Behavior Investigation of Chinese Residents in 2022" (PBICR 2022) [22]. This extensive survey was conducted in China (excluding Hong Kong, Macau, and Taiwan) from June to August 2022, employing a multistage random sampling approach consisting of two stages. Initially, a total of 148 cities, 202 districts and counties, 390 townships/towns/subdistricts, and 780 communities/villages from 23 provinces, five autonomous regions, and four municipalities were selected as the first stratification [23]. Subsequently, respondents from each community and village were chosen in the second stage using non-equal probability sampling (quota sampling). The quota criteria include gender and age, with a required gender ratio of 1:1 and an age distribution generally following the Population Pyramid as per the "Seventh National Census in 2020" of China

A pre-tested structured questionnaire was used to collect information through a one-on-one and face-to-face interview by trained investigators. When face-to-face investigation was not feasible, the investigator resorted to online video interviews and directly provided electronic questionnaires to the participants. In total, 31,480 questionnaires were disseminated, collecting 30,505 valid questionnaires, yielding an overall response rate of 96.9%. The present study utilized data from the PBICR 2022 survey. The inclusion criteria comprised the following: (1) participants held Chinese nationality; (2) women aged between 20 and 49 years old without children and not currently pregnant. Although China's family planning regulations explain that women's reproductive age is 15–49 [24], considering the legal age of marriage for women in China is 20 years old, this study selected data related to women aged 20–49. (3) volunteered to participate in the research and completed a consent form; (4) could understand the content of each item in the questionnaire. The exclusion criteria included (1) participants with unconsciousness or severe mental disorders and (2) those unwilling to cooperate or be involved in similar projects. Ultimately, according to the inclusion and exclusion criteria (Fig. 2), we obtained a valid sample of 4872 for this study after deleting data with missing values and outliers.

Measures

Fertility intention

To accurately measure fertility intention, a single question was included on the scale: "What is the strength of your desire to have your first child?" Respondents recorded their responses by moving a slider, which ranged from 0 (No desire) to 100 (Strong desire), with higher scores signifying a heightened level of fertility intention.

Perceived stress scale (PSS-4)

The PSS-4 is a 4-item instrument to assess the perceived psychological stress experienced over the preceding month [25]. Questions 1 and 4 were coded from 0 (Never) to 4 (Very often), and Questions 2 and 3 were reverse-coded. The total score is the sum of each item, ranging from 0 to 16 points, with higher scores indicating a more pronounced stress level. This scale has demonstrated reliability and validity in Chinese [26]. The Cronbach's α for PSS-4 was 0.668.

Generalized anxiety disorder scale-7 (GAD-7)

The GAD-7 was applied to assess the self-reported severity of anxiety. This scale contains seven items, each rated on a scale ranging from 0 (Not at all) to 3 (Almost every day), resulting in a total score ranging from 0 to 21. The classification of scores is as follows: 0–4 indicates no symptoms, 5–9 suggests mild symptoms, 10–14 means moderate symptoms, and 15–21 signifies severe symptoms [27]. The Chinese version of the GAD-7 has been

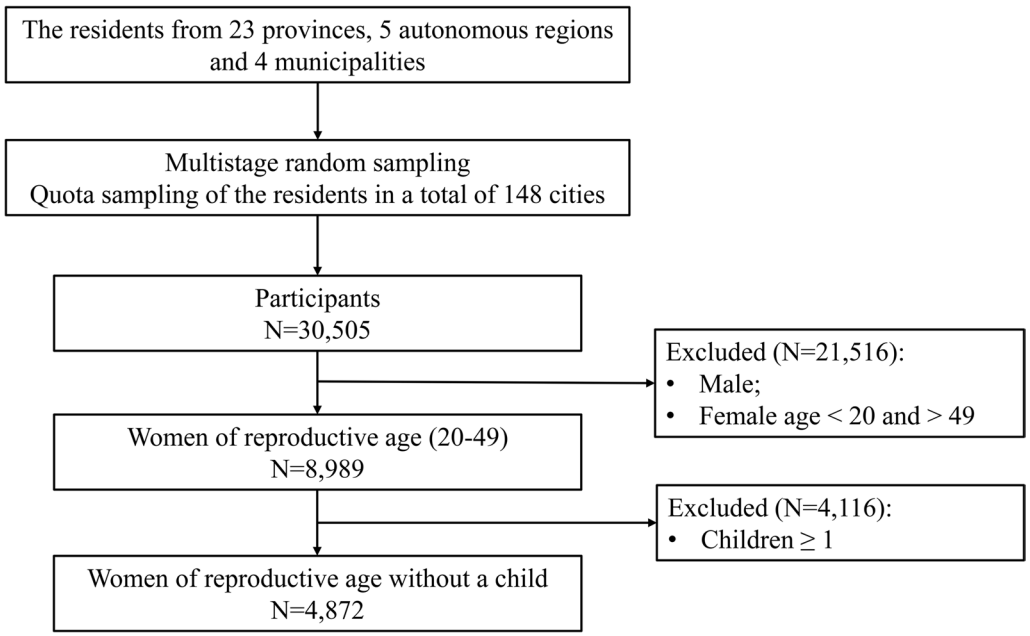

Fig. 2 Flow chart of participant enrollment

validated and demonstrated strong reliability and validity [28]. In this study, the Cronbach's α coefficient was 0.944.

Family communication scale (FCS-10)

We used the FCS-10 to assess the quality of communication among family members, encompassing aspects such as idea exchange, information sharing, degree of concern, openness, confidence, and emotional expression [29]. Respondents rated ten items on a scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The overall score ranged from 10 to 50, with higher scores indicating more excellent family communication. The scale has demonstrated reliability and validity in previous application studies [30]. In our study, the Cronbach's α coefficient of FCS-10 was 0.970.

World Health Organization well-being index (WHO-5)

The WHO-5 is a 5-item assessment tool to evaluate respondents' subjective psychological well-being over the past two weeks [31]. Participants provided numerical responses on a scale ranging from 0 (None of the time) to 5 (All of the time) for each item. The raw score was multiplied by 4 to yield a final score that ranged from 0 to 100, representing the individuals' perceived level of well-being. The Chinese version of the WHO-5 has been proven reliable and valid in previous application studies [32]. In our study, the Cronbach's α coefficient of WHO-5 was 0.954.

Statistical analysis

We used Excel software for real-time data input and SPSS 25.0 to conduct descriptive statistics, difference tests, and correlation analysis between variables for data analysis. We applied the Kolmogorov–Smirnov normality test to assess the normality of the measurement data. Baseline characteristics were summarized using frequencies and percentages. Due to the non-normal distribution of fertility intention data, we use the median (Interquartile range, IQR) to describe it. The Mann–Whitney U test and Kruskal–Wallis test were respectively used to evaluate differences among binary variables (Permanent Residence, Marital status, and Debt) and multi-class variables (Age, Education, Number of houses, Housing area, and Family per capita monthly income), within demographic sociology indicators. Spearman correlation was used to analyze the correlation between variables.

We utilized Mplus8.3 to construct a chain path model. The goodness of model fit was assessed based on criteria such as a root-mean-square error of approximation (RMSEA) < 0.05 and comparative fit index (CFI) and Tucker Lewis Index (TLI) > 0.95, $\chi^2/df < 3$; SRMR < 0.05 indicating a well-fitting model [33, 34].

Results

Sociodemographic characteristics and fertility intention

Our study included 4,872 women of childbearing age without children, as presented in Table 1. The majority of the participants were unmarried (89.9%), falling

Table 1 Sociodemographic characteristics of the participants (N = 4872)

Characteristics	N (%)	Median of fertility intention (IQR)	*U/H*	*P*
Age		27(2–57)		
20–29	4294(88.1)		84.941	< 0.001
30–39	476(9.8)	50(20–75)		
40–49	102(2.1)	24(0–51)		
Permanent Residence				
Urban	3854(79.1)	30(2–60)	− 0.232	0.816
Rural	1018(20.9)	29(5–58)		
Education				
Junior high school and below	88(1.8)	49(18–73.3)	30.151	< 0.001
Senior high school	886(18.2)	23(1–56)		
Bachelor	3559(73.0)	30(3–59)		
Master and above	339(7.0)	42(5–71)		
Marital status				
Unmarried	4378(89.9)	25(2–53)	− 15.236	< 0.001
Married	494(10.1)	61(35.8–83)		
Number of properties				
0	856(17.6)	25(1.3–52.8)	26.245	< 0.001
1	2547(52.2)	35(5–60)		
2	1028(21.1)	26.5(2–26.5)		
3	441(9.1)	22(0–53)		
Housing area (M^2)				
< 90	1438(29.5)	26(1–54)	27.156	< 0.001
90–150	2934(60.2)	33(5–60)		
≥ 150	500(10.3)	21.5(0–55.8)		
Family per capita monthly income (CNY)				
≤ 3000	1522(31.2)	22(1–50)	51.162	< 0.001
3001–6000	2012(41.3)	34(5–60)		
6001–12000	925(19.0)	39(5–61)		
≥ 12,000	413(8.5)	25(2–62)		
Debt				
No	1744(35.8)	29(2–59)	− 1.538	0.124
Yes	3128(64.2)	31.5(4–60)		

CNY = China Yuan

within the age range of 20 to 29 years (88.1%), and residing in urban areas (79.1%). In terms of education, 73.0% of participants had completed college, 18.2% had received senior high school education, 7.0% had obtained a master's or doctoral degree, and 1.8% had an educational background of junior high school or below. Approximately half of the participants (52.2%) reported that their family owned only one house. Concerning housing area, 60.2% of participants lived in spaces ranging from 90 to 150m^2. Family per capita monthly income was divided into four categories: ≤ 3000 CNY, 3001–6000 CNY, 6001–12000 CNY, and ≥ 12,000 CNY, with proportions of 31.2%, 41.3%, 19.0%, and 8.5%, respectively. Moreover, 64.2% of participants reported that their families had incurred debt in the past year.

The median fertility intention score is 30 (3–60), as shown in Table 2. Notably, significant variations in fertility intentions were observed among different age groups, displaying an inverted U-shaped trend as age increased. Specifically, the 30–39 age group exhibited the highest fertility intention, with a median score of 50 (ranging from 20 to 75) ($P < 0.001$). Furthermore, married women tended to express higher fertility intentions than their single counterparts ($P < 0.001$). Additionally, there were notable differences in fertility intention among different educational groups ($P < 0.001$). As education

Table 2 Median, IQR, and the correlation of study variables (N = 4872)

Spearman correlation	PS	ANX	FC	SWB	FI
PS	1				
ANX	0.490**	1			
FC	− 0.312**	− 0.286**	1		
SWB	− 0.466**	− 0.405**	0.437**	1	
FI	− 0.158**	− 0.069**	0.168**	0.175**	1
Median	8	5	39	60	30
IQR	5–7	1–7	30–41.8	40–80	3–60

PS = perceived stress, ANX = anxiety, FC = family communication, SWB = subjective well-being, FI = fertility intention, IQR = interquartile range, $^{**}P < 0.01$

Table 3 Regression coefficients, standard errors, and 95%CI for all pathways of the final model (N = 4872)

Pathways	Parameter Estimations				
	B	*β*	SE	*P*	95%CI
PS-FI	− 0.919	− 0.076	0.018	< 0.001	− 0.113, − 0.043
ANX-FI	0.238	0.037	0.016	0.022	0.005, 0.069
FC-FI	0.376	0.106	0.015	< 0.001	0.075, 0.135
SWB-FI	0.114	0.088	0.017	< 0.001	0.057, 0.122
PS-SWB	− 3.043	− 0.324	0.015	< 0.001	− 0.354, − 0.296
ANX-SWB	− 0.465	− 0.094	0.018	< 0.001	− 0.130, − 0.060
FC-SWB	0.798	0.288	0.015	< 0.001	0.258, 0.317
PS-FC	− 0.865	− 0.255	0.016	< 0.001	− 0.286, -− 0.224
ANX-FC	− 0.193	− 0.107	0.018	< 0.001	-− 0.143, − 0.072
PS-ANX	0.952	0.504	0.011	< 0.001	0.483, 0.526

PS = perceived stress, ANX = anxiety, FC = family communication, SWB = subjective well-being, FI = fertility intention. B = unstandardized regression coefficients, *β* = standardized regression coefficients,

levels progressed from junior high school to master and above, a U-shaped curve emerged in the pattern of fertility intention with a bottom in the high school education group. In contrast, the relationship between income and fertility intention displayed an inverted U-shaped trend, with fertility intentions peaking among women with a per capita household income of 6000–12000 CNY ($P < 0.001$). Significant differences in fertility intention were also observed among women with one property and other groups ($P < 0.001$). Furthermore, variations in fertility intention were observed among groups with different housing areas. Women residing in homes ranging from 90 to 150 square meters reported the highest fertility desires ($P < 0.001$). Notably, permanent residence status and debt did not significantly influence fertility intentions (Table 1).

Correlation

We conducted pairwise correlation analyses to examine the relationships between fertility intention and other variables in the hypothesized model. As indicated in Table 2, there are significant correlations between all variables. Perceived stress ($r = -0.158$, $P < 0.01$) and anxiety ($r = -0.069$, $P < 0.01$) exhibit negative correlations with fertility intention. Conversely, family communication ($r = 0.168$, $P < 0.01$) and subjective well-being ($r = 0.175$, $P < 0.01$) display positive associations with fertility intention.

Multiple mediating analysis

Given the significant differences in fertility intentions observed across various demographic groups—distinguished by age, education levels, marital status, number of properties, housing area, and per capita monthly income—we incorporated these variables as control variables in the chain path model. The model demonstrated excellent fit indices: RMSEA = 0.017, $P = 1.000$; CFI = 0.993, TLI = 0.985; $\chi^2/df = 2.36$; SRMR = 0.013. As shown in Table 3 and Fig. 3, perceived stress significantly and negatively affected fertility intention ($\beta = -0.076$, $P < 0.001$). Anxiety significantly and positively affected fertility intention ($\beta = 0.037$, $P < 0.05$). Additionally, family communication ($\beta = 0.106$, $P < 0.001$) and subjective well-being ($\beta = 0.088$, $P < 0.001$) both had substantial and positive influences on fertility intention.

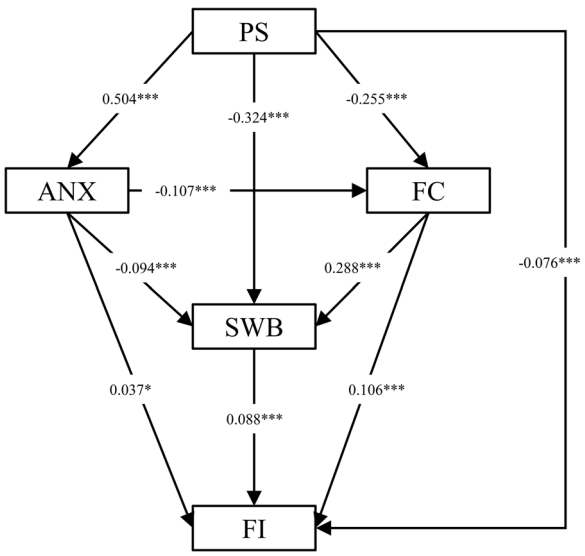

Fig. 3 Multiple mediating paths between perceived stress and fertility intention. SE = standard errors, CI = confidence intervals. Standardized regression coefficients were reported for each path. PS = perceived stress, ANX = anxiety, FC = family communication, SWB = subjective well-being, FI = fertility intention. $^{*}P < 0.05$; $^{***}P < 0.001$

Furthermore, perceived stress ($\beta = -0.324$, $P < 0.001$) and anxiety ($\beta = -0.094$, $P < 0.001$) had significant and negative effects on subjective well-being, respectively. Family communication significantly and positively impacted subjective well-being ($\beta = 0.288$, $P < 0.001$). Additionally, perceived stress ($\beta = -0.255$, $P < 0.001$) and anxiety ($\beta = -0.107$, $P < 0.001$) were both significantly and negatively associated with family communication. Finally, perceived stress ($\beta = 0.504$, $P < 0.001$) significantly and positively affected anxiety.

All the direct and indirect paths between perceived stress and fertility intention are shown in Table 4. It was found that the mediating effects of anxiety ($\beta = 0.019$, Boot SE = 0.008, Boot 95%CI [0.003, 0.035]), family communication ($\beta = -0.027$, Boot SE = 0.004, Boot 95%CI [− 0.036, − 0.019]), and subjective well-being ($\beta = -0.029$, Boot SE = 0.006, Boot 95%CI [− 0.041, − 0.018]) were all statistically significant. Additionally, the chain mediation effects were also significant for all four mediators ($\beta = -0.006$, Boot SE = 0.001, Boot 95%CI [− 0.009, − 0.004]), ($\beta - 0.004$, Boot SE = 0.001, Boot 95%CI [− 0.007, − 0.002]), ($\beta = -0.007$, Boot SE = 0.001, Boot 95%CI [− 0.010, − 0.004]), ($\beta = -0.001$, Boot SE = 0.000, Boot 95%CI [− 0.002, − 0.001]).

Discussion

Based on the national cross-sectional data, this study investigated the fertility intentions of childbearing-age women without children. We examined the complex interrelations among perceived stress, anxiety, family communication, subjective well-being, and fertility intentions. Additionally, path analysis clarified the psychological mechanisms by which perceived stress impacts fertility intentions. The results demonstrated that perceived stress adversely affected fertility intentions both directly and indirectly through anxiety, family communication, and subjective well-being. The findings offer deeper insights into the factors contributing to declining fertility rates.

The prevalence of fertility intention

Our findings indicate that the median fertility intention score among childbearing-aged Chinese women without children is 30 (3 to 60). This data suggests that half of the participants reported a relatively low level of fertility desire, as evidenced by a score of 30 points. These findings suggest a prevailing low fertility intention among childbearing-aged women without children in contemporary China.

Perceived stress as an indicator *of fertility intention*

We discovered that perceived stress is a non-negligible indicator of fertility intentions. It was observed that perceived stress directly and negatively impacted fertility intention, accounting for approximately 58.02% of the total effect (Table 4). This outcome aligns with the findings of previous studies [35]. Due to physiological and psychological changes, childbirth is considered a significant stressor for women. Moreover, the decision to have children involves a complex interplay of factors, including the financial burdens of child-rearing, potential loss of personal freedom, and challenging work-family conflicts [36]. When these pressures and risks overwhelm, parent–child companionship is often reduced, leading to a substantial emotional burden [37]. Consequently, women may reevaluate their decisions regarding parenthood [38].

Table 4 Multiple mediating models between perceived stress and fertility intention (N = 4872)

Pathways	Parameter estimations				
	β	Relative effect (%)	SE	*P*	95% CI
PS-FI	− 0.076	58.02	0.018	< 0.001	− 0.113, − 0.043
PS-ANX-FI	0.019	− 14.50	0.008	0.022	0.003, 0.035
PS-FC-FI	− 0.027	20.61	0.004	< 0.001	− 0.036, − 0.019
PS-SWB-FI	− 0.029	22.14	0.006	< 0.001	− 0.041, − 0.018
PS-ANX-FC-FI	− 0.006	4.58	0.001	< 0.001	− 0.009, − 0.004
PS-ANX-SWB-FI	− 0.004	3.05	0.001	< 0.001	− 0.007, − 0.002
PS-FC-SWB-FI	− 0.007	5.34	0.001	< 0.001	− 0.010, -– 0.004
PS-ANX-FC-SWB-FI	− 0.001	0.76	0.000	< 0.001	− 0.002, − 0.001
Total Indirect effect	− 0.055	41.98	0.011	< 0.001	− 0.077, − 0.035
Total effect	− 0.131	100.00	0.014	< 0.001	− 0.159, − 0.103

PS = perceived stress, ANX = anxiety, FC = family communication, SWB = subjective well-being, FI = fertility intention. *β* = standardized regression coefficients, SE = standard errors, CI = confidence intervals

Anxiety as the mediator between perceived stress and fertility intention

Recent research increasingly highlights the growing prevalence of fertility-related anxiety as parenting stress intensifies. Some young women even experience what is colloquially termed "childbearing phobia" [39]. Consistent with prior studies, our findings confirm that perceived stress significantly and positively influences anxiety. Notably, while anxiety was established as a mediator between perceived stress and fertility intentions, its effect is unexpectedly positive ($\beta = 0.037$; $P < 0.05$), contrary to our initial hypotheses. This indicates the presence of a masking effect within the relationship between perceived stress, anxiety, and fertility intentions. Hypothesis 1 was not entirely supported.

A plausible explanation for this inconsistency can be made from several aspects. First, fertility is significantly influenced by physiological factors such as age. Women's fecundity gradually declines after age 32 and more rapidly after 37 years [40]. For women who have not yet experienced childbirth, increasing age may intensify anxiety related to fecundity and health concerns, prompting more severe consideration of fertility-related issues. Our findings, which indicate an inverted U-shaped relationship between age and fertility intentions, with the highest intentions observed in the 30–39 age group, support this perspective. Additionally, the entrenched cultural emphasis on family and the pressure from parents to have grandchildren in China may heighten anxiety among young women, compelling them to prioritize childbirth in their life plans.

Furthermore, it is widely recognized that a moderate level of anxiety can enhance alertness and consciousness, potentially benefiting certain behaviors. Our data, indicating a median anxiety score of 5 (on a scale from 1 to 7), suggest a mild level of anxiety among the participants. It is plausible that this level of anxiety could stimulate fertility intentions. However, it is worth noting that our study exclusively focused on women of childbearing age without children. Future research should explore whether the impact of anxiety on fertility intentions varies among women who have already given birth.

Family communication as the mediator between perceived stress and fertility intention

Effective communication within the family plays a crucial role in task distribution and completion. The process model of family functioning suggests that adequate family communication is essential for women of childbearing age to manage anxiety and stress, enhance subjective well-being, and better engage in family fertility tasks. Deep and meaningful family communication gives women respect, compassion, love, and support, significantly influencing their reproductive decision-making [41]. However, stress can increase an individual's psychological burden and adversely affect their interpersonal relationships and ability to utilize social support [42]. Previous research has indicated that daily stressors and hassles are negatively associated with the quality of family communication and couple relationships [43]. Our results align with these studies, revealing a significant negative correlation between family communication and perceived stress and a positive correlation between family communication and fertility intentions. Moreover, family communication acts as a mediator between perceived stress and fertility intentions, thus confirming Hypothesis 2. This finding underscores the role of open and supportive family communication in the negative impacts of stress and positively affecting fertility intentions.

Subjective well-being as the mediator between perceived stress and fertility intention

Numerous studies have demonstrated the constructive impact of subjective well-being on an individual's reproductive behavior and decision-making, with these findings held across different countries [44]. However, the accumulation of stress could diminish an individual's perception of happiness and has been linked to their future fertility choices [45]. In accordance with these previous findings, our data indicates that subjective well-being negatively correlates with perceived stress and positively influences fertility intentions. Notably, subjective well-being was a significant mediator in the relationship between perceived stress and fertility intentions, thus affirming Hypothesis 3.

The chain mediating role of anxiety and family communication on perceived stress and fertility intention

Our findings confirmed that anxiety and family communication act as chain mediators between perceived stress and fertility intentions. The quality of communication within a family and how its members express their thoughts and feelings are widely recognized as critical factors affecting their mental health and family functioning [46]. Effective family communication, serving as a stress buffer, can mitigate the effects of negative emotions and empower young women with the courage and confidence to handle pressures and challenges [47]. This dynamic is likely to lead to an enhancement in fertility intention.

The chain mediating role of anxiety and subjective well-being on perceived stress and fertility intention

Furthermore, the chain mediating role of anxiety and subjective well-being between perceived stress and fertility intentions was also established. Subjective well-being,

a positive emotional and cognitive evaluation of one's life, influences childbearing behavior [48]. Enhanced subjective well-being is often considered as a prerequisite for a greater inclination to have children [49]. However, when women of reproductive age frequently encounter various stressors, they are more susceptible to experiencing anxiety [50], which in turn leads to diminished happiness and a reduced desire to have children.

The chain mediating role of family communication and subjective well-being on perceived stress and fertility intention

Our results confirmed the chain-mediated effect of family communication and subjective well-being on the relationship between perceived stress and fertility intentions. Couples experiencing relationship issues are more likely to suffer reduced happiness and face significant obstacles when planning for childbirth [51]. Conversely, effective family communication, acting as a buffer against stress, can enhance women's subjective well-being and promote their fertility intentions [52].

The chain mediating role of anxiety, family communication, and subjective well-being on perceived stress and fertility intention

Our study also identified that anxiety, family communication, and subjective well-being play a more complex chain-mediated role in the relationship between perceived stress and fertility intentions among women of childbearing age without children. Anxiety is linked to behaviors such as reassurance-seeking and avoidance [53]. Suppose an anxious woman successfully receives adequate comfort and support from her spouse or family. In that case, she is likely to feel happier and more energized, thereby bolstering her belief in the value and meaning of childbirth. Conversely, in the absence of practical support from family members and effective psychological relief, a woman's emotions may remain entrenched in stress, diminishing her subjective well-being and life satisfaction and reinforcing her reluctance towards fertility [54]. This is also consistent with the principles of the process model of family functioning theory. Hypothesis 4 was all confirmed.

Lastly, it is worth noting that although all the hypotheses have been validated, the regression coefficients for fertility intentions and the remaining variables are relatively small. Firstly, this may be attributed to the complexity of fertility intentions, which are influenced by multiple macro/micro and subjective/objective factors. Perceived stress is just one such factor, explaining the modest size of its regression coefficient. This underscores the importance of considering other influential variables in future research. Secondly, the small coefficients may also be related to the large sample size in the study. A larger sample size increases the sensitivity of hypothesis testing, enabling the detection of minor differences. This factor necessitates caution in interpreting these results. Moving forward, we plan to conduct further experiments to validate these findings more robustly.

Strengths and limitations

This study utilized a large, nationwide sample, enhancing the representativeness and reliability of our results for the general population. Additionally, we conducted complex chain mediation analyses, clarifying the mechanisms by which perceived stress influences fertility intentions and rendering our findings more comprehensive and conclusive. However, this study is not without limitations. Firstly, its cross-sectional design constrains our ability to determine temporal sequences or establish causal relationships. Consequently, future longitudinal studies are essential to ascertain causality. Secondly, while significant relationships were identified between fertility intentions and other variables, the weak effects observed necessitate a cautious interpretation of the results. In future studies, it is crucial to determine whether these findings genuinely reflect reality or are influenced by the large sample size. Thirdly, this research focused solely on women of childbearing age without children. Whether the model is valid among other groups of women is unknown and needs further verification in future studies.

Conclusions

The fertility intentions of Chinese women of childbearing age without children are generally low. Perceived stress has been identified as a non-negligible variable that not only directly suppressed fertility intentions but also indirectly affected it through anxiety, family communication, and subjective well-being. In light of this, multiple measures are needed to foster a fertility-friendly environment for young women. The government should actively monitor and mitigate key stress factors impeding young women's fertility intentions, such as financial constraints, workplace challenges, and parenting concerns. The implementation of favorable birth policies and the establishment of a robust child-rearing services system could significantly enhance fertility rates. Anxiety, serving as a mediator between perceived stress and fertility intentions, underscores the need for improved psychological and social support to help women of reproductive age prepare mentally and emotionally for parenthood. Obstetricians, gynecologists, and family planning professionals should prioritize women's mental health and provide reproductive psychology education and support. Additionally, family communication and subjective well-being are significant factors in enhancing fertility intentions

among women of childbearing age without children. Family members are encouraged to enhance communication and offer diverse support to improve women's well-being and decision-making regarding childbirth.

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Author contributions
JPZ, WJQ, and JH conceived and designed the research. JPZ, WJQ, and YBW collected and analyzed the data. JPZ wrote the manuscript. JH, WJQ, and YC revised the manuscript. RH, HYJ, YJW, MNY, and HCL contributed materials, analysis tools, tables and figures. All the authors read and approved the final manuscript.

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Availability of data and materials
The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study was approved by the Clinical Research Ethics Committee of the Second Xiangya Hospital of Central South University (2022-K050) on Aug 17, 2022. All participants signed informed consent forms and voluntarily participated.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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