# Parental Responsibility and Health Lifestyle Behaviors among Young Mothers Who are Breast Cancer Survivors in China: A Structural Equation Modeling Study

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## Abstract

*This study aims to identify the role of parental responsibility as a central driver of health lifestyle behaviors among young mothers who are breast cancer survivors in China. The study also explores the mediating role of attitude and intention and the moderating effect of organizational culture. A cross-sectional survey of 399 young mothers who are breast cancer survivors aged 18–40 years was conducted in Liaoning, China. Data were collected using structured questionnaires. SEM was employed to analyze the relationships among constructs. The results indicate that parental responsibility significantly influences behavior through its effects on attitude (β = 0.156, p < 0.001) and intention (β = 0.142, p = 0.009), with a substantial indirect impact on behavior via attitude and intention (VAF = 47.13%). perceived benefits positively influence attitude (β = 0.144, p = 0.001) and intention (β = 0.023, p = 0.012). Organizational culture was found to moderate the relationship between parental responsibility and behavior. The findings have important implications for the development of culturally sensitive health interventions tailored to young breast cancer survivors. Practical interventions are suggested to assist young breast cancer survivors in enhancing their health behaviors by integrating parental responsibility into health promotion strategies. This study emphasizes how health behaviors can be managed more effectively within the specific cultural context of China. The findings extend the literature on health behavior by integrating parental responsibility into the health behavioral model and theory of reasoned action, offering a framework that enhances the understanding of how culturally relevant factors influence health behaviors among young breast cancer survivors a non-Western context.*

**Keywords:** *Parental Responsibility, Healthy Lifestyle Behaviors, Breast Cancer Survivors, Young Mothers, China, Attitude, Intention.*

## Introduction

Breast cancer (BC) is the most commonly diagnosed cancer among women globally, with a growing incidence in younger age groups, particularly in developing countries like China (Arnold et al., 2022). In 2020, nearly 20% of new BC diagnoses occurred in women under 40, reflecting an alarming trend with profound implications for younger survivors' quality of life (Vuong & Warner, 2024). Young mothers who are breast cancer survivors (YMBCSs) face unique challenges as they navigate the dual responsibilities of cancer recovery and caregiving (Milosevic et al., 2020). These challenges often lead to poor adherence to recommended healthy lifestyle behaviors, such as balanced nutrition and regular physical activity. Such behaviors are crucial for improving overall survival rates and reducing the likelihood of recurrence (Manni & El-Bayoumy, 2023).

Despite global guidelines advocating lifestyle changes for breast cancer survivors (BCSs; Hoedjes et al., 2022), few interventions adequately address the specific needs of young mothers. Tailored strategies that consider their caregiving burdens, energy constraints, and psychological stressors are urgently needed (Grimmett et al., 2019). In China, the situation is further complicated by cultural norms that influence health behaviors (HBs). Filial piety, a Confucian value emphasizing family duty over personal well-being, often leads YMBCSs to prioritize caregiving over self-care (Hu et al., 2021; Shi et al., 2023). Additionally, collectivist ideals and concerns about maintaining 'face' can deter women from seeking support or adopting

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behaviors perceived as burdensome to their families (Fernandes, 2020). These cultural dynamics underscore the importance of developing interventions that respect and leverage local values.

Current HB models, such as the Health Belief Model (HBM; Rosenstock, 1974) and the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1969), provide valuable frameworks for understanding HBs (Bluethmann et al., 2015). However, their application to YMBCSs in a culturally nuanced context remains underexplored. These models focus on individual perceptions of susceptibility, severity, benefits, and barriers but fail to account for the caregiving roles and cultural factors that profoundly shape attitudes (ATTs) and intentions (INTs) (Hoedjes et al., 2022; Jia et al., 2022). Addressing this gap, the present study integrates parental responsibility (PR) as a novel construct to capture the unique motivations and constraints of young mothers in post-cancer recovery.

Thus, this study aims to examine the predictors of healthy lifestyle behaviors among YMBCSs in Liaoning, China, using an integrated HBM-TRA framework. Specifically, it explores the roles of perceived susceptibility, severity, benefits, and barriers alongside PR, subjective norms, and self-efficacy. By identifying key drivers of HBs and addressing culturally specific barriers, this research seeks to inform the design of tailored interventions that promote sustainable lifestyle changes among YMBCSs.

## Literature Review

*Healthy Lifestyle Behaviors Among Breast Cancer Survivors*

BCSs face distinctive challenges in adopting and maintaining healthy lifestyle behaviors, despite their critical role in improving survival rates and quality of life (Olson et al., 2024). Young BCSs, in particular, often encounter competing demands, including caregiving responsibilities, time constraints, and psychosocial stressors, which create tensions between perceived benefits and barriers to health-promoting practices (Milosevic et al., 2020). These factors can hinder their motivation and ability to adhere to recommendations for physical activity, healthy eating, and other beneficial behaviors.

The need for tailored, accurate information about healthy lifestyle practices is a recurring theme in the literature. Thorsen et al. (2022) found that long-term cancer survivors, including those with BC, frequently report unmet informational needs related to diet, physical activity, and rehabilitation services, even years after treatment. Addressing these gaps is vital for enabling informed decisions and fostering adherence to healthy behaviors.

Adherence to lifestyle guidelines has been linked to better health outcomes. For instance, Li et al. (2022) observed that postmenopausal women following a healthy lifestyle experienced a reduced risk of BC recurrence and mortality. Conversely, studies have found that unfavorable lifestyle patterns, such as physical inactivity and poor diet, are associated with earlier diagnoses and lower survival rates (Lofterød et al., 2020; Parada Jr et al., 2019).

Evidence-based lifestyle interventions specifically designed for BCSs have shown significant benefits. Programs integrating balanced diets and physical activity have been associated with enhanced quality of life and psychophysical well-being (e.g., Montagnese et al., 2020). Such interventions, when culturally sensitive and demographic-specific, are particularly effective in addressing the unique challenges faced by survivors.

Cultural and demographic factors further shape the HBs of young BCSs. For instance, younger survivors, particularly mothers, often struggle to balance their health with caregiving responsibilities, making it harder to adopt and maintain healthy practices (Gormley et al., 2022; Martens et al., 2021). Therefore, interventions must incorporate flexible, supportive strategies tailored to their needs to ensure sustainable behavior change.

## Literature Review

This study is grounded in two foundational theories of HB: the HBM and the TRA. Together, these models offer a comprehensive framework to explore the psychological, social, and cultural factors that influence the adoption of healthy lifestyle behaviors among YMBCSs.

*Health Belief Model (HBM)*

HBM is a well-established framework that explains HB change by emphasizing the role of individuals' perceptions of health threats and their perceptions of the efficacy of preventive behaviors. The model posits that health decisions are influenced by five key constructs: perceived susceptibility (PSU), perceived severity (PSE), perceived benefits (PBE), perceived barriers (PBA), and self-efficacy (SE) (Rosenstock, 1974). PSU refers to an individual's belief about their vulnerability to a health issue, while PSE relates to how severe the individual perceives the consequences of the health threat. PBE is the belief in the benefits of taking health actions, PBA represents the perceived obstacles to engaging in these behaviors, and SE is the belief in one's ability to perform the necessary behaviors (Rosenstock, 1974).

The HBM has been applied extensively in cancer research, including BC, to understand how individuals' HBs are influenced by their perceptions of risk and prevention (e.g., Firouzbakht et al., 2021). For YBCS, particularly mothers, the HBM provides a relevant framework for exploring the psychological and situational factors that impact their HBs. These mothers' health decisions are often shaped by their perceptions of vulnerability to cancer recurrence (PSU), the severity of recurrence (PSE), their confidence in managing their health (SE), and the perceived benefits (PBE) of adopting preventive actions such as physical activity and healthy eating. However, barriers such as time constraints due to caregiving responsibilities (PBA) also significantly impact their engagement in these behaviors (Dewi et al., 2022; Juárez-García et al., 2020; Shubayr et al., 2022). Given the significance of these factors in HB decisions, it is hypothesized that:

$H_{1a}$: PBA is negatively correlated with ATT.

$H_{1b}$: PBE is positively correlated with ATT.

$H_{1c}$: PSU is positively correlated with ATT.

$H_{1d}$: PSE is positively correlated with ATT.

$H_{1e}$: SE is positively correlated with ATT.

*Theory of Reasoned Action*

TRA posits that an individual's behavior is primarily determined by their intention to perform that behavior. INT, in turn, is influenced by two key factors: ATT and subjective norms (SN). ATT reflects an individual's positive or negative evaluation of performing a specific behavior, while SN refer to the perceived social pressures from significant others (e.g., family, friends, healthcare providers) to either engage in or refrain from the behavior (Ajzen & Kruglanski, 2019). According to the TRA, behavioral intention is the strongest predictor of actual behavior (Ajzen & Kruglanski, 2019).

Recent studies have demonstrated the enduring relevance of the TRA in explaining HBs, with particular emphasis on the role of subjective norms in influencing intentions (La Barbera & Ajzen, 2020). For YMBCSs, ATT toward engaging in HBs—such as physical activity or healthy eating—plays a central role in forming their INT to adopt these actions. Additionally, social influences, particularly from close family members, healthcare providers, and broader societal expectations, shape their subjective norms. These norms can either encourage or inhibit the adoption of healthy behaviors, depending on whether the

perceived social pressures are supportive or discouraging (Firouzbakht et al., 2021). For instance, the influence of healthcare providers and family members in encouraging physical activity has been shown to significantly affect the intention to exercise among BCSs (Taschner et al., 2022).

The TRA's explanatory power has also been evident in diverse health contexts. For example, subjective norms have been identified as a key factor influencing women's BC screening behaviors, highlighting the critical role of social pressures in health-related decision-making (Firouzbakht et al., 2021). Furthermore, studies have applied the TRA to various HBs, such as cancer rehabilitation and exercise adherence, demonstrating that both internal ATTs and external norms jointly shape intentions and behaviors (Yarmohammadi et al., 2023).

In the context of YMBCSs, the interplay of ATT and SN influences their decisions to engage in HBs, particularly when managing the challenges of recovery from BC. Internal factors, such as ATT toward health and well-being, significantly affect their INT to adopt behaviors like regular exercise, dietary modifications, and health monitoring. Simultaneously, external pressures from family, healthcare providers, and broader societal expectations can either enhance or deter these intentions, depending on how these norms align with personal health goals. Therefore, the following hypotheses are proposed:

H2: ATT is positively correlated with INT.

H3: SN are positively correlated with INT.

H4: INT is positively correlated with BEH.

*Integration of HBM and TRA for YMBCSs*

The integration of the HBM and the TRA provides a comprehensive framework for understanding HBs in YMBCSs. HBM highlights the role of perceived factors (e.g., susceptibility, severity, benefits) in shaping ATTs toward HBs, while TRA focuses on how ATTs and subjective norms influence intentions, which ultimately guide behavior.

Research in mobile banking adoption (Chawla & Joshi, 2019) and chatbot usage (Kasilingam, 2020) shows that ATT mediates the relationship between perceived factors and INT. This aligns with findings in sustainable tourism (Wut et al., 2023), where ATT and INT serve as mediators between external factors and behavior. Similarly, in HBs, ATT and INT act as chain mediators, as seen in environmental behaviors (Shen et al., 2024).

For YMBCSs, perceptions of health risks and benefits influence ATTs toward adopting healthy behaviors, and these ATTs, in turn, shape their INTs. This mediating role of ATT and INT supports the following hypotheses:

H5: ATT mediates the relationship between perceived factors (PBA, PBE, PSU, PSE, SE, PR) and INT.

H6: INT mediates the relationship between ATT and BEH.

H7: ATT and INT act as chain mediators between perceived factors and BEH.

*Incorporating Parental Responsibility*

PR is a significant construct in HB models for YMBCSs. It reflects a strong duty toward family health, particularly within collectivist cultures like China, where family values drive HBs (Michaelson et al., 2021). For YMBCS, PR motivates health-promoting behaviors to safeguard both their own well-being and that of their children (Shin et al., 2023). Empirical research shows that PR significantly influences HBs in parents. Al-Hosni et al. (2023) demonstrated that programs addressing PR improved participant outcomes by aligning with parents' desire to model healthy behaviors. Integrating PR into HB models can make

interventions more culturally relevant and effective, improving outcomes for YMBCSs. Therefore, PR is hypothesized to positively influence ATT toward healthy behaviors. Thus, the following hypothesis can be proposed:

H1f: PR is positively correlated with ATT.

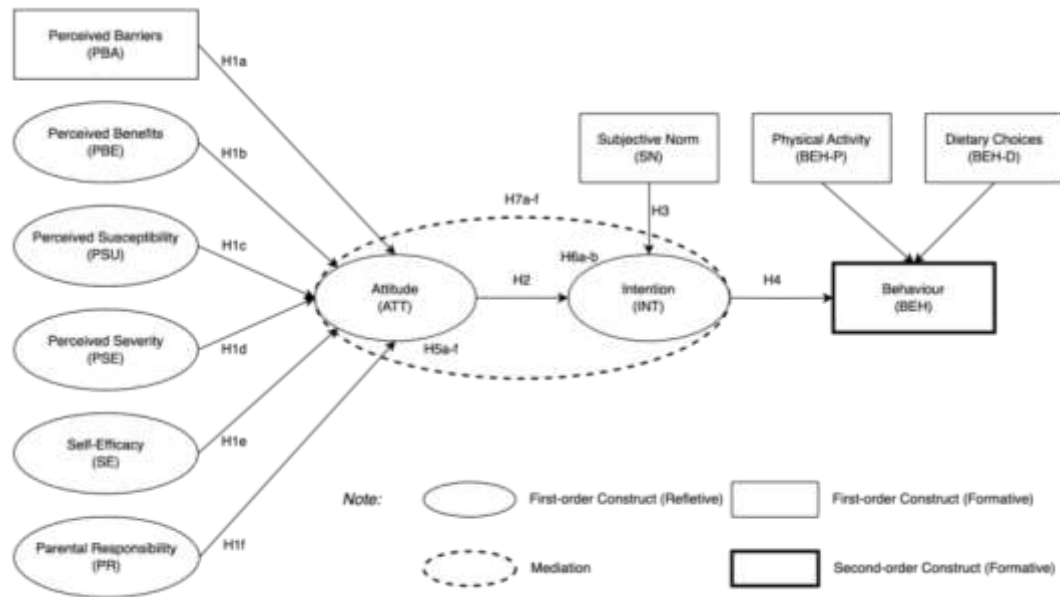The study model and hypotheses based on the previous review are depicted in Figure 1.



**Figure 1. Study Framework**

## Methodology

*Participants and Procedures*

Participants in this study were young mothers aged 18–40 who had survived BC and were raising at least one child under the age of 18. They were recruited from nine hospitals (China Medical University Affiliated Shengjing Hospital, China Medical University Affiliated First Hospital, Liaoning Cancer Hospital, Dalian Medical University Affiliated First Hospital, Dalian Medical University Affiliated Second Hospital, Benxi Central Hospital, Dandong Central Hospital, Jinzhou Medical University Affiliated First Hospital, Tieling Central Hospital) across six cities(Shenyang, Dalian, Benxi, Dandong, Jinzhou, Tieling) in Liaoning Province, China. Eligibility criteria included being a female BSCs aged 18–40, having at least one child under 18 years old, having completed initial cancer treatment with no recurrence, having lived in Liaoning for at least one year, having a primary education or higher, and being willing and able to complete the survey. Participants were excluded if they experienced cognitive or psychiatric impairments affecting their ability to respond or were currently undergoing active cancer treatment or had metastatic disease.

Data collection was conducted from March to October 2024, following institutional ethical approval (Approval Number: DDSZXYY-2024-20). A cross-sectional survey design was employed to explore the relationships between constructs from the HBM and the TRA. The survey was conducted in hospital settings, including rehabilitation centers and health education sessions, using a combination of paper-based and online surveys via the Wenjuanxing platform.

A total of 399 valid responses were analyzed after excluding incomplete or invalid questionnaires. In the study, participants were young mothers aged 18-40 who had survived BC and were raising at least one child

under 18 years old in Liaoning Province, China. The demographic distribution of the 399 respondents revealed that the majority of participants were aged 36-40 (91.70%), had a normal BMI (51.40%), and had resided in Liaoning for over 10 years (50.10%). The majority had completed at least college-level education (40.60%), were married or in a partnership (93.00%), and had a monthly household per capita income of 2500-4499 (52.10%). Employment status varied, with the largest group working sedentary jobs (43.10%). In terms of disease stage, the majority of participants were diagnosed with Stage II BC (59.40%), and the majority had been diagnosed within the last three years (68.70%). The majority of these young mothers had one child (79.40%), with the most common child age group being infants (54.90%). These demographic characteristics provide a detailed profile of the study's participants, reflecting the diversity and specific circumstances of young BCSs in the region.

*Measures*

The questionnaire used in this study comprised two sections: The first section was a Demographic Questionnaire designed to collect detailed participant information, including age, BMI, education, employment, marital status, income, time since diagnosis, and family structure. This section aimed to establish a comprehensive profile of the participants relevant to the study's objectives. The second section consisted of 50 statements tailored to the constructs of the HBM and TRA. The items were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). To ensure cultural relevance in the Chinese context, items were carefully adapted, and certain statements were reverse-coded to enhance the reliability of responses.

The questionnaire was pilot-tested with 50 participants to assess its clarity, cultural appropriateness, and reliability. Results from the pilot study indicated excellent reliability, with Cronbach's α values for all constructs exceeding 0.900, demonstrating the robustness of the instrument. Detailed results of the reliability analysis are presented in Table 1.

**Table 1. Summary of Constructs Measurement**

|  | Construct | Items | Source | α |
|---|---|---|---|---|
| BEH | BEH-P | 5 | Teng et al. (2010) | 0.904 |
|  | BEH-D | 5 | Teng et al. (2010) | 0.905 |
| TRA | ATT | 4 | Ajzen (2006) | 0.903 |
|  | SN | 4 | Ajzen (2006) | 0.902 |
|  | INT | 4 | Ajzen (2006) | 0.901 |
| HBM | PBA | 8 | Champion (1984) | 0.915 |
|  | PBE | 4 | Champion (1984) | 0.903 |
|  | PSU | 4 | Champion (1984) | 0.904 |
|  | PSE | 4 | Champion (1984) | 0.903 |
|  | SE | 4 | Schwarzer & Jerusalem (1995) | 0.902 |
| Add | PR | 4 | Campis et al. (1986) | 0.905 |

Note. Attitude = ATT, behavior = BEH, health belief model = HBM, physical activity = BEH-P, delay choices = BEH-D, intention = INT, parental responsibility = PR, perceived barriers = PBA, perceived benefits = PBE, perceived susceptibility = PSU, perceived severity = PSE, self-efficacy = SE, Theory of Reasoned Action = TRA.

*Data Analysis*

The analytical strategy of this study leverages Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS v4.1.0.3 to investigate the interplay among constructs influencing the HBs of YBCSC. This approach encompasses a meticulous examination of the measurement model, assessing both reflective and formative first-order constructs, and a second-order construct for HB. The strategy advances to evaluate the structural model in terms of collinearity, significance, explanatory power, and predictive power. Hypothesis testing is conducted to uncover direct effects, the mediating roles of ATT and INT, and chain

mediation effects on HBs (Hair Jr et al., 2021). To bolster the reliability of the estimates and to appraise the significance of indirect effects, bootstrapping with 5,000 subsamples is implemented. The analysis relies on stringent evaluation metrics such as the Coefficient of Determination ($R^2$) and Predictive Relevance ($Q^2$), which are integral to PLS-SEM (Chin et al., 2003). Furthermore, the study takes into account the cultural nuances and parental responsibilities that are specific to the Chinese context, thus offering a holistic approach to deciphering the factors that shape HBs among the study's demographic.

## Results

*Measurement Model Assessment*

*First-Order Reflective Constructs*

Seven first-order reflective constructs—ATT, INT, PBE, PSE, PSU, PR, and SE—were evaluated for reliability and validity. Standardized outer loadings ranged from 0.674 to 0.896, with most exceeding the 0.70 threshold (Table 2 and Figure2). While PR3 had a slightly lower loading (0.674), it was retained for theoretical relevance without compromising reliability. Composite reliability (CR) values ranged from 0.843 to 0.925, and Cronbach's alpha values from 0.753 to 0.892, both exceeding the 0.70 threshold, confirming internal consistency. Convergent validity was supported by AVE values exceeding 0.5, while discriminant validity was confirmed via the Fornell-Larcker (FL) criterion and heterotrait–monotrait ratio (HTMT) ratios, all below 0.9 (Tables 2). These results confirm the robustness of the measurement model.

**Table 2. Reliability, Validity, and Discriminant Validity Measures for First-Order Reflective Constructs**.

| uct | FL | | | | | | | HTMT | | | | | | α | rho_a |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | | |
| | 0.809 | | | | | | | | | | | | | 0.823 | 0.832 |
| | 0.743 | 0.869 | | | | | | 0.860 | | | | | | 0.892 | 0.893 |
| | 0.640 | 0.765 | 0.842 | | | | | 0.749 | 0.867 | | | | | 0.863 | 0.869 |
| | 0.572 | 0.634 | 0.508 | 0.759 | | | | 0.712 | 0.767 | 0.619 | | | | 0.753 | 0.776 |
| | 0.662 | 0.735 | 0.695 | 0.491 | 0.808 | | | 0.789 | 0.857 | 0.825 | 0.617 | | | 0.823 | 0.826 |
| | 0.654 | 0.702 | 0.622 | 0.497 | 0.726 | 0.792 | | 0.798 | 0.827 | 0.745 | 0.636 | 0.885 | | 0.801 | 0.808 |
| | 0.645 | 0.751 | 0.643 | 0.623 | 0.638 | 0.604 | 0.783 | 0.792 | 0.893 | 0.775 | 0.795 | 0.791 | 0.758 | 0.790 | 0.791 |

Note. Attitude = ATT, behavior = BEH, health belief model = HBM, physical activity = BEH-P, delay choices = BEH-D, intention = INT, parental responsibility = PR, perceived barriers = PBA, perceived benefits = PBE, perceived susceptibility = PSU, perceived severity = PSE, self-efficacy = SE, Theory of Reasoned Action = TRA.

*First-Order Formative Constructs*

Two constructs, PBA and SN, were modeled as formative. For PBA, item weights ranged from 0.020 to 0.445, with PBA7 being the most significant (weight = 0.445). Despite PBA8's low weight (0.020), its loading of 0.545 justified retention. T-statistics for most items were below the threshold of 1.96, but their loadings remained relevant. Variance Inflation Factor (VIF) values for all indicators were below 2, indicating no multicollinearity.

For SN, item weights ranged from 0.035 to 0.532, with SN2 having the highest weight (0.532). SN1 had the lowest weight (0.035) but an acceptable loading of 0.734. T-statistics for most items were significant, with SN2 (T = 8.087) showing the highest significance. All VIF values were below 3.3, confirming no

multicollinearity.

*Second-Order Construct*

BEH was modeled as a second-order formative construct, consisting of Physical Activity (BEH-P) and Diet (BEH-D). Table 7 presents the weights and significance for the first-order constructs.

Step 1. Assess First-Order Constructs﹕ Convergent Validity: Redundancy analysis showed strong convergent validity for both BEH-P and BEH-D, with path coefficients > 0.70. Collinearity: VIF values for most indicators were below 5.00, except for BEH5 (VIF = 8.182) and BEH8 (VIF = 10.78), which were retained due to their theoretical importance. BEH5 addresses critical aspects of physical activity behavior, while BEH8 captures essential dietary habits. Since they measure distinct HB dimensions—physical activity and nutrition—they are vital for understanding the breadth of healthy lifestyle behaviors. Thus, while acknowledging the potential multicollinearity, their theoretical contribution justifies their retention. Significance: Bootstrapping confirmed that BEH5 (weight = 0.625, T = 2.431) and BEH8 (weight = 0.655, T = 2.596) were significant.

Step 2. Assess the Second-Order Construct﹕ Convergent Validity: Path coefficients from BEH-P and BEH-D to BEH were > 0.70, confirming strong representation of the second-order construct. Collinearity: VIF values for the second-order construct were below 5.00, indicating no collinearity issues. Significance: The weights for BEH-P and BEH-D were significant, supporting their contribution to BEH.

*Structural Model Assessment*

The structural model was assessed following Hair and Almer (2022), focusing on collinearity, the significance and relevance of relationships, explanatory power, and predictive power. Collinearity assessment, based on inner VIF values, confirmed the absence of multicollinearity, as all VIF values ranged from 1.000 to 2.907, well below the threshold of 3.00. Bootstrapping (5,000 subsamples) revealed statistically significant relationships ($p < 0.05$) between constructs, including PBA → ATT ($\beta$ = -0.202, p = 0.000), PBE → ATT ($\beta$ = 0.144, p = 0.001), ATT → INT ($\beta$ = 0.332, p = 0.000), SN → INT ($\beta$ = 0.636, p = 0.000), and INT → BEH ($\beta$ = 0.693, p = 0.000). Effect size ($f^2$) analysis demonstrated medium to large effects, with ATT → INT ($f^2$ = 0.301), SN → INT ($f^2$ = 1.108), and INT → BEH ($f^2$ = 0.922) indicating the strength of the relationships. The model's explanatory power, assessed via $R^2$, was substantial for INT ($R^2$ = 0.788) and moderate for ATT ($R^2$ = 0.609) and BEH ($R^2$ = 0.480), suggesting strong variance explained by predictors. Predictive power, evaluated using $Q^2$ values through the blindfolding procedure, confirmed predictive relevance, with all $Q^2$ values exceeding zero (INT = 0.778, ATT = 0.590, BEH = 0.421). These findings affirm the structural model's robustness in explaining and predicting HBs among young mothers who are BCSs in Liaoning, China.

*Hypothesis Testing*

*Direct Effects*

Path analysis confirmed all hypothesized direct effects between constructs, as presented in Table 3, with all relationships statistically significant at $p < 0.01$. PBA negatively influenced ATT ($\beta$ = -0.202, p < 0.001), suggesting that higher barriers lead to more negative ATTs, while PBE positively predicted ATT ($\beta$ = 0.144, p = 0.001), indicating that perceived benefits enhance positive ATTs. PSU ($\beta$ = 0.173, p < 0.001) and PSE ($\beta$ = 0.137, p = 0.006) both had positive effects on ATT, showing that heightened risk perceptions and severe health concerns foster favorable ATTs. SE also positively correlated with ATT ($\beta$ = 0.142, p = 0.006), emphasizing the role of confidence in shaping ATTs. ATT strongly predicted INT ($\beta$ = 0.332, p < 0.001), demonstrating the direct impact of ATTs on INTs, while SN exhibited a significant influence on INT ($\beta$ = 0.636, p < 0.001), highlighting the importance of social influence. INT was the strongest predictor of BEH ($\beta$ = 0.693, p < 0.001), confirming the central role of INT in driving behavior. Effect size ($f^2$) analysis revealed small to medium impacts, with the largest being PBA's influence on ATT ($f^2$ = 0.049), reinforcing

the significance and relevance of the structural model's direct effects.

Role of Parental Responsibility (PR): Hypothesis H$_{1f}$, which posits that PR positively influences ATT, was supported. PR demonstrated a significant positive path coefficient to ATT (β = 0.156, SD = 0.043, t = 3.637, p < 0.001), with a 95% confidence interval of 0.071 to 0.241, confirming the robustness of the estimate (see Table 10). The effect size (f² = 0.036) indicated a small to moderate impact of PR on ATT. These results suggest that a strong sense of parental responsibility enhances positive ATTs toward HBs, emphasizing the role of maternal responsibility in fostering health-promoting ATTs.

PR and Time/Energy Constraints: Further analysis explored the relationship between PR and parenting-related barriers, specifically focusing on PBA7: "Parenting tasks limit my time and energy for exercise." Spearman's correlation (see Table 4) revealed a significant negative association between PR and PBA7 (r = -0.347, p < 0.001), indicating that while many mothers feel a strong responsibility to maintain their health for their children's benefit, they often face substantial time and energy constraints due to parenting tasks. This duality underscores the complexity of balancing health responsibilities with caregiving demands.

**Table 3. Hypothesis (H1-H4) Testing Results (Direct Effects)**

| H | Path | Coef. | S.D. | T | P | LLCI | ULCI | Support | f² |
|---|---|---|---|---|---|---|---|---|---|
| H$_{1a}$ | PBA → ATT | -0.202 | 0.044 | 4.552 | 0.000 | -0.305 | -0.132 | Yes | 0.049 |
| H$_{1b}$ | PBE → ATT | 0.144 | 0.045 | 3.203 | 0.001 | 0.049 | 0.227 | Yes | 0.022 |
| H$_{1c}$ | PSU → ATT | 0.173 | 0.047 | 3.675 | 0.000 | 0.079 | 0.264 | Yes | 0.031 |
| H$_{1d}$ | PSE→ATT | 0.137 | 0.05 | 2.728 | 0.006 | 0.037 | 0.236 | Yes | 0.017 |
| H$_{1e}$ | SE → ATT | 0.142 | 0.052 | 2.746 | 0.006 | 0.035 | 0.238 | Yes | 0.021 |
| H$_{1f}$ | PR → ATT | 0.156 | 0.043 | 3.637 | 0.000 | 0.071 | 0.241 | Yes | 0.036 |
| H$_2$ | ATT→INT | 0.332 | 0.037 | 8.986 | 0.000 | 0.256 | 0.400 | Yes | 0.301 |
| H$_3$ | SN → INT | 0.636 | 0.036 | 17.490 | 0.000 | 0.567 | 0.712 | Yes | 1.108 |
| H$_4$ | INT → BEH | 0.693 | 0.032 | 21.501 | 0.000 | 0.625 | 0.750 | Yes | 0.922 |

Note. Attitude = ATT, behavior = BEH, health belief model = HBM, physical activity = BEH-P, delay choices = BEH-D, intention = INT, parental responsibility = PR, perceived barriers = PBA, perceived benefits = PBE, perceived susceptibility = PSU, perceived severity = PSE, self-efficacy = SE, Theory of Reasoned Action = TRA.

**Table 4. Correlation Between Parental Responsibility and Perceived Barriers (PBA7)**

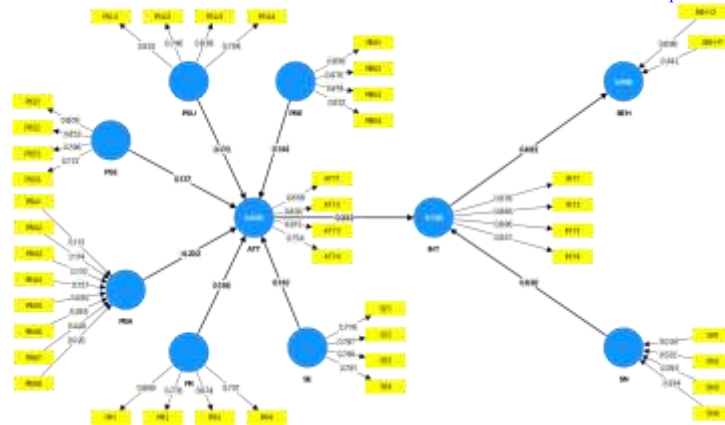| | Spearman Rho | PBA 7 | PR (mean) |
|---|---|---|---|
| PBA7 | Correlation Coefficient | 1.000 | -.347** |
| | Significance (2-tailed) | . | .000 |
| | N | 399 | 399 |
| PR (mean) | Correlation Coefficient | -.347** | 1.000 |
| | Significance (2-tailed) | .000 | . |
| | N | 399 | 399 |

Note: ** p < 0.001.

**Figure 2. Hypothesis (H1-H4) Testing Results (Direct Effects)**

*Mediation Effects of ATT*

The mediation analysis for Hypothesis 5 (H5) revealed significant indirect effects of ATT on INT across all tested pathways (see Table 5 and Figure 3). For PBA, the indirect effect through ATT was significant (β = -0.033, p = 0.002), with a Variance Accounted For (VAF) of 22.60%, indicating a partial mediation. PBE also influenced INT indirectly via ATT (β = 0.023, p = 0.012, VAF = 8.16%). PSU showed a positive indirect effect on INT through ATT (β = 0.030, p = 0.005, 95% CI [0.011, 0.052], VAF = 22.90%), as did PSE (β = 0.023, p = 0.023, 95% CI [0.005, 0.044], VAF = 17.16%). SE demonstrated a significant indirect pathway to INT via ATT (β = 0.023, p = 0.026, VAF = 10.18%). Lastly, PR exhibited a significantly positive indirect effect on INT through ATT (β = 0.026, p = 0.003, 95% CI [0.010, 0.044], VAF = 17.81%). These findings highlight ATT as a critical mediator in the relationships between key predictors and Behavioral INT, supporting its central role in the structural model.

*Mediation Effects of INT*

The mediation analysis for $H_6$ confirmed the significant indirect effects of INT on BEH. For H6a, ATT influenced BEH through INT with a highly significant indirect effect (β = 0.271, p < 0.001) and a Variance Accounted For (VAF) of 59.30%, indicating a substantial mediation effect. Similarly, for H6b, SN significantly impacted BEH through INT (β = 0.271, p < 0.001, VAF = 59.30%). These findings highlight INT as a robust mediator in translating both ATT and SN into HBs, reinforcing its pivotal role in the structural model (see Table 5 and Figure 4).

**Table 5. Hypothesis (H5 and H6) Testing Results (Mediation Effects)**

| H | Path | (O) | SD | T | P | LLCI | ULCI | Support | VAF |
|---|---|---|---|---|---|---|---|---|---|
| $H_{5a}$ | PBA → ATT → INT | -0.033 | 0.011 | 3.123 | 0.002 | -0.057 | -0.015 | Yes | 22.60% |
| $H_{5b}$ | PBE → ATT → INT | 0.023 | 0.009 | 2.511 | 0.012 | 0.006 | 0.042 | Yes | 8.16% |
| $H_{5c}$ | PSU → ATT → INT | 0.030 | 0.011 | 2.816 | 0.005 | 0.011 | 0.052 | Yes | 22.90% |
| $H_{5d}$ | PSE → ATT → INT | 0.023 | 0.010 | 2.273 | 0.023 | 0.005 | 0.044 | Yes | 17.16% |
| $H_{5e}$ | PR → ATT → INT | 0.026 | 0.009 | 2.998 | 0.003 | 0.010 | 0.044 | Yes | 17.81% |
| $H_{5f}$ | SE → ATT → INT | 0.023 | 0.010 | 2.226 | 0.026 | 0.004 | 0.044 | Yes | 10.18% |
| $H_{6a}$ | SN → INT → BEH | 0.271 | 0.049 | 5.548 | 0.000 | 0.170 | 0.363 | Yes | 59.30% |
| $H_{6b}$ | ATT → INT → BEH | 0.151 | 0.032 | 4.732 | 0.000 | 0.088 | 0.214 | Yes | 52.07% |

Note. Attitude = ATT, behavior = BEH, health belief model = HBM, physical activity = BEH-P, delay choices = BEH-D, intention = INT, parental responsibility = PR, perceived barriers = PBA, perceived benefits = PBE, perceived susceptibility = PSU, perceived severity = PSE, self-efficacy = SE, Theory of Reasoned Action = TRA.
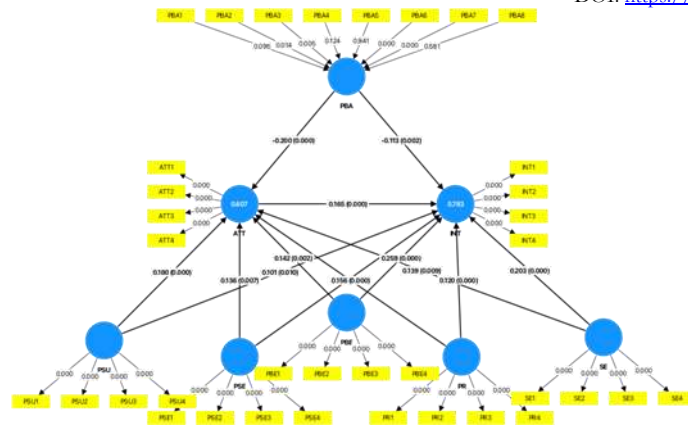
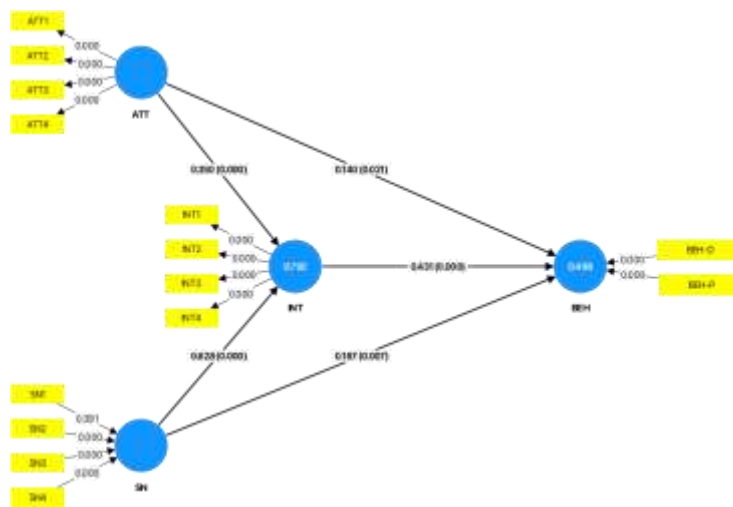**Figure 3. Hypothesis (H₅) Testing Results (Mediation Effects of ATT)**



**Figure 4. Hypothesis (H6) Testing Results (Mediation Effects of INT)**

*Chain Mediation Effects of ATT and INT*

The analysis revealed significant chain mediation effects for PBA and PBE on BEH through ATT and INT (Table 6, Figure 5). PBA demonstrated a significant negative total effect on BEH ($\beta$ = -0.119, p = 0.013), with the majority of this effect mediated through ATT and INT (total indirect effect: $\beta$ = -0.084, p < 0.001, VAF = 70.59%). The direct effect was not significant ($\beta$ = -0.035, p = 0.553), indicating that PBA primarily influences BEH indirectly by fostering negative ATTs and lowering INTs. Conversely, PBE showed a strong positive total effect on BEH ($\beta$ = 0.304, p < 0.001), with a substantial indirect effect mediated through ATT and INT ($\beta$ = 0.130, p < 0.001, VAF = 42.76%) and a significant direct effect ($\beta$ = 0.174, p = 0.001), suggesting that perceived benefits enhance both ATTs and INTs, leading to improved HBs. Similarly, SE had a strong positive total effect on BEH ($\beta$ = 0.321, p < 0.001), with both direct ($\beta$ = 0.215, p < 0.001) and indirect ($\beta$ = 0.106, p < 0.001) effects contributing significantly. The VAF (33.02%) highlights the critical role of self-efficacy in fostering positive ATTs and strong INTs, ultimately promoting HBs.

The results for PSU indicated that the total effect on BEH was not significant ($\beta$ = -0.019, p = 0.054), and the VAF value (-384.21%) pointed to a suppression effect (see Table 6). The direct effect of PSU on BEH was negative and marginally significant ($\beta$ = -0.092, p = 0.060), suggesting that while PSU can influence ATTs and INTs positively, it may also induce anxiety or avoidance, reducing its overall impact on HBs. Similarly, PSE showed a suppression effect. The total effect on BEH was negative and significant ($\beta$ = -0.069, p = 0.038). The direct effect of PSE on BEH was also significantly negative ($\beta$ = -0.138, p = 0.038), while the total indirect effect was positive and significant ($\beta$ = 0.069, p < 0.001). The negative direct effect

may reflect feelings of helplessness or fatalism associated with high perceived severity, reducing proactive HBs despite positive ATTs and INTs.

PR demonstrated a significant positive total effect on BEH (β = 0.157, p < 0.001), with the indirect effect (β = 0.074, p < 0.001) accounting for 47.13% of the total effect (see Table 6). The direct effect, however, was not significant (β = 0.083, p = 0.125). This suggests that parental responsibility significantly influences HBs through its effects on ATTs and intentions, despite not having a direct influence on behavior.

**Table 6. Hypothesis (H7) Testing Results (Chain Mediation Effects)**

| Hypothes is | Construct | Total Effect on BEH (β) | Direct Effect (β) | Total Indirect Effect (β) | Supp ort | VAF (%) |
|---|---|---|---|---|---|---|
| H7a | PBA → ATT → INT → BEH | -0.119 , p = 0.013 | β = -0.035, p = 0.553ns | -0.084, p < 0.001 | Yes | 70.59 |
| H7b | PBE → ATT → INT → BEH | 0.304, p < 0.001 | β = 0.174, p = 0.001 | 0.130, p < 0.001 | Yes | 42.76 |
| H7c | PSU → ATT → INT → BEH | -0.019 , p = 0.054 ns | β = -0.092, p = 0.06 ns | 0.073, p < 0.001 | No | -384.21 |
| H7d | PSE → ATT → INT → BEH | -0.069, p = 0.038 | β = -0.138, p = 0.038 | 0.069, p < 0.001 | No | -100 |
| H7e | SE → ATT → INT → BEH | 0.321, p < 0.001 | β = 0.215, p < 0.001 | 0.106, p < 0.001 | Yes | 33.02 |
| H7f | PR → ATT → INT → BEH | 0.157, p < 0.001 | β= 0.083, p = 0.125ns | 0.074, p < 0.001 | Yes | 47.13 |

Note. ns: Not significant; VAF: Variance Accounted for by the model; β: Standardized path coefficient; p < 0.05 indicates statistical significance; VAF values indicate the percentage of variance in the outcome variable that is accounted for by the indirect effects.
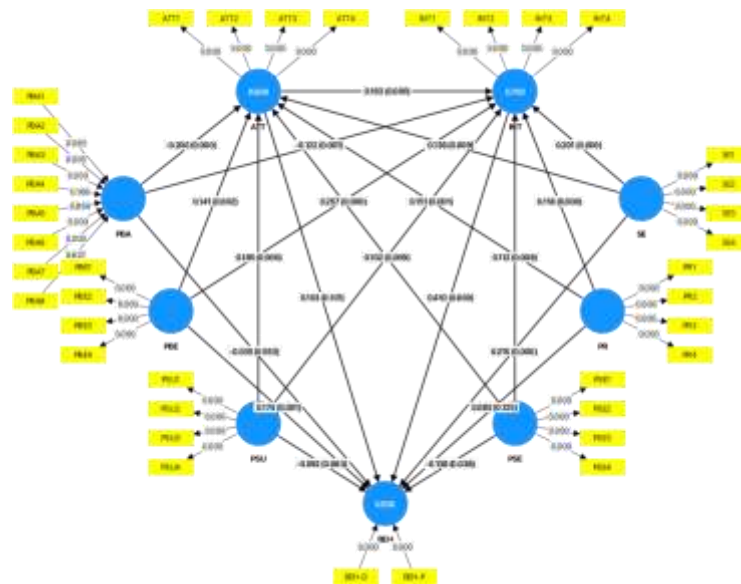


**Figure 5: Hypothesis (H7) Testing Results (Chain Mediation Effects)**

## Discussion

This study highlights the complex interplay of factors influencing HBs among young mothers who are BCSs in Liaoning, China. PBA and PBE were found to significantly influence behavior through ATT and INT, with PBA exerting a strong negative effect and PBE promoting positive outcomes. SE emerged as a

critical motivator, significantly enhancing HBs through its positive impact on ATT and INT. These findings align with theoretical frameworks and underscore the importance of addressing barriers, emphasizing benefits, and boosting SE in health interventions. However, the role of PR, a novel construct introduced in this study, and the suppression effects observed in PSU and PSE, require deeper exploration to understand their unique contributions and cultural underpinnings. Further discussion will delve into these aspects, shedding light on their implications for behavior change among this population.

*Suppressive Effects of PSU and PSE on BEH*

The analysis revealed unexpected suppressive effects of PSU and PSE on BEH among YMBCSs. Both constructs positively influenced ATT and INT, suggesting that heightened awareness of risk and severity fosters more favorable cognitive and emotional orientations toward HBs. However, paradoxically, their direct effects on BEH were negative. PSE showed a statistically significant negative direct effect ($\beta$ = -0.138, p = 0.038), while PSU's direct effect was marginally negative and non-significant ($\beta$ = -0.092, p = 0.063).

Mediation analysis revealed that both PSU and PSE had positive indirect effects on BEH through the ATT → INT → BEH pathway, with VAF values indicating significant indirect mediation (PSU: VAF = -384.21%, PSE: VAF = -100%). However, the suppressive effects observed in the direct pathways (e.g., PSU → ATT → BEH) led to negative VAF values, suggesting that while awareness of health risks and severity can motivate INTs, it may hinder the translation of those INTs into actual behaviors. This paradoxical finding may be attributed to psychological and cultural factors, such as fatalism or a sense of helplessness, which could reduce proactive HB despite increased awareness.

The suppressive effects of PSU and PSE can be interpreted through Terror Management Theory (TMT), which suggests that heightened awareness of mortality can trigger psychological defenses (Willis et al., 2021). For these mothers, awareness of vulnerability (PSU) and severity (PSE) may evoke existential fears, leading them to disengage from HBs. This psychological coping mechanism may manifest as prioritizing caregiving roles over personal health, providing emotional security and mitigating anxiety. In the context of their dual roles as survivors and caregivers, these mothers may view self-care as secondary to fulfilling familial responsibilities (Willis et al., 2023).

Cultural norms in Liaoning, China, further exacerbate this dynamic. The Confucian value of filial piety (xiao) emphasizes familial loyalty and caregiving obligations, shaping individual behavior. These mothers may face an inner conflict between maintaining their health for their families and meeting the immediate demands of caregiving. Under these norms, prioritizing self-care might feel selfish, reinforcing disengagement from health-promoting actions. High PSU and PSE, instead of motivating proactive HBs, may lead to re-prioritization toward caregiving responsibilities at the expense of personal health (Tao et al., 2023).

The stigma surrounding cancer in Chinese society adds another layer of complexity (Tsai & Wang, 2023). Often perceived as a "death sentence," cancer can cultivate fatalistic beliefs, where survivors feel their actions have little influence on outcomes. High PSE, in particular, may amplify feelings of helplessness, reducing self-efficacy and fostering resignation. This learned helplessness diminishes motivation for health-promoting behaviors, leaving survivors feeling powerless to alter their situation (Kang et al., 2020).

Social constructs such as "face" (mianzi) and privacy further compound these effects (Ma et al., 2021). To preserve familial honor and avoid being perceived as weak, mothers may avoid openly addressing health concerns, thereby limiting engagement with HBs. High PSU and PSE, when combined with this desire to maintain social and familial respect, may exacerbate avoidance behaviors, creating a boomerang effect where heightened awareness of risks leads to disengagement rather than action (Lee & Shi, 2022; Liang et al., 2021).

*PR as a Driver of Motivation Under Practical Constraints*

PR plays a dual role in shaping the HBs of YMBCSs. While PR fosters motivation by enhancing ATT and

INT toward healthy behaviors, caregiving constraints often limit the ability to act on these INTs.

PR significantly impacts ATT ($\beta = 0.156$, $p < 0.001$) and INT ($\beta = 0.118$, $p < 0.001$), and its influence on INT through ATT is mediated ($\beta = 0.026$, $p = 0.003$, CI [0.010, 0.044]). PR's total indirect effect on BEH via ATT and INT is positive ($\beta = 0.074$, CI [0.039, 0.113]), explaining 47.13% of BEH variance. However, the direct effect of PR on BEH is weak and non-significant ($\beta = 0.083$, CI [-0.025, 0.189]), indicating that PR primarily motivates behavior indirectly.

Time and energy constraints related to caregiving, reflected in PBA, significantly hinder mothers' ability to act on INTs. PBA negatively affects ATT ($\beta = -0.202$, $p < 0.001$), with a high mean score for caregiving demands (PBA7, mean = 2.77), indicating these barriers are substantial. This creates a "want to but can't" situation, where PR-driven motivation is outweighed by caregiving responsibilities.

In Chinese culture, caregiving is a deeply ingrained value, driving PR as a motivator for health-promoting behaviors (Rahman et al., 2019; Wu et al., 2019). However, societal expectations also amplify caregiving responsibilities, which often take precedence over self-care (Ross et al., 2020). This tension explains why structured health routines like strength training (mean = 3.70) and flexibility exercises (mean = 3.73) are deprioritized, despite moderate overall physical activity (mean = 3.79).

PR motivates HBs by fostering positive ATTs and INTs, but practical caregiving constraints limit their enactment (Zhong & Wang, 2019). Balancing intrinsic motivation with external caregiving demands is critical for promoting sustainable health behaviors in this demographic (Choudry & Ganti, 2024).

## Implications

This study advances the understanding of HBs among young BCSs mothers by integrating personal, social, and cultural factors into the HBM and TRA frameworks. It introduces PR as a vital motivator shaping ATT, INT, and BEH, highlighting the family-oriented motivations central to this demographic. The study refines the HBM by uncovering the nuanced role of PSE and PSU, where PSE had suppressive direct effects on BEH but positive indirect effects through ATT and INT. Aligned with the TRA, ATT and INT emerged as essential mediators linking perceptions to behavior, while SN strongly influenced INT, particularly in China's collectivist cultural context. By incorporating PR and cultural dimensions, this study tailors HB models to family-oriented and collectivist settings, offering broader insights into behavior change frameworks.

Practically, the findings highlight the need for family-centered and culturally sensitive interventions for BCSs. Emphasizing PR's role, programs should frame healthy behaviors as beneficial for both mothers and their families, while addressing barriers like time constraints through flexible, family-friendly solutions such as shorter exercise sessions with childcare support. Strengthening PBE and SE through achievable goals and relatable examples can sustain motivation. Given the influence of ATT and INT, interventions should focus on fostering positive ATTs and maintaining INTs over time. Involving family members in health education and encouraging joint activities can enhance SN's supportive role. Balancing risk perceptions with empowering, actionable strategies will help mothers navigate caregiving responsibilities while prioritizing their health.

## Conclusion

In conclusion, this study lays the groundwork for future research aimed at enhancing HBs among young BCSs. By integrating cultural sensitivity, theory-driven approaches, and practical recommendations, the findings contribute to more effective health promotion strategies, offering valuable insights for both theory development and real-world application.

## Limitations and Direction for Future Studies

Several limitations warrant consideration. First, the cross-sectional design restricts causal inferences.

Longitudinal studies are needed to confirm these relationships over time. Second, the reliance on self-reported data may introduce response bias. Future research could incorporate objective health measures to validate findings. Finally, while the study focuses on Liaoning Province, regional variations in cultural and healthcare practices may limit generalizability to other regions in China. Future research should explore interventions targeting the identified barriers and cultural factors. Additionally, qualitative studies could provide deeper insights into the psychological and cultural underpinnings of HBs among this population.

## References

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. Amherst, MA. http://people.umass.edu/~aizen/pdf/tpb.measurement.pdf

Ajzen, I., & Fishbein, M. (1969). The prediction of behavioral intentions in a choice situation. Journal of Experimental Social Psychology, 5(4), 400–416.

Ajzen, I., & Kruglanski, A. W. (2019). Reasoned action in the service of goal pursuit. Psychological Review, 126(5), 774–786.

Al-Hosni, K., Chan, M. F., & Al-Azri, M. (2023). Effectiveness of an Educational Program on awareness of breast Cancer risk factors, symptoms, and barriers to seeking medical help among adolescent Omani School Students—An interventional study. Current Oncology, 30(4), 4126–4138.

Arnold, M., Morgan, E., Rumgay, H., Mafra, A., Singh, D., Laversanne, M., Vignat, J., Gralow, J. R., Cardoso, F., & Siesling, S. (2022). Current and future burden of breast cancer: Global statistics for 2020 and 2040. The Breast, 66, 15–23. https://doi.org/10.1016/j.breast.2022.08.010

Bluethmann, S. M., Vernon, S. W., Gabriel, K. P., Murphy, C. C., & Bartholomew, L. K. (2015). Taking the next step: A systematic review and meta-analysis of physical activity and behavior change interventions in recent post-treatment breast cancer survivors. Breast Cancer Research and Treatment, 149, 331–342. https://doi.org/10.1007/s10549-014-3255-5

Campis, L. K., Lyman, R. D., & Prentice-Dunn, S. (1986). The Parental Locus of Control Scale: Development and Validation. Journal of Clinical Child Psychology, 15(3), 260–267. https://doi.org/10.1207/s15374424jccp1503_10

Champion, V. L. (1984). Instrument development for health belief model constructs. Advances in Nursing Science, 6(3), 73–85. https://doi.org/10.1097/00012272-198404000-00011

Chawla, D., & Joshi, H. (2019). Consumer attitude and intention to adopt mobile wallet in India–An empirical study. International Journal of Bank Marketing, 37(7), 1590–1618.

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. Information Systems Research, 14(2), 189–217. https://doi.org/10.1287/isre.14.2.189.16018

Choudry, M., & Ganti, L. (2024). Exploration of the Motivational Factors that Influence the Maintenance of Health. Health Psychology Research, 12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10963256/

Dewi, T. K., Ruiter, R. A. C., Diering, M., Ardi, R., & Massar, K. (2022). Breast self-examination as a route to early detection in a lower-middle-income country: Assessing psychosocial determinants among women in Surabaya, Indonesia. BMC Women's Health, 22(1), 179. https://doi.org/10.1186/s12905-022-01748-4

Fernandes, M. J. (2020). Deconstructing women and ensuring life: Trajectories in facing breast cancer in Brazil and in Germany [PhD Thesis, University of Augsburg]. https://opus.bibliothek.uni-augsburg.de/opus4/frontdoor/index/index/docId/78807

Firouzbakht, M., Hajian-Tilaki, K., & Bakhtiari, A. (2021). Comparison of competitive cognitive models in explanation of women breast cancer screening behaviours using structural equation modelling: Health belief model and theory of reasoned action. European Journal of Cancer Care, 30(1). https://doi.org/10.1111/ecc.13328

Gormley, M., Ghazal, L., Fu, M. R., Van Cleave, J. H., Knobf, T., & Hammer, M. (2022). An integrative review on factors contributing to fear of cancer recurrence among young adult breast cancer survivors. Cancer Nursing, 45(1), E10–E26. https://doi.org/10.1097/ncc.0000000000000858

Grimmett, C., Corbett, T., Brunet, J., Shepherd, J., Pinto, B. M., May, C. R., & Foster, C. (2019). Systematic review and meta-analysis of maintenance of physical activity behaviour change in cancer survivors. International Journal of Behavioral Nutrition and Physical Activity, 16, 1–20. https://doi.org/10.1186/s12966-019-0787-4

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. Research Methods in Applied Linguistics, 1(3), 1–18.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. Springer Nature. https://library.oapen.org/handle/20.500.12657/51463

Hoedjes, M., Nijman, I., & Hinnen, C. (2022). Psychosocial determinants of lifestyle change after a cancer diagnosis: A systematic review of the literature. Cancers, 14(8), 2026. https://doi.org/10.3390/cancers14082026

Hu, Y., Xu, J., Wang, X., Shi, Y., Chen, M., & Im, E.-O. (2021). Socio-ecological environmental characteristics of young Chinese breast cancer survivors. Oncology Nursing Forum, 48(5), 481–490. https://doi.org/10.1188/21.onf.481-490

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Jia, T., Liu, Y., Fan, Y., Wang, L., & Jiang, E. (2022). Association of healthy diet and physical activity with breast cancer: Lifestyle interventions and oncology education. Frontiers in Public Health, 10, 797794.

Juárez-García, D. M., de Jesús García-Solís, M., & Téllez, A. (2020). Adaptation and validation of the health belief model scale for breast self-examination in Mexican women. Value in Health Regional Issues, 23, 30–36. https://doi.org/10.1016/j.vhri.2019.11.006

Kang, N. E., Kim, H. Y., Kim, J. Y., & Kim, S. R. (2020). Relationship between cancer stigma, social support, coping strategies and psychosocial adjustment among breast cancer survivors. Journal of Clinical Nursing, 29(21–22), 4368–4378. https://doi.org/10.1111/jocn.15475

Kasilingam, D. L. (2020). Understanding the attitude and intention to use smartphone chatbots for shopping. Technology in Society, 62, 101280. https://doi.org/10.1016/j.techsoc.2020.101280

La Barbera, F., & Ajzen, I. (2020). Control interactions in the theory of planned behavior: Rethinking the role of subjective norm. Europe's Journal of Psychology, 16(3), 401.

Lee, E. W. J., & Shi, J. (2022). Examining the roles of fatalism, stigma, and risk perception on cancer information seeking and avoidance among Chinese adults in Hong Kong. Journal of Psychosocial Oncology, 40(4), 425–440. https://doi.org/10.1080/07347332.2021.1957061

Li, Q., Lesseur, C., Neugut, A. I., Santella, R. M., Parada, H., Teitelbaum, S., & Chen, J. (2022). The associations of healthy lifestyle index with breast cancer incidence and mortality in a population-based study. Breast Cancer, 29(6), 957–966. https://doi.org/10.1007/s12282-022-01374-w

Liang, S., Chen, J., Rui, J. R., & Guo, J. (2021). The boomerang effect of tuberculosis knowledge and self-efficacy on Chinese parents' intention to seek timely treatment and adhere to doctors' regimens. Patient Education and Counseling, 104(6), 1487–1493. https://doi.org/10.1016/j.pec.2020.10.030

Lofterød, T., Frydenberg, H., Flote, V., Eggen, A. E., McTiernan, A., Mortensen, E. S., Akslen, L. A., Reitan, J. B., Wilsgaard, T., & Thune, I. (2020). Exploring the effects of lifestyle on breast cancer risk, age at diagnosis, and survival: The EBBA-Life study. Breast Cancer Research and Treatment, 182, 215–227. https://doi.org/10.1007/s10549-020-05679-2

Ma, Z., Wang, J., Li, J., & Jia, Y. (2021). The association between obesity and problematic smartphone use among school-age children and adolescents: A cross-sectional study in Shanghai. BMC Public Health, 21(1), 2067. https://doi.org/10.1186/s12889-021-12124-6

Manni, A., & El-Bayoumy, K. (2023). Lifestyle Modifications and Breast Cancer Risk. Cancers, 15(11), 2870. https://doi.org/10.3390/cancers15112870

Martens, K., Ulrich, G. R., Ranby, K. W., & Kilbourn, K. (2021). What matters most? Predictors of quality of life and life satisfaction among young breast cancer survivors. Cancer Nursing, 44(6), E727–E734. https://doi.org/10.1097/ncc.0000000000000967

Michaelson, V., Pilato, K. A., & Davison, C. M. (2021). Family as a health promotion setting: A scoping review of conceptual models of the health-promoting family. PloS One, 16(4), e0249707.

Milosevic, E., Brunet, J., & Campbell, K. L. (2020). Exploring tensions within young breast cancer survivors' physical activity, nutrition and weight management beliefs and practices. Disability and Rehabilitation, 42(5), 685–691. https://doi.org/10.1080/09638288.2018.1506512

Montagnese, C., Porciello, G., Vitale, S., Palumbo, E., Crispo, A., Grimaldi, M., Calabrese, I., Pica, R., Prete, M., & Falzone, L. (2020). Quality of life in women diagnosed with breast cancer after a 12-month treatment of lifestyle modifications. Nutrients, 13(1), 136. https://doi.org/10.3390/nu13010136

Olson, J. L., Conroy, D. E., Mama, S. K., & Schmitz, K. H. (2024). Lifestyle Behaviors and Health-Related Quality of Life in Cancer Survivors: A Latent Class Analysis. Health Education & Behavior, 51(3), 341–351. https://doi.org/10.1177/10901981231203978

Parada Jr, H., Sun, X., Tse, C.-K., Olshan, A. F., & Troester, M. A. (2019). Lifestyle patterns and survival following breast cancer in the Carolina Breast Cancer Study. Epidemiology, 30(1), 83–92. https://doi.org/10.1097/ede.0000000000000933

Rahman, M. M., Liang, C. Y., Gu, D., Ding, Y., & Akter, M. (2019). Understanding Levels and Motivation of Physical Activity for Health Promotion among Chinese Middle-Aged and Older Adults: A Cross-Sectional Investigation. Journal of Healthcare Engineering, 2019, 1–9. https://doi.org/10.1155/2019/9828241

Rosenstock, I. M. (1974). Historical origins of the health belief model. Health Education Monographs, 2(4), 328–335. https://doi.org/10.1177/109019817400200403

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In S. Wright & M. Johnston (Eds.), Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35–37). NFER-NELSON. https://www.religiousforums.com/data/attachment-files/2014/12/22334_285ebbd019ec89856493442b1b6f9154.pdf

Shi, A., Fong, K. H. A., Rodomar, C., Demetriou, C. A., Kolokotroni, O., Philippou, E., Salameh, P., Mosquera, M. C., Papageorgiou, E., & Critselis, E. (2023). Barriers and facilitators for adopting healthy lifestyles in breast cancer survivors: A scoping review protocol. JBI Evidence Synthesis, 21(11), 2218–2226. https://doi.org/10.11124/jbies-22-00395

Shin, Y., Kim, H., Lee, T., Kim, S., Lee, S. B., Kim, J., Chung, I. Y., Ko, B. S., Lee, J. W., & Son, B. H. (2023). Factors in Parenting Stress in Young Patients With Breast Cancer and Implications for Children's Emotional Development: The PSYCHE Study. JAMA Network Open, 6(11), e2344835–e2344835. https://doi.org/10.1001/jamanetworkopen.2023.44835

Shubayr, N., Khmees, R., Alyami, A., Majrashi, N., Alomairy, N., & Abdelwahab, S. (2022). Knowledge and factors associated with breast cancer self-screening intention among Saudi female college students: Utilization of the health belief

model. *International Journal of Environmental Research and Public Health*, 19(20), 13615. https://doi.org/10.3390/ijerph192013615

Tao, L., Hu, X., Fu, L., Zhang, X., & Chen, H. (2023). Effects of family beliefs and family strength on individual resilience and quality of life among young breast cancer survivors: A cross-sectional study. *Journal of Clinical Nursing*, 32(11–12), 2616–2626. https://doi.org/10.1111/jocn.16321

Taschner, M. C., Piero, R., Broomhall, C. N., & Crecelius, A. R. (2022). Examining Contributors to Intent to Continue Exercising in Patients With Cancer in Rehabilitation. *Clinical Journal of Oncology Nursing*, 26(1), 78–85. https://doi.org/10.1188/22.CJON.78-85

Teng, H., Yen, M., & Fetzer, S. (2010). Health promotion lifestyle profile-II: Chinese version short form. *Journal of Advanced Nursing*, 66(8), 1864–1873. https://doi.org/10.1111/j.1365-2648.2010.05353.x

Thorsen, L., Bøhn, S.-K. H., Lie, H. C., Fosså, S. D., & Kiserud, C. E. (2022). Needs for information about lifestyle and rehabilitation in long-term young adult cancer survivors. *Supportive Care in Cancer*, 30(1), 521–533. https://doi.org/10.1007/s00520-021-06418-z

Tsai, W., & Wang, J. H. (2023). Fatalism and Psychological Distress Among Chinese American Breast Cancer Survivors: Mediating Role of Perceived Self-control and Fear of Cancer Recurrence. *International Journal of Behavioral Medicine*, 30(5), 705–713. https://doi.org/10.1007/s12529-022-10136-z

Vuong, S., & Warner, E. (2024). Breast cancer survivorship among younger patients: Challenges and opportunities—narrative review. *Annals of Palliative Medicine*, 13(5), 1246257–1241257.

Willis, E., Mah, K., Shapiro, G. K., Hales, S., Li, M., An, E., Zimmermann, C., Schultebraucks, K., & Rodin, G. (2023). Testing terror management theory in advanced cancer. *Death Studies*, 47(1), 65–74. https://doi.org/10.1080/07481187.2021.2019145

Wu, J., Liu, M., Zhang, G., & Chi, I. (2019). A Mixed-Methods Study on The Influence of Chinese Culture on Caregiving and Impacts of CSMP. *Innovation in Aging*, 3(Suppl 1), S546. https://doi.org/10.1093/geroni/igz038.2012

Yarmohammadi, S., Mousavi, S., Ajori, L., Mohammadzade, F., & Marashi, T. (2023). Impact of attitude, subjective norms and perceived behavioral control on health behaviors among women with low-risk HPV, and the mediating role of behavioral intention: An interventional study. *International Journal of Health Promotion and Education*, 61(2), 70–82. https://doi.org/10.1080/14635240.2021.1995776

Zhong, T., & Wang, H. (2019). Motivation profiles for physical activity among office workers. *Frontiers in Psychology*, 10, 1577. https://doi.org/10.3389/fpsyg.2019.01577.