

Effects of Interoception-Related Parenting on Proximal and Distal Socioemotional Outcomes

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Abstract: Social, emotional, and behavioural (SEB) skills encompass an individual's ability to maintain relationships, regulate emotions, and manage goal-directed behaviours. These skills can be viewed as a distal outcome of socioemotional development, which is supported by foundational social cognitive abilities such as empathy and Theory of Mind (ToM), as well as emotional functioning skills like emotional regulation and awareness. Recent theories propose that the development of interoception, significantly influenced by child-parent interactions even into adolescence, underlies socioemotional development. The present study aimed to investigate whether interoception-related parenting enhances SEB skills by fostering these essential social, emotional cognitive abilities. A total of 160 Chinese participants (mean age = 23.55, 83 females) took part in the research. They completed self-report measures, including the Recollected Interoception-related Parenting Questionnaire (RIPQ), the Behavioural, Emotional, and Social Skills Inventory (BESSI), and the Brief Form of the Interpersonal Reactivity Index (B-IRI). In addition to self-report measures, participants also completed a Hinting Task. We found that recalled positive interoception-related parenting from childhood and adolescence is significantly linked to higher levels of social, emotional, and behavioural skills in adulthood. Notably, self-reported perspective-taking, empathic concern, and personal distress were found to mediate this relationship.

Keywords: Positive Interoception-related Parenting; Social Cognitive Abilities; Empathy; Theory of Mind; Social, Emotional, and Behavioural Skills.

1. Introduction

Although interoception has traditionally been regarded as an individual process, increasing evidence and theoretical frameworks suggest that its development is significantly influenced by interpersonal interactions. Several research models propose that interactions between infants and their caregivers actively shape feeding experiences and impact the development of interoception[1]. While these theories mainly focus on infancy, recent models indicate that the development of interoceptive abilities in adolescents may still be affected by parenting behaviours. Particularly, as children move into adolescence, the nature of parental support shifts from offering direct physiological guidance to fostering independence. Our previous research has demonstrated that positive interoceptive parenting during this vital developmental phase can equip teenagers with the necessary skills to understand, trust, regulate, and effectively utilise their interoceptive abilities.

Adolescence is often seen as a crucial period for social and emotional development, during which interoception plays a key role in nurturing essential social cognitive skills such as empathy and Theory of Mind (ToM). Throughout this stage, caregivers help teenagers develop their ability to understand, trust, regulate, and apply their interoceptive perceptions. Positive interoceptive parenting aids adolescents in distinguishing between themselves and others, which is a fundamental step in the growth of empathy and ToM. Additionally, it improves their capacity to accurately recognise both their own bodily and mental states and those of others, which is vital for fostering empathy and ToM. Moreover, interoception may assist individuals in managing the overlap between self and others by differentiating between our own and others' bodily and mental states [2]. In summary, the role of interoception-focused parenting during

adolescence can significantly influence not only the development of interoception in teenagers but also their broader social and emotional growth.

Furthermore, social, emotional, and behavioural skills (SEB skills) can be defined as individuals' capabilities to maintain social relationships, regulate emotions, and manage behaviours directed toward goals and learning[3]. According to this definition, empathy and theory of mind (ToM) are crucial components of effective social interaction. These functions of social cognition form the foundation of SEB skills and are closely linked to various domains within SEB skills, such as social engagement and cooperation skills. For example, the BESSI model is the most comprehensive tool for assessing participants' SEB skills. Within the domain of cooperation skills, an essential aspect is perspective-taking, which aligns with the concept of ToM. In summary, SEB skills can be regarded as the distal outcomes of social and emotional development, influenced by interoception-related parenting; however, there is currently a lack of corresponding empirical research.

This research aimed to examine the impact of interoception-related parenting behaviours on the social, emotional, and behavioural skills of teenagers. The hypothesis proposed that positive interoception-related parenting behaviours would promote the development of these skills. Data was gathered through questionnaires. If the hypothesis is supported, it is anticipated that teenagers displaying positive interoception-related behaviours will demonstrate stronger social management and cooperation skills compared to their peers exhibiting negative interoception-related behaviours.

2. Method

2.1. Participants

A total of 160 individuals participated in the study, comprising 77 males and 83 females. This sample size was determined based on the recommendations of Fritz & MacKinnon (2007) for detecting an indirect effect using bias-corrected bootstrap methods, assuming a small-to-medium correlation ($\rho=0.26$) between the predictor and mediator, as well as between the mediator and the outcome variable. The average age of the participants was 23.55 years. Participants were recruited as volunteers through online postings and social networking platforms. Eligibility criteria required participants to be Chinese and at least 18 years old. Before participation, all individuals were informed about the study's purpose and procedures. They were then presented with a consent form that outlined the potential risks involved and emphasised their right to withdraw from the study at any time. Additionally, the data collected during the survey were used exclusively for research purposes.

2.2. Materials

This was an observational study with a retrospective correlational design. The study included four measured variables: the Recollected Interoception-related Parenting Questionnaire (RIPQ), the Behavioural, Emotional, and Social Skills Inventory (BESSI), the Hinting Task, and the Brief Form of the Interpersonal Reactivity Index (B-IRI).

The RIPQ is a retrospective self-report measure consisting of 16 items that assess respondents' perceptions of parenting about their interoception. It includes two subscales, each with 8 items: the RIPQ-POS, which focuses on positive interoception-related parenting (e.g., modelling, discussing, and validating children's bodily sensations, as well as coaching them to utilize their interoception in social and emotional contexts), and the RIPQ-NEG, which addresses negative parenting behaviours (e.g., being intrusive, overinvolved, ridiculing, dismissive, or neglectful of children's bodily sensations). Both subscales demonstrated strong reliability, with scores of 0.87 for RIPQ-POS and 0.79 for RIPQ-NEG.

Additionally, the BESSI model is designed to evaluate participants' social, emotional, and behavioural skills through self-reporting. It encompasses five broad domains: social engagement, cooperation, self-management, emotional resilience, and innovation. We utilised the complete 192-item version of the BESSI and analysed the domain-level scores to address specific research questions. Participants rated their

abilities regarding the statements in each question using a scale from 1 to 5, where 1 signifies "Not at all well" and 5 represents "Extremely well." The BESSI demonstrated high reliability with a score of 0.95.

Moreover, the hinting task is a performance-based assessment of ToM ability. It consists of 10 brief stories, each ending with a character making a statement. After each story, participants are required to interpret the underlying meaning of the character's intentions. Scoring is based on participants' responses: 2 points are awarded for a correct interpretation on the first attempt, 1 point for a correct interpretation on the second attempt, and 0 points if the response is simply a paraphrase of the character's statement. The total score can range from 0 to 20, with the hinting task exhibiting a reliability score of 0.44, indicating low internal consistency.

Finally, the B-IRI is a 16-item self-report questionnaire aimed at evaluating individual differences in empathic responsiveness. It comprises four subscales: perspective-taking, fantasy, empathic concern, and personal distress. In this questionnaire, we assessed three subscales: perspective-taking, empathic concern, and personal distress. Participants respond to each item using a scale from 1 to 5, where 1 means "Does not fit me at all" and 5 means "Fits me extremely well." The reliability scores for Empathic Concern, Personal Distress, and Perspective Taking in the B-IRI are 0.83, 0.78, and 0.79, respectively, demonstrating high reliability. Overall, the RIPQ, BESSI, and B-IRI are measured using closed-ended questionnaires, while the hinting task is conducted through interviews.

2.3. Procedure

The study consisted of three parts. First, participants completed the questionnaire that included the RIPQ and then the B-IRI. Following this, participants took part in an interview involving the Hinting Task, which involves telling them ten stories and asking them what the people in the stories mean by what they say. Finally, they needed to complete a second questionnaire consisting of the BESSI.

2.4. Data Analysis Plan

We first examined the relationships between retrospective interoception-related parenting, social cognitive abilities, and SEB skills using bivariate correlations. Then, a mediation analysis was conducted using a structural equation modelling (SEM) approach. We used the standard alpha level of 0.05.

3. Result

3.1. Descriptive Statics

Table 1. Descriptive data (N=160) for the experiment

	Mean	SD	Minimum	Maximum
Age, years	23.55	5.796	18	62
Female, n	83	-	-	-
RIM_Pos	26.725	5.987	13	38
RIM_Neg	30.619	5.098	16	40
IAS	49.819	5.735	29	60
IATS	37.906	10.715	15	60
IRI_EC	15.894	2.956	6	20
IRI_PD	12.119	3.39	4	19
IRI_PT	15.419	2.748	8	20

Note. The table illustrates the mean, SD, minimum, and maximum values of age, RIM, IAS, IATS, and IRI. And the number of male and female participants.

The final sample size for analysis included 160 participants, comprising 77 males and 83 females. Participants' ages ranged from 18 to 62 years, with an average age of 23.55 (SD = 5.80). As illustrated in Table 1, the mean score for Positive Parenting on the RIM was 26.73 (SD = 5.99), while for Negative Parenting, it was 30.62 (SD = 5.10). Scores on the IAS varied from 29 to 60, with a mean of 49.82 (SD = 5.74), and the mean score for the IATS was 37.91 (SD = 10.72), with values ranging from 15 to 60. Additionally, participants reported an average score of 15.89 (SD = 2.96) on Empathic Concern, 12.12 (SD = 3.39) on Personal Distress, and 15.42 (SD = 2.75) on Perspective Taking in the IRI.

3.2. Confirmatory Analysis

Pearson correlation analyses were performed to explore the relationships among the key variables, including RIM, IRI, Hinting Task, and BESSI. As illustrated in Table 2, RIM_Pos exhibited a positive and significant correlation with IRI_EC ($r = .25$, $p = .002$) and IRI_PT ($r = .41$, $p < .001$), while demonstrating a negative correlation with IRI_PD ($r = -.26$, $p < .001$). Additionally, RIM_Pos showed strong positive correlations with BESSI ($r = .56$, $p < .001$). Furthermore, there was no significant correlation observed between

RIM_Pos and the Hinting Task ($r = -.07$, $p = .350$).

Moreover, as illustrated in Figure 1, RIM_Pos exhibited a significant positive association with IRI_EC ($\beta = 0.123$), and IRI_EC was also significantly correlated with BESSI ($\beta = 5.141$). The indirect effect of RIM_Pos on BESSI via IRI_EC demonstrated a meaningful association ($\beta = 0.630$). Additionally, RIM_Pos was significantly positively related to IRI_PT ($\beta = 0.188$), with IRI_PT showing a significant association with BESSI ($\beta = 11.662$). The indirect effect of RIM_Pos on BESSI through IRI_PT ($\beta = 2.188$) yielded statistically significant results. Conversely, RIM_Pos was significantly negatively associated with IRI_PD ($\beta = -0.148$), and IRI_PD was significantly negatively correlated with BESSI ($\beta = -10.977$). The indirect effect of RIM_Pos on BESSI through IRI_PD ($\beta = 1.619$) also produced statistically significant results. The pathway from RIM_Pos to the Hinting task, however, was not statistically significant ($\beta = -0.022$), whereas the relationship from Hinting tasks to BESSI was significant ($\beta = 8.160$). The indirect effect of RIM_Pos on BESSI through the Hinting task was not significant ($\beta = -0.181$). Lastly, the direct effect of RIM_Pos on BESSI was significant ($\beta = 5.251$).

Table 2. Table of Pearson's Correlations

	1	2	3	4	5	6	7	8	9	10	11	12
1. RIM_Pos	—											
2. RIM_Neg	.41***	—										
3. IRI_EC	.25**	.11	—									
4. IRI_PD	-.26***	-.31***	.06	—								
5. IRI_PT	.41***	.126	.5***	-.19	—							
6. HintingTask	-.07	.01	-.14	.04	-.05	—						
7. BESSI	.56***	.32***	.34***	-.49***	.58***	.07	—					
8. BESSI_Social	.53***	.28***	.31***	-.50***	.56***	.037	.93***	—				
9. BESSI_Cooperation	.52***	.35***	.54***	-.38***	.59***	-.01	.86***	.75***	—			
10. BESSI_Self	.56***	.36***	.26***	-.46**	.53***	.09	.91***	.79***	.78***	—		
11. BESSI_Innovation	.39***	.13	.28***	-.37***	.42***	.06	.85***	.81***	.66***	.64***	—	
12. BESSI_Emotion	.52***	.31***	.26***	-.50***	.53***	.09	.91***	.82***	.73***	.80***	.71***	—
13. BESSI_Compound	.39***	.25**	.23**	-.41***	.45***	.12	.90***	.80***	.70***	.77***	.85***	0.79***

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

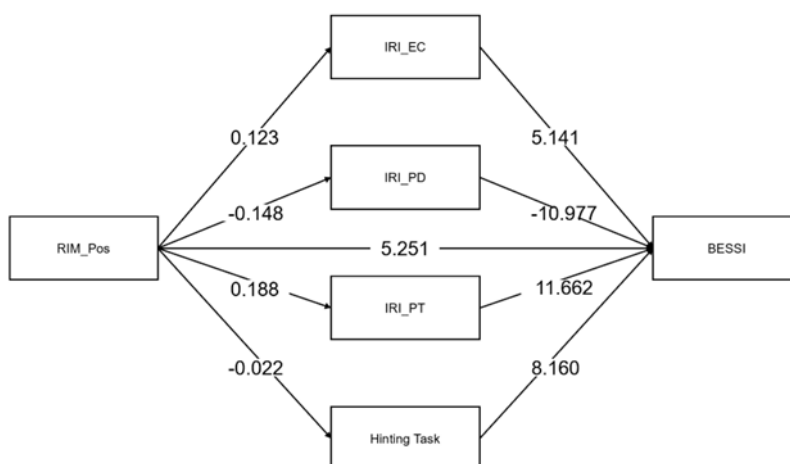


Figure 1. Mediation Model of the RIM_Pos on BESSI

Note. The path diagram shows the direct and indirect effects of RIM_Pos on BESSI via IRI_EC, IRI_PD, IRI_PT, and the Hinting Task.

4. Discussion

This study examined the relationship between positive interoception-related parenting (RIM_Pos) and social, emotional, and behavioural skills (SEB skills), with empathy (measured through the Empathy Indexes: IRI_EC, IRI_PD, and IRI_PT) and theory of mind (assessed via the Hinting Task) serving as mediators. Data analysis revealed that participants who reported higher levels of RIM_Pos demonstrated significantly improved SEB skills. This effect was both direct and mediated by empathy (assessed through Empathic Concern, Perspective Taking, and Personal Distress), leading us to reject our null hypothesis regarding theory of mind, as its performance was not statistically significant based on the Hinting Task.

Mediation analyses indicated that positive interoception-related parenting enhances SEB skills by promoting Empathic Concern (EC) and Perspective Taking (PT). EC involves feelings of sympathy and care for others in distress, while PT refers to the inherent ability to understand and consider another person's mental or emotional perspective[4]. Together, EC and PT contribute to improved social engagement and cooperation skills within SEB skills. Furthermore, positive interoception-related parenting also fosters SEB skills by inhibiting Personal Distress (PD), which describes self-focused feelings of discomfort and anxiety in tense interpersonal situations[4]. Elevated levels of PD can hinder social behaviours, as individuals may concentrate more on their discomfort rather than on assisting others. This can lead to avoidance in social situations and a decline in cooperation and engagement, both of which are subscales of SEB skills.

This study makes a significant contribution as the first to directly examine whether interoception-related parenting behaviours influence socio-emotional development. Notably, it simultaneously investigates both proximal outcomes (i.e., social cognitive abilities) and distal outcomes (i.e., socio-emotional behavioural skills).

This study offers valuable insights into the relationship between positive interoception-related parenting and social cognitive abilities; however, it does have some limitations. Firstly, the cross-sectional design prevents us from making inferences about change, highlighting the need for longitudinal research to examine how positive interoception-

related parenting influences social cognitive development over time. Additionally, individual adolescents often exhibit meaningful changes in SEB skills, highlighting diverse and varied developmental paths[5]. Furthermore, the study relied on retrospective self-reports, which may be affected by recall bias.

Furthermore, the Hinting Task used to assess theory of mind exhibited low internal reliability within this sample. This lack of reliability may undermine confidence in the findings' strength and stability. Future research should consider revising the task content to incorporate more culturally relevant and locally adapted stories, as this could enhance participants' comprehension and response accuracy.

Overall, the findings demonstrate that positive interoception-related parenting is significantly associated with higher levels of social, emotional, and behavioural skills in teenagers. Notably, empathic traits—particularly perspective-taking and personal distress—were found to mediate this relationship.

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