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Effect of parenting stress, self-esteem and parent–child interaction in parents of children with allergic rhinitis on self-esteem of children: Analysis of Actor-partner Interdependence Model

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Abstract

Aim: It is important to focus on the early identification of factors that promote children's self-esteem, to foster the healthy development of children with allergic rhinitis. This study aimed to identify the effects of parents' parenting stress, self-esteem, and parent–child interaction on the self-esteem of children with allergic rhinitis.

Methods: Structural equation modeling was used to verify the conceptual model. This study was conducted on 656 children with symptoms of allergic rhinitis and their parents who participated in the 8th Panel Study on Korean Children (PSKC). Data collection involved a questionnaire on parents' parenting stress, self-esteem, parent–child interaction and self-esteem of children. Secondary data from the PSKC were analyzed using Actor-partner Interdependence Model. Data were analyzed using SPSS-WIN Version 20.0 and AMOS Version 20.0.

Results: In the high self-esteem group, the father's parenting stress had a partner effect on the mother's self-esteem, while the mother's self-esteem affected her parent–child interaction, which in turn affected the child's self-esteem. In the low self-esteem group, the father's parenting stress affected the mother's self-esteem, the father's self-esteem had a partner effect on the mother's parent–child interaction, and the mother's self-esteem had an indirect effect on the child's self-esteem.

Conclusions: This study was conducted to provide basic data to help understand the interactions among variables related to the self-esteem of children with allergic rhinitis. The findings indicate that the model has utility in developing effective nursing intervention to promote self-esteem of children with allergic rhinitis.

KEYWORDS
child, interaction, parents, rhinitis, self-esteem

1 | INTRODUCTION

Early childhood represents a critical period for the development of the immune system. However, allergies (or atopic disorders) have also been proven to emerge early in life (Vrbova et al., 2018). Large birth cohort studies generally support the observation that the incidence of allergic disorders has increased during the past decades, and that, in central European populations, allergic disorders affect approximately 30% of all children (Kratěnová, Žejglicová, &

Malý, 2012). According to a report by the Ministry of Health and Welfare (2016), the incidence of asthma and atopic dermatitis reduced to 25.5% and 11.4%, respectively, while that of allergic rhinitis increased to 14.1%, with children under 12 years old constituting 30.0% of all patients in Korea.

Compared with asymptomatic individuals, patients with chronic nocturnal rhinitis symptoms were more likely to report impaired cognitive function and decreased work productivity and performance (Dass et al., 2017). In particular, a child with allergic rhinitis experiences physical changes, sleep disorders, and worsening of academic performance due to frequent rhinorrhea, sneezing, and nasal congestion; these symptoms interfere with the child's daily life and lead to poor quality of life and self-esteem (Ferro & Boyle, 2013a; Mir, Panjabi, & Shah, 2012; Pinquart, 2012). Particularly, self-esteem during school age is a preliminary stage that leads to the formation of self-esteem in adolescence and adulthood. Lower self-esteem is associated with higher depression, stress, violence, delinquency, and antisocial activities. It is also associated with lower academic achievement, adaptation to school life, happiness, life satisfaction, social relationships, and interactions with peers, teachers, and parents (Baumeister, Campbell, Krueger, & Vohs, 2003). These phenomena link to adolescence and adulthood and can present severe social problems. Therefore, the initial assessment and approach to the self-esteem of children with allergic rhinitis should view it as a social, rather than an individual, problem (Lee & Hankin, 2009). In contrast, high self-esteem in a child with a chronic illness can be an internal resource that could help the child perceive the illness positively and overcome stressful situations (Martz, Livneh, & Wright, 2007). Thus, it is important to focus on the early identification of factors that promote children's self-esteem, to foster the healthy development of children with allergic rhinitis (Ferro & Boyle, 2013b).

Self-esteem of children can be developed, affected, and shaped by a potentially unlimited number of factors. Hence, it is only practical to identify and investigate the most important fundamental and effective factors (Keshky & Samak, 2017). The child's surroundings are one of the most significant influences on the development of his/her self-esteem. As a child's time, which corresponds with the initial phase of the development of self-esteem, completely revolves around his/her parents, therefore parenting is the most influential of all surrounding elements, as compared to peers and the community (Woolfolk, 2005).

A child's self-esteem level varies according to the developmental stage (Tsang & Yip, 2006). Previous studies have reported that different mental and physical outcomes occur depending on a child's self-esteem level (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Orth, Robins, & Roberts, 2008). High self-esteem prospectively

predicts success and well-being in life domains such as relationships, work, and health (Orth & Robins, 2014). In contrast, low self-esteem leads to dysfunctional relationships, neurosis, anxiety, and depression, acting as a universal denominator in addiction (Reasoner, 2010). Additionally, children with high self-esteem tend to be extrovert, confident, and risk takers, whereas those with low self-esteem are likely to be introvert, shy, and limited to their own boundaries and spaces. It also affects their voluntary participation (Keshky & Samak, 2017). Therefore, it is necessary to consider an approach to promote self-esteem according to the child's self-esteem level.

Because children with chronic diseases such as allergic rhinitis are four times more likely to have mental problems than are healthy children (Bennett, Shafran, Coughtrey, Walker, & Heyman, 2015), allergic rhinitis affects the lives of not only the children but also their families, thus increasing the dysfunction of that family (Ferro & Boyle, 2015). Several chronic medical diseases, including allergic diseases, have been thought to be closely associated with parenting stress and the relationship between mothers and their children (Murdock, Adams, Pears, & Ellis, 2012; Rabung, Ubbelohde, Kiefer, & Schauenburg, 2004; Walker & Cheng, 2007; Warschburger, Buchholz, & Petermann, 2004). Parenting stress and parents' attitudes toward their children have the potential to affect comorbidities or the severity of children's illnesses (Nagano et al., 2010).

Parenting stress affects children's self-esteem and leads to changes in self-esteem levels over time (Han & Kim, 2017). Parents' low self-esteem leads to dysfunctional relationships with the child, whereas positive self-esteem can serve as a buffer from negative emotion, thereby promoting parent–child interaction (Porter et al., 2015). As the parenting stress of the mother of a child with chronic disease increases, parents perceive their child as a difficult child (Ferro & Boyle, 2015), leading them to exhibit a parenting attitude that is critical and controlling, which ultimately leads to low self-esteem in the child (Sweenie, Mackey, & Streisand, 2014). However, self-esteem is viewed as the disposition to experience oneself as competent to cope with basic life challenges and worthy of happiness (Rosenberg, 1989). As purported in Maslow's theory of hierarchy of needs, the desire to be loved and recognized by one's parents is fulfilled when a child interacts with his/her parents, which then increases his/her self-esteem in perceiving himself as a valuable person (Keshky & Samak, 2017).

Previous studies on children's self-esteem were generally conducted on adolescents, and these studies identified the effects of school-related factors, such as school life adaptation, peer relations, and friend support, on the self-esteem of children. However, self-esteem of adolescents is based on and expands upon the self-esteem of school-aged children,

which is related to parental variables. Thus, a study that comprehensively identifies the relationship between parents and children is necessary. Despite the increase in the number of school-aged children with allergic rhinitis, studies on children's self-esteem that affects responding to allergic rhinitis and managing stress are still lacking. Specifically, more research is needed to identify the relationship between parent-related variables, which is a major variable affecting children's self-esteem, and the child's self-esteem in order to improve the self-esteem of school-aged children with allergic rhinitis.

As a married couple comprises two individuals who are in an interdependent relationship, the Actor-Partner Interdependent Model (APIM) suggested by Kenny (1996) is recommended as a method to analyze the interrelationships among variables related to married couples. When dyadic data are treated independently, the interoperability of the pair cannot be observed. Even when data is collected from both members of the dyad, performing analysis on the interrelationship data using methods for independent data violates the major independent data assumptions of statistical inferences, which leads to a measurement of standard error that is smaller than the reality, leading to the possibility of committing a type I error. Thus, interdependent dyadic data should be analyzed using APIM (Kenny, 1996). Therefore, since a child's self-esteem develops through his/her interaction with parents, data on the child's self-esteem should be collected in parent–child units and dyadic analyses should be performed. In particular, family environment, which forms the basis for the formation of a child's self-esteem, is affected by this interaction. Thus, it is necessary to identify the effects that parenting stress, self-esteem, and parent–child interaction, of not just one parent but both parents, have on the child's self-esteem.

Therefore, this study aimed to perform APIM analyses on parents and children to identify the effects of parents' parenting stress, self-esteem, and parent–child interaction on the self-esteem of children with allergic rhinitis, the incidence of which has been increasing. It also aimed to identify the actor effect and partner effect of the parental variables to provide basic data for the development of programs to improve the self-esteem of children with allergic rhinitis.

2 | METHODS

2.1 | Participants

This study was conducted on parents and children who participated in the 8th PSKC. Data from the 8th Panel Study on Korean Children (PSKC) (2015) has currently been released to the public. The PSKC, conducted by Korea Institute of Child Care and Education (KICCE), is a longitudinal study

of newborns born in 2008, their mothers, and the community environment. For this study, we targeted parents aged 19 years or older and their children who participated in the 8th panel survey (2015). The PSKC was conducted at a sample medical institution with 500 or more annual delivery cases as of 2006. The PSKC recruited a preliminary sample of 2562 households, of which 2150 newborn households were finally sampled using a multi-phasic sampling method. In Phase 1, the medical institution in which newborn births occur was selected. In Phase 2, households with a newborn that was born in the selected medical institution were extracted as a preliminary sample. In Phase 3, we sampled preliminary sample households with the desire to participate in the panel. The PSKC research team confirmed a sample retention rate of 74.3% for the 8th panel survey (2015). Finally, the 656 children with symptoms of allergic rhinitis, 656 fathers, and 656 mothers who participated in all health survey investigations and panel investigations were selected as the final participants for this study. In the structural equation model, a sample size of at least 10 times the recommended level of freedom is recommended and the ideal recommended size of 150–400 people is necessary. Thus, the sample of 656 participants was sufficient to analyze the actor effect and partner effect using structural equation modeling.

2.2 | Measurements

In this study, measurements consisted of parenting stress, parents' self-esteem, parent–child interaction and self-esteem of the child. Validity was confirmed through a confirmatory factor analysis. The fit of the model was examined using Chi-square and Chi-square/degrees of freedom analyses, the adjusted goodness-of-fit index (AGFI), the goodness-of-fit index (GFI), the comparative-fit index (CFI), the root mean square residual (RMSR), the root mean square error of approximation (RMSEA), and the normed-fit index (NFI). Chi-square/degrees of freedom should be less than 3.00 and model fit analysis scores, such as AGFI, GFI, CFI, and NFI, should be greater than 0.80. The acceptable model fit should be greater than 0.90. In addition, RMRS and RMSEA should be less than 1.00 (Bae, 2017). Construct validity was confirmed when the factor loading value was >.50, Construct reliability (CR) was >.70, and average variance extracted (AVE) was >.50 for concentration validity (Bae, 2017).

2.2.1 | Parenting stress

For parenting stress, this study used an 11-item tool developed by the PSKC research team in 2007 via a preliminary investigation, using items from the "distress and pressure on performing parenting roles," which is a subscale in the

parenting stress scale developed by Kim and Kang (1997). It comprises a five-point Likert scale (score range 11–55), with higher scores indicating a higher level of parenting stress. In Kim et al.'s study, the reliability of the tool was Cronbach's alpha = .86. In this study, the reliability of the tool for fathers was Cronbach's alpha = .90 and that for mothers was Cronbach's alpha = .90. According to a confirmatory factor analysis, the goodness-of-fit of the model for fathers' parenting stress was $\chi^2 = 85.87$, df = 44, GFI = .92, adjusted GFI (AGFI) = .90, NFI = .91, CFI = .99, standardized root mean square residual (SRMR) = .03, RMSEA = .02, CR = 0.95, and AVE = 0.67. The goodness-of-fit of the model for mothers' parenting stress was $\chi^2 = 86.74$, df = 44, GFI = .93, AGFI = .92, NFI = .93, CFI = .95, SRMR = .04, RMSEA = .05, CR = .95, and AVE = .67.

2.2.2 | Parents' self-esteem

Parents' self-esteem was measured using the revised self-esteem measurement tool developed by Rosenberg (1989), and revised into Korean by Lee (1999). For the PSKC, self-esteem was reorganized into a total of 10 items on five-point Likert scale (score range 10–50), with higher total scores indicating a higher level of self-esteem. In Lee's study, the reliability of the tool was Cronbach's alpha = .82. In this study, the reliability of the tool was Cronbach's alpha = .86 for fathers and Cronbach's alpha = .88 for mothers. According to a confirmatory factor analysis, the goodness-of-fit of the model for fathers' self-esteem was $\chi^2 = 82.44$, df = 35, GFI = 90, AGFI = .91, NFI = .90, CFI = .90, SRMR = .04, RMSEA = .06, CR = .96, and AVE = .71. The goodness-of-fit of the model for mothers' self-esteem was $\chi^2 = 87.79$, df = 35, GFI = .90, AGFI = .89, NFI = .90, CFI = .91, SRMR = .05, RMSEA = .06, CR = .96, and AVE = .70.

2.2.3 | Parent–child interaction

Items on parent–child interaction come from among the home environment, activities, and cognitive stimulation portion of the Early Childhood Longitudinal Study-Kindergarten cohort (ECLS-K) (ECLS research institution, 2013). The PSKC research team retrieved them on April 1, 2013, and translated and edited them for use in the survey. The PSKC research team obtained permission for the use of the tool from the research institution of ECLS. The tool was used as a final measurement tool after reconfirming the back-translation by a third person from the ECLS research institution. In the 8th PSKC, the statement "I learn reading, writing, and numbers with the child" was added considering the age of the child, and the statement "I play with assembling kits with the child" was changed to "I make something or play with assembling

kits with the child." The measurement consisted of nine items utilized a four-point rating scale (score range 9-44), with higher total scores indicating a higher level of interaction between parents and children. In this study, the Cronbach's alpha = .88 for fathers and .84 for mothers. According to a confirmatory factor analysis, the goodness-of-fit of the model for fathers' interaction with the child was $\chi^2 = 36.74$, df = 35, GFI = .95, AGFI = .94, NFI = .95, CFI = .94, SRMR = .04, RMSEA = .05, CR = 0.95, and AVE = 0.68. The goodness-of-fit of the model for mothers' interaction with the child was $\chi^2 = 85.14$, df = 35, GFI = .94, AGFI = .95, NFI = .94, CFI = .95, SRMR = .05, RMSEA = .04, CR = .96, and AVE = .72.

2.2.4 | Self-esteem of the child

Child's self-esteem was measured using the self-esteem measurement tool developed by Rosenberg (1989), which was reduced to five items appropriate for the child's age by the Millennium Cohort Study (MCS) team in the Department of Social Science, UCL Institute of Education, University of London. This five-item tool utilized a four-point rating scale (score range 5–20), with higher total scores indicating a higher level of self-esteem of the child. The reliability of the tool in this study was Cronbach's alpha = .76. According to a confirmatory factor analysis, the goodness-of-fit of the model for the child's self-esteem was $\chi^2 = 44.74$, df = 15, GFI = .92, AGFI = .90, NFI = .92, CFI = .92, SRMR = .03, RMSEA = .05, CR = .96, and AVE = .72.

2.3 | Ethical considerations

The 8th PSKC was conducted after receiving approval from the institutional review board (IRB) of the Korea Institute of Child Care and Education (KICCEIRB-2015-03). This study was conducted after receiving approval from the IRB of K University (KU IRB 2018-0090).

2.4 | Data collection and analyses

The data for this study were retrieved from the PSKC home page. After approval for using the 8th PSKC data was granted, the corresponding data were downloaded. Collected data were analyzed using SPSS-WIN Version 20.0 and AMOS Version 20.0. The descriptive statistics for the general characteristics of the participants and measurement variables were performed using descriptive statistics on SPSS. To test the normality of the data, the skewness and kurtosis of the measurement variables were assessed. AMOS was used to test multivariate normality. Each construct, relationship among measurement variables, and multicollinearity were assessed using Pearson's correlation coefficients. The

TABLE 1 General characteristics of participants

(N = 656)					
	High self-esteem group (n = 338)		**Low self-esteem group (n = 318)**		
Variables	**n**	**%**	**n**	**%**	**χ² (P)**
Father's age (years) (mean ± SD = 40.1 ± 3.9)					
36	40	6.1	40	6.1	0.52 (.770)
36–40	148	22.5	130	19.8	
40<	150	22.9	148	22.6	
Mother's age (years) (mean ± SD = 37.5 ± 3.7)					
36	103	15.7	89	13.6	0.94 (.618)
36–40	172	26.2	162	24.7	
40<	63	9.6	67	10.2	
Father's education					
High school	75	11.4	82	12.5	5.27 (.260)
College	69	10.5	76	11.6	
Bachelor's degree	194	29.6	160	24.4	
Mother's education					
High school	90	13.7	86	13.1	2.17 (.705)
College	96	14.6	90	13.7	
Bachelor's degree	152	23.2	142	21.7	
Father's occupation					
Manager or white-collar job	159	24.2	164	25.0	17.26 (.100)
Service sector or sales person	48	7.3	44	6.7	
Engineer or machine fabricators	41	6.3	41	6.3	
Others	90	13.7	69	10.5	
Mother's occupation					
Manager or white-collar job	94	14.3	81	12.3	6.32 (.503)
Housewife	165	25.1	178	27.1	
Others	28	4.4	110	16.8	
Family income(million won) (mean ± SD = 467.4 ± 186.7)					
< 400	158	24.1	158	24.1	0.56 (.250)
≥ 400	180	27.4	160	24.4	
Sex of child					
Male	178	27.1	188	28.7	2.76 (.096)
Female	160	24.4	130	19.8	
Rhinitis symptom - sneezing					
Yes	101	15.4	86	13.1	0.50 (.478)
None	237	36.1	232	35.4	
Rhinitis symptom - rhinorrhea					
Yes	86	13.1	77	11.7	0.05 (.818)
None	252	38.4	241	36.8	
Rhinitis symptom - nasal obstruction					
Yes	249	38.0	232	35.4	0.02 (.877)
None	89	13.5	86	13.1	

(Continues)

TABLE 1   (Continued)

(N = 656)					
	High self-esteem group (n = 338)		**Low self-esteem group (n = 318)**		
Variables	**n**	**%**	**n**	**%**	**χ^2 (P)**
Rhinitis symptom - pruritus of nose					
Yes	130	19.8	121	18.5	0.02 (.900)
None	208	31.7	197	30.0	
Sleep disturbance					
Yes	131	20.0	122	18.6	0.01 (.918)
None	207	31.5	196	29.9	
Limitation of daily activity					
Yes	82	12.5	81	12.4	0.13 (.720)
None	256	39.0	237	36.1	

Abbreviations: SD, standard deviation.

reliability of the tools were assessed with Cronbach's alpha values. To evaluate the actor effect and partner effect of parents' parenting stress, self-esteem, and parent–child interaction on the self-esteem of the child, structural equation modeling was conducted on AMOS. To test whether mothers' and fathers' data have identical meanings within one measurement tool, tests of measurement equivalence were performed. To test the goodness-of-fit of the research models, the maximum-likelihood method was used. Confirmatory factor analyses were performed to assess the validity of the latent variables for model analyses. Assessments of goodness-of-fit of the model were made using the χ^2, χ^2/df, RMSEA, SRMR, GFI, AGFI, CFI, NFI, and Tucker-Lewis Index (TLI). The statistical significance of the direct, indirect, and total effects were assessed using bootstrapping. Test of the structural model invariance across the groups is an analysis method that considers the difference in the numbers of paths across measurement models. These analyses were conducted using metric invariance constraints and cross-group equality constraints.

3 | RESULTS

3.1 | General characteristics of participants

The fathers' mean age was 40.1 ± 3.9 years, while that of mothers was 37.5 ± 3.7 years. The child mean age was 87.91 ± 1.55 months. Regarding education, bachelor's degree was the most common category for both fathers and mothers, with 354 (54.0%) and 294 participants (44.8%), respectively. Regarding occupation, manager or white-collar jobs was the most common for fathers, with 323 participants (49.2%), while the most common occupation for mothers was housewife, with 343 participants (52.2%). Average family income was 467.4 ± 186.7

million won. Among the children, 366 were male (55.8%) and 290 were female (44.2%). With reference to rhinitis symptom types, 187 participants (28.5%) reported sneezing, 163 (24.8%) reported rhinorrhea, 481 (73.4%) reported nasal obstruction, and 251 (38.3%) reported pruritus of the nose. Further, 253 participants (38.6%) reported experiencing sleep disturbances due to allergic rhinitis, and 163 (24.9%) reported experiencing limitations in daily activities. Based on the z-score calculated using the mean and standard deviation of the self-esteem of the child, children were divided into high and low self-esteem groups. A comparison of the general characteristics of the participants by groups using cross-tabulations revealed no significant differences in the general characteristics between the two groups (Table 1).

3.2 | Descriptive statistics of variables

For children in the high self-esteem group, the data exhibited a normal distribution, with the absolute skewness value (−1.05–0.66) being less than 2 and the absolute kurtosis value (−1.52–0.84) being less than 4. For children in the low self-esteem group, the data exhibited a normal distribution, with the absolute skewness value (−1.61–0.79) being less than 2 and the absolute kurtosis value (−0.48–1.10) being less than 4. At the significance level of .05, all measured variables had statistically significant correlations. The absolute value of the correlations among the variables did not exceed 0.8, which excluded the possibility of problems with multicollinearity (Table 2).

3.3 | Test of measurement equivalence

To confirm whether the data from fathers and mothers had the same meaning within one measurement tool,

TABLE 2 Correlation of the variables

(N = 656)								
Variables	Mean ± SD	X1 r (P)	X2 r (P)	X3 r (P)	X4 r (P)	X5 r (P)	X6 r (P)	X7 r (P)
High self-esteem group								
X1: Parenting stress (father)	2.1 ± 0.6	1						
X2: Parenting stress (mother)	2.5 ± 0.6	.38 (<.001)	1					
X3: Self-esteem (father)	3.8 ± 0.5	−.59 (<.001)	−.58 (<.001)	1				
X4: Self-esteem (mother)	3.7 ± 0.6	−.28 (<.001)	−.26 (<.001)	.30 (<.001)	1			
X5: Parent–child interaction (father)	1.9 ± 0.4	−.29 (<.001)	−.30 (.033)	.12 (<.001)	.12 (.017)	1		
X6: Parent–child interaction (mother)	2.1 ± 0.4	−.10 (<.001)	−.10 (<.001)	.18 (.014)	.27 (<.001)	.21 (<.001)	1	
X7: Self-esteem (child)	3.8 ± 0.1	−.13 (<.001)	−.16 (<.001)	.10 (.030)	.13 (<.001)	.14 (<.001)	.15 (<.001)	1
Low self-esteem group								
X1: Parenting stress (father)	2.3 ± 0.6	1						
X2: Parenting stress (mother)	2.7 ± 0.6	.42 (<.001)	1					
X3: Self-esteem (father)	3.6 ± 0.5	−.53 (<.001)	−.21 (<.001)	1				
X4: Self-esteem (mother)	3.6 ± 0.6	−.29 (<.001)	−.55 (<.001)	.27 (<.001)	1			
X5: Parent–child interaction (father)	2.0 ± 0.4	−.27 (<.001)	−.21 (<.001)	.23 (<.001)	.19 (<.001)	1		
X6: Parent–child interaction (mother)	1.7 ± 0.4	−.20 (<.001)	−.27 (<.001)	.18 (<.001)	.21 (<.001)	.29 (<.001)	1	
X7: Self-esteem (child)	3.0 ± 0.4	−.19 (<.001)	−.18 (<.001)	.15 (<.001)	.13 (<.001)	.11 (.001)	.11 (.025)	1

Abbreviations: SD, standard deviation.

measurement equivalence was tested by comparing four competing models. The first model was unconstrained, the second constrained measurement weights, the third constrained measurement residual, and the fourth constrained measurement weights and residual. In this study, the results of comparing the goodness-of-fit of these models with χ^2, TLI, CFI, and RMSEA, which are not sensitive to sample size, confirmed the measurement equivalence of the data (Table 3).

3.4 | Hypothesis testing

Results of testing the hypothetical models using the maximum-likelihood method showed $\chi^2 = 15.84$ ($P = .002$), df = 6, RMSEA = .04, SRMR = .05, GFI = .99, AGFI = .98, CFI = .99, NFI = .98, and TLI = .99 for the high self-esteem of the child group, and $\chi^2 = 17.32$ ($P = .006$), df = 6, RMSEA = .05, SRMR = .06, GFI = .97, AGFI = .96, CFI = .97, NFI = .97, and TLI = .98 for the low self-esteem of the child group. The goodness-of-fit of the models were appropriate; therefore, the model was confirmed. Among a total of 10 hypotheses, seven were chosen for each of the high and low self-esteem of the child groups (Figures 1 and 2).

3.5 | Actor and partner effect in parents' variables on the self-esteem of the child

In this study, subjects were divided into two groups based on the child's self-esteem mean value. The high self-esteem group contained children whose self-esteem is higher than average, the low self-esteem group with children whose self-esteem is lower than average. For the high self-esteem of the child group, father's parenting stress had an actor effect ($\beta = -.52$, $P < .001$) on father's self-esteem and a partner effect ($\beta = -.07$, $P = .021$) on the mother's self-esteem. Mother's parenting stress had an actor effect ($\beta = -.54$, $P < .001$) on mother's self-esteem. Both father's and mother's self-esteem had an actor effect ($\beta = .57$, $P < .001$; $\beta = .48$, $P < .001$, respectively) on the parent–child interaction level perceived by them. Further, father's ($\beta = .10$, $P = .007$) and mother's ($\beta = .09$, $P = .016$) parent–child interaction affected the child's self-esteem. Additionally, father's parenting stress had an indirect effect on the parent–child interaction perceived by the father ($\beta = -.34$, $P < .001$) and mother ($\beta = -.15$, $P = .046$). Mother's parenting stress ($\beta = -.33$, $P < .001$) had an indirect effect on the parent–child interaction perceived by the mother. Finally, parents' parenting stress (father: $\beta = -.15$, $P < .001$; mother: $\beta = -.14$, $P = .029$)

TABLE 3   The test of measurement equivalence

Model		χ^2	df	TLI	CFI	RMSEA
Parenting stress						
Model 1	Unconstrained model	663.57	216	0.84	0.86	0.06
Model 2	Measurement weights constrain	687.90	226	0.84	0.86	0.06
Model 3	Measurement residual constrain	625.16	206	0.85	0.85	0.07
Model 4	Measurement weights and residual constrain	671.74	217	0.83	0.85	0.07
Self-esteem						
Model 1	Unconstrained model	607.57	169	0.91	0.91	0.05
Model 2	Measurement weights constrain	614.28	178	0.89	0.90	0.05
Model 3	Measurement residual constrain	544.76	159	0.91	0.91	0.05
Model 4	Measurement weights and residual constrain	611.33	168	0.87	0.88	0.06
Parent–child interaction						
Model 1	Unconstrained model	602.66	169	0.92	0.92	0.01
Model 2	Measurement weights constrain	624.39	178	0.91	0.92	0.03
Model 3	Measurement residual constrain	566.98	159	0.92	0.93	0.01
Model 4	Measurement weights and residual constrain	618.81	168	0.92	0.93	0.03

Abbreviations: df, degrees of freedom; TLI, Tucker-Lewis Index; CFI, comparative-fit index; RMSEA, root mean square error of approximation
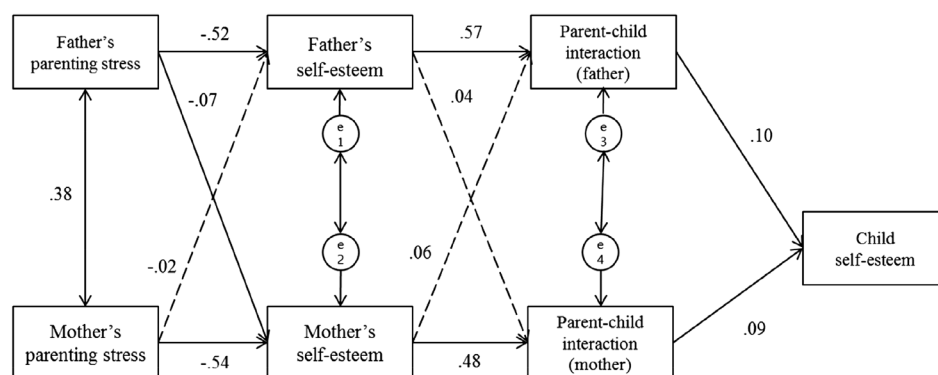
FIGURE 1   The result of the hypothetical model on the high self-esteem group

and self-esteem (father: β = .17, P = .012; mother: β = .18, P = .004) had an indirect effect on the child's self-esteem (Table 4).

For the low self-esteem of the child group, father's parenting stress had an actor effect (β = −.57, P < .001)

on father's self-esteem and a partner effect (β = −.13, P < .001) on the mother's self-esteem. Mother's parenting stress had an actor effect (β = −.52, P < .001) on mother's self-esteem. Father's self-esteem had an actor effect (β = .47, P < .001) on the parent–child interaction
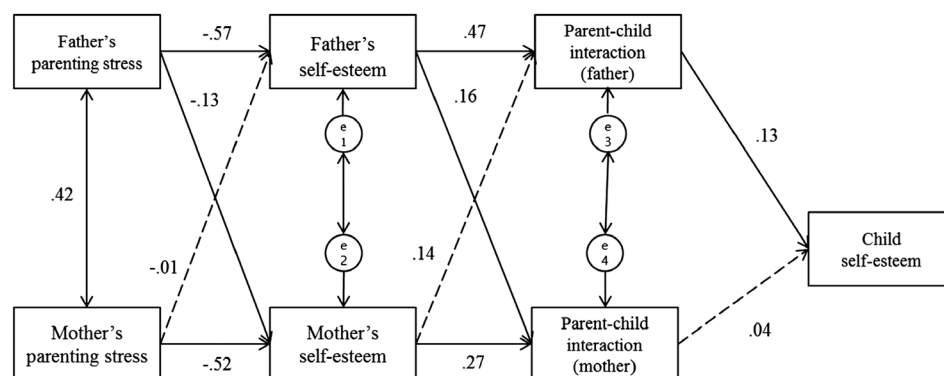

FIGURE 2   The result of the hypothetical model on the low self-esteem group

TABLE 4 The results of the hypothetical model

Independent variables		Dependent variables	β	B	SE	CR	P	Direct effect β	Direct effect P	Indirect effect β	Indirect effect P	Total effect β	Total effect P
High self-esteem group													
FPS	→	FSE	−.52	−.45	0.03	−15.13	(<.001)	−.52	(<.001)	−	−	−.52	(<.001)
MPS	→	FSE	−.02	−.02	0.02	−0.62	(.533)	−.02	(.533)	−	−	−.02	(.533)
FPS	→	MSE	−.07	−.07	0.03	−2.31	(.021)	−.07	(.021)	−	−	−.07	(.021)
MPS	→	MSE	−.54	−.47	0.02	−16.38	(<.001)	−.54	(<.001)	−	−	−.54	(<.001)
FSE	→	PCIF	.57	.52	0.07	7.34	(<.001)	.57	(<.001)	−	−	.57	(<.001)
MSE	→	PCIF	.06	.05	0.03	1.33	(.183)	.06	(.183)	−	−	.06	(.183)
FPS	→	PCIF	−	−	−	−	−	−	−	−.34	(<.001)	−.34	(<.001)
MPS	→	PCIF	−	−	−	−	−	−	−	−.03	(.468)	−.03	(.509)
FSE	→	PCIM	.04	.03	0.03	0.87	(.383)	.04	(.383)	−	−	.04	(.383)
MSE	→	PCIM	.48	.41	0.06	6.82	(<.001)	.48	(<.001)	−	−	.48	(<.001)
FPS	→	PCIM	−	−	−	−	−	−	−	−.15	(.046)	−.15	(.046)
MPS	→	PCIM	−	−	−	−	−	−	−	−.33	(<.001)	−.33	(<.001)
PCIF	→	CSE	.10	.11	0.03	2.68	(.007)	.10	(.007)	−	−	.10	(.007)
PCIM	→	CSE	.09	.09	0.03	2.14	(.016)	.09	(.016)	−	−	.09	(.016)
FPS	→	CSE	−	−	−	−	−	−	−	−.15	(<.001)	−.15	(<.001)
MPS	→	CSE	−	−	−	−	−	−	−	−.14	(.029)	−.14	(.029)
FSE	→	CSE	−	−	−	−	−	−	−	.17	(.012)	.17	(.012)
MSE	→	CSE	−	−	−	−	−	−	−	.18	(.004)	.18	(.004)
Low self-esteem group													
FPS	→	FSE	−.57	−.52	0.03	−16.71	(<.001)	−.57	(<.001)	−	−	−.57	(<.001)
MPS	→	FSE	−.01	−.01	0.03	−0.28	(.781)	−.01	(.781)	−	−	−.01	(.781)
FPS	→	MSE	−.13	−.12	0.03	−3.72	(<.001)	−.13	(<.001)	−	−	−.13	(<.001)
MPS	→	MSE	−.52	−.46	0.03	−15.63	(<.001)	−.52	(<.001)	−	−	−.52	(<.001)
FSE	→	PCIF	.47	.40	0.06	6.0521	(<.001)	.47	(<.001)	−	−	.47	(<.001)
MSE	→	PCIF	.14	.10	0.03	−1.09	(.429)	.14	(.429)	−	−	.14	(.429)
FPS	→	PCIF	−	−	−	−	−	−	−	−.33	(.001)	−.33	(.001)
MPS	→	PCIF	−	−	−	−	−	−	−	−.14—	(.856)	−.14—	(.856)
FSE	→	PCIM	.16	.15	0.03	2.07	(.047)	.16	(.047)	−	−	.16	(.047)
MSE	→	PCIM	.27	.22	0.03	7.10	(<.001)	.27	(<.001)	−	−	.27	(<.001)
FPS	→	PCIM	−	−	−	−	−	−	−	−.10	(.001)	−.10	(.001)

(Continues)

TABLE 4 (Continued)

Independent variables		Dependent variables	β	B	SE	CR	P	Direct effect β	Direct effect P	Indirect effect β	Indirect effect P	Total effect β	Total effect P
MPS	→	PCIM	—	—	—	—	—	—	—	-.19	(.001)	-.19	(.001)
PCIF	→	CSE	.13	.12	0.03	3.26	(<.001)	.13	(<.001)	—	—	.13	(<.001)
PCIM	→	CSE	.04	.04	0.03	1.06	(.289)	.04	(.289)	—	—	.04	(.289)
FPS	→	CSE	—	—	—	—	—	—	—	-.15	(.001)	-.15	(.001)
MPS	→	CSE	—	—	—	—	—	—	—	-.18	(.375)	-.18	(.375)
FSE	→	CSE	—	—	—	—	—	—	—	.13	(.001)	.13	(.001)
MSE	→	CSE	—	—	—	—	—	—	—	.11	(.104)	.11	(.004)

Abbreviations: CR, critical ratio; CSE, child self-esteem; FPS, father's parenting stress; FSE, father's self-esteem; MPS, mother's parenting stress; MSE, mother's self-esteem; PCIF, parent–child interaction (father); PCIM, parent–child interaction (mother); SE, standard error.

perceived by the father, and partner effect ($\beta = .16$, $P = .047$) on the parent–child interaction perceived by the mother. Mother's self-esteem also had an actor effect ($\beta = .27$, $P < .001$) on the parent–child interaction perceived by the mother. Father's ($\beta = .13$, $P < .001$) parent–child interaction had an effect on the child's self-esteem. Further, father's parenting stress had an indirect effect on the parent–child interaction perceived by the father ($\beta = -.33$, $P < .001$) and mother ($\beta = -.10$, $P = .001$). Mother's parenting stress ($\beta = -.19$, $P = .001$) had an indirect effect on the parent–child interaction perceived by the mother. Finally, father's parenting stress ($\beta = -.15$, $P = .001$) and self-esteem ($\beta = .13$, $P = .001$) had an indirect effect on the child's self-esteem (Table 4).

To identify significant changes in the path coefficient between groups, the differences between the χ^2 values of the unconstrained and constrained models of the 10 paths in the research model were assessed. The results showed that a change in the χ^2 had a statistically significant difference in the path from father's self-esteem to mother's parent–child interaction ($\triangle\chi^2 = 4.08$, df $= 1$) and the path from mother's parent–child interaction to the child's self-esteem ($\triangle\chi^2 = 5.62$, df $= 1$) in the two groups.

4 | DISCUSSION

This study used PSKC data to assess the effect of parenting stress, self-esteem, and parent–child interaction of parents of children with allergic rhinitis on the self-esteem of the child, and the actor effect and partner effect of the parental variables.

In the high self-esteem group, father's parenting stress had an actor effect on father's self-esteem and partner effect on mother's self-esteem. Mother's parenting stress had an actor effect on mother's self-esteem. This is in line with the results reported by Jung (2013), which showed that father's parenting stress lowers mother's self-esteem. This may occur because the father's attitudes toward childcare is a factor that directly affects the psychological stability of the mother and child (Biller, 1993). This study is significant in that we investigated the effect of parenting stress on self-esteem, while most previous studies investigated the effect of parents' self-esteem on parenting stress. Considering the present finding that mothers' self-esteem has a positive influence on parent–child interactions, improving mothers' self-esteem in the Korean culture, in which mothers usually raise the child, is thought to be an important factor in childcare.

Moreover, in the high self-esteem group, father's and mother's self-esteem each had actor effects on the parent–child interaction perceived by the father and mother. This is in line with the results reported by Small (1988), which

confirmed that parents with higher self-esteem interacted more often with their children. This may occur because mothers with high self-esteem give children freedom to make decisions, are comparatively better communicators, and have fewer interferences for child's behaviors, while fathers with high self-esteem are comparatively better in communicating with the child and use physical punishments less often (Small, 1988). Therefore, to improve interactions with children with allergic rhinitis, parents' self-esteem needs to be improved. Additionally, father's parenting stress had an indirect effect on the parent–child interaction perceived by the father and mother, while mother's parenting stress had an indirect effect on the parent–child interaction perceived by the mother. Particularly, with most other studies focusing on the parenting stress of the mothers of children with chronic illnesses, our result that father's parenting stress influences the parent–child interaction perceived by the mother is significant. Among several chronic medical diseases, allergic diseases have been considered to be closely associated with parenting stress and the relationships between mothers and their children (Rabung et al., 2004; Walker & Cheng, 2007; Warschburger et al., 2004). Murdock et al. (2012) found that pediatric asthma induced conflicts between parents and children. Moreover, parenting stress has been thought to be related to morbidity in children with chronic illness. Parenting stress and parents' attitudes toward their children have the potential to affect comorbidities or the severity of children's illnesses (Nagano et al., 2010). Therefore, for the healthy development of children with allergic rhinitis, it is necessary to manage the parenting stress of the parents, especially the father, of children with allergic rhinitis to improve the interactions between the child and the mother, who performs most of the actual childcare.

In this study, mother's and father's parent–child interaction influenced the child's self-esteem in the high self-esteem group. Furthermore, father's and mother's self-esteem had an indirect effect on the child's self-esteem. This is because a mother with high self-esteem has the tendency to respect the child as a human being and provide consistent encouragement and support, thereby causing the child to have a positive, realistic, and balanced opinion of him/herself (Cassidy, 1988). Therefore, it is necessary to assess various methods between parents' self-esteem and child's self-esteem in order to improve the self-esteem of children with allergic rhinitis. Additionally, when developing programs to improve children's self-esteem, it is necessary to include strategies to improve the parent–child interaction of fathers and mothers.

Further, this study found that parents' parenting stress and self-esteem had an indirect effect on the child's self-esteem. This finding is similar to that reported by Putnick et al. (2008), who reported that parents' parenting stress indirectly influences the child's self-concept (including self-esteem and self-perception) via the childcare behavior perceived by the child. Therefore, in order to improve the self-esteem of children with allergic rhinitis, we recommend assessing the specific variables and paths that induce the indirect effect of the parents' parenting stress on the child's self-esteem.

The paths between parents' variables in the low self-esteem group in this study differed with reference to two paths as compared to the high self-esteem group. This study aimed to discuss the differences between these two groups.

First, in the low self-esteem group in this study, fathers' self-esteem had a partner effect on the parent–child interaction perceived by mothers. This is in line with the finding that parent's low self-esteem leads to dysfunctional relationships with the child, whereas their positive self-esteem can serve as a buffer from negative emotions, thereby promoting parent–child interaction (Porter et al., 2015). Therefore, it is important to improve fathers' self-esteem to improve the interaction between children with allergic rhinitis and low self-esteem and their mothers. Because most variables related to childcare assess the actor affect among variables of mothers or of both mothers and fathers, we recommend assessing the partner effect of mother-related variables on father-related variables. Second, this study found that only the parent–child interaction perceived by the father affects the child's self-esteem in the low self-esteem group. This is in contrast to our other finding that the parent–child interaction perceived by the mother and father influences the child's self-esteem in children with high self-esteem and allergic rhinitis. This difference is also evident in the results that the interaction perceived by the mother was lower and that perceived by the father was higher in the group of children with low self-esteem and allergic rhinitis. Therefore, it is thought that the interaction with the father rather than the mother has a significant effect on the formation of positive self-esteem in children with low self-esteem. Thus, it is necessary to select children with low self-esteem at the time of diagnosis, reduce parents' parenting stress, improve parents' self-esteem, and increase the interaction with the father in order to increase the self-esteem of a child with allergic rhinitis. In particular, it is predicted that a child's self-esteem is negatively affected and a negative emotional state is caused when interactions with parents are not harmonious. Although there has been research on the relationship between the child's self-esteem and the parent–child interaction targeting mothers or both mothers and fathers, there is insufficient research on the relationship between low self-esteem of a child and the father–child interaction. Thus, more research is needed in the future.

5 | CONCLUSION

This study utilized the APIM to assess the effect of parenting stress, self-esteem, and parent–child interaction of the

parents of children with allergic rhinitis on the child's self-esteem. This study confirmed that parenting stress, self-esteem, and parent–child interaction of the parents influence the self-esteem of children with allergic rhinitis. Based on these results, we recommend conducting research to assess various parent-related influential factors depending on the level of self-esteem of the child.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

H. C. and JW. H. contributed to the conception and design of this study and JW. H. carried out the data collection; JW. H. conducted the statistical analysis and H. C. and JW. H. drafted the manuscript; and H. C. and JW. H. critically reviewed and made revisions to the paper regarding important intellectual content.

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