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# Effect of Maternal Anxiety on Parenting Stress of Fathers of Children With ADHD

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## ABSTRACT

**Background:** Hyperactivity, inattention, and impulsivity of children with attention deficit hyperactivity disorder (ADHD) increase parenting stress and familial conflict. Among parent-related factors, maternal mental health has been studied in-depth, but studies on paternal factors in this context are scarce. This cross-sectional study was conducted of children with ADHD and their parents in South Korea. We investigated the relationships between ADHD symptom severity of children and the mental health of their mothers and fathers.

**Methods:** The study included 70 children with ADHD and their 140 married heterosexual parents (70 fathers and 70 mothers). Children completed the Child Depression Inventory and State-Anxiety Inventory for children, and their parents completed the Korean ADHD rating scale-IV, Adult ADHD self-report scale, State-Anxiety Inventory, Patient Health Questionnaire-9, and Parental Stress Scale.

**Results:** There was a significant positive correlation between children's ADHD symptoms and maternal anxiety symptom severity, whereby more severe ADHD symptoms were associated with more severe maternal anxiety symptoms. There was also a significant positive correlation between maternal anxiety symptom severity and paternal parenting stress severity, whereby more severe maternal anxiety was associated with more severe paternal parenting stress. A mediation model showed that paternal parenting stress severity was not directly related to children's ADHD symptoms, but the severity of maternal anxiety mediated this relationship.

**Conclusion:** The present study found the importance of mental health in mothers of children with ADHD and the interrelatedness of mental health within families. Future assessments and treatment of children with ADHD should include both the children and their parents.

**Keywords:** Attention-Deficit/Hyperactivity Disorder; Parenting, Maternal Anxiety; Paternal Stress; Parent-Child Relations

## INTRODUCTION

A healthy parent-child relationship is especially important in families of children with attention deficit hyperactivity disorder (ADHD), because it affects ADHD prognosis with respect to symptom severity, treatment compliance, and impact on comorbidities.<sup>1,2</sup> Parents

**Author Contributions**

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of children with ADHD must play an active role as auxiliary therapists in pharmacological and behavioral treatments to improve the prognosis of children with ADHD.<sup>1</sup> Therefore, good parent-child relationships are essential in families with a child with ADHD and should be investigated further.

Parents with children with ADHD experience higher levels of parenting stress and parent-child conflict than those with typically developing children.<sup>3-7</sup> This could be because parents of children with ADHD experience a high level of frustration in managing their children's problematic behaviors, such as less compliance with parents' requests and demands, increased distraction, demands for attention, and requiring more assistance than typically developing children.<sup>8-10</sup> Parenting stress negatively influences children through several pathways, including poor monitoring of children's behaviors and emotions, increased punishment, a less supportive attitude, and increased conflict in parent-child relationships.<sup>11,12</sup>

Parenting stress is also associated with parents' mental health.<sup>6,13</sup> Parental depression is associated with distorted perceptions and negative cognitions, which makes it difficult for such parents to objectively evaluate their children's behavior and communicate effectively.<sup>14</sup> When parents have anxiety or mood problems, children with ADHD display more impulsivity and hyperactivity than their counterparts with healthy parents.<sup>15,16</sup> Considering that ADHD is inherited, it is possible that parental ADHD symptoms are contributing factors to parenting stress and negatively affect family functioning.<sup>6,17</sup> Parental ADHD symptoms have been associated with both harsh and lax parenting.<sup>18</sup> The negative cycle is apparent in these family relationships, whereby children with ADHD negatively affect their parents' mental health, and parents' mental pathology leads to increased conflict with children, the development of negative parent-child interactions, and children's behavioral problems.<sup>3,13</sup> Therefore, clinicians should aim to accurately assess the mental health of parents of children with ADHD while simultaneously assessing and providing therapy to the children.

Parenting stress and its impacts on mental health in fathers of children with ADHD has been studied, albeit less so than the mental health of mothers of children with ADHD.<sup>19-25</sup> Compared with the fathers with typically developing children, fathers of children with ADHD have been reported to feel more deficient and have greater dissatisfaction in their role as a parent.<sup>6,10,22,25</sup> Families of children with ADHD experience a lot of marital conflict, and this in turn can have adverse effects on parental mental health and parenting stress.<sup>26,27</sup> In turn, parental depression increases marital conflict and negatively affects children's mental health, either directly or indirectly.<sup>27,28</sup> Much like the reciprocal relationship between children with ADHD and parental mental health, mothers' mental health affects fathers' mental health negatively or positively, and fathers' mental health also affects mothers' mental health. In the context of fathers' increasing participation in parenting, some studies have highlighted the importance of fathers' mental health in parenting.<sup>22</sup> It is thus necessary to examine the relationship between mothers' and fathers' mental health, such as depression and anxiety, and their parenting stress.

Parenting stress differs between cultures.<sup>29,30</sup> For example, one study revealed that Korean mothers reported significantly higher parenting stress but fewer behavioral problems among their children than American mothers.<sup>29</sup> Additionally, a cross-cultural study that examined 31 cultures using a child behavior checklist revealed differences in the mean scale scores across cultures.<sup>30</sup> However, research is still lacking with regard to the cross-cultural differences that could affect parenting stress. Specifically, few studies have examined fathers' parenting in East Asian countries; this gap is particularly important to address given the

cultural differences in paternal roles in Eastern and Western cultures.<sup>29,31,32</sup> The paternal parenting role in South Korea has changed dramatically with modernization and the increasing participation of women in the workforce. The employment rate of married women has increased from 9.3% in the 1960s to 47.7% in 2019.<sup>32</sup> However, Confucianism has had significant philosophical and ethical influences on Korean society since the 14th century, including different gender roles for fathers and mothers in parenting.<sup>31,32</sup> Namely mothers take on most of the parenting responsibilities, and fathers are often emotionally distant from their children and maintain a position of authority and respect. Therefore, maternal and paternal parenting stress associated with raising children with ADHD in South Korea may differ from those observed in Western societies.

Parents of children with ADHD experience more parenting stress than parents with typically developing children, and more parenting stress if the parent has depressive symptoms and/or anxiety. In South Korea, the mother is primarily responsible for child-rearing, so it is expected that mothers of children with ADHD experience more parenting stress than fathers; furthermore, mothers' mental health may in turn harms fathers' mental health. Thus, we examined parenting stress and parents' mental health in mothers and fathers of children with ADHD in South Korea. We hypothesized that 1) children's ADHD symptoms would be negatively related to maternal and paternal mental health, and 2) parents' mental health and parenting stress would be reciprocally related.

## METHODS

### Participants

This cross-sectional study was conducted with children and their parents who visited our outpatient service from January 1, 2018 to December 31, 2019. Children diagnosed with ADHD according to the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) and their parents participated in this study.<sup>33</sup> Their parents were heterosexual and had been living together after marriage. Children who had a history of head injury, neurological disorder, severe medical disease, or whose primary diagnosis did not have ADHD according to DSM-5 were excluded from this study. Finally, 70 children with ADHD and their parents (70 mothers and 70 fathers) participated in this study. The demographic information of participants is described in the Results section.

### Instruments

#### *Korean ADHD Rating Scale-IV (K-ARS-IV)*

The K-ARS-IV is an 18-item measure that assesses the ADHD diagnostic criteria of the DSM-IV and was completed by the child's mother and father to evaluate symptom severity of children with ADHD.<sup>34</sup> Each item is rated on a 4-point Likert scale (0–3) according to the frequency of the child's problematic behavior. It is designed such that the total score of odd-numbered items measures inattention, and the total score of even-numbered items measures hyperactivity-impulsivity. A total score  $\geq 19$  indicates clinically significant ADHD symptoms.<sup>35</sup> In the K-ARS-IV standardized by Jang et al.<sup>35</sup> the Cronbach's alpha was 0.74–1, and the validity was 0.06–0.59. In this study, the Cronbach's alpha was 0.93.

#### *Child Depression Inventory (CDI)*

The CDI was developed by Kovacs.<sup>36</sup> It assesses the cognitive, emotional, and behavioral symptoms of childhood and adolescent depression. In the present study, mother and father

completed this for children aged 6–10 years, and adolescents aged 11–18 years completed it by themselves. The CDI was used to evaluate depression among children with ADHD. Depression is a common comorbidity of ADHD and can affect the level of parenting stress.<sup>37,38</sup> The CDI consists of 27 items; each item is rated on a 3-point Likert scale (0–2) based on respondents' mood state. A total score  $\geq 22$  indicates a clinically significant depressive symptom.<sup>39</sup> In the Korean version of the CDI, standardized by Cho and Lee,<sup>39</sup> the Cronbach's alpha was 0.88, and the correlation was strong, with a test-retest reliability of 0.82. In this study, the Cronbach's alpha was 0.92.

#### *Adult ADHD Self-Report Scale (ASRS)*

The ASRS is a self-report measure that assesses adults' ADHD symptoms, and was completed by the mother and father of children with ADHD. The ASRS consists of two parts (Parts A and B). Part A is composed of six questions; checking four or more darkly shaded boxes is likely to be the most sensitive predictor of adult ADHD symptoms.<sup>40</sup> We assessed ADHD symptoms of parents using Part A. However, all parents checked fewer than four darkly shaded boxes in Part A, which indicated that they were unlikely to have ADHD symptoms. Part B is composed of 12 items; each item is evaluated on a 5-point Likert scale (0–4).<sup>41</sup> A combined ASRS score (after adding the scores of parts A and B) higher than 31 is defined as the 50th percentile.<sup>42</sup> The Korean version of the ASRS has a good sensitivity and specificity.<sup>43</sup> In this study, the Cronbach's alpha of the ASRS was 0.89 and 0.90 among fathers and mothers respectively.

#### *State-Anxiety Inventory (SAI)/State-Anxiety Inventory for Children (SAI-C)*

The SAI, which was developed by Spielberger et al.<sup>44</sup> is a self-report test that assesses state anxiety in adults. The SAI is sensitive to transient anxiety in adults. The SAI-C was adapted from the SAI for adults to ensure that the instrument is easily understood by children and adolescents.<sup>45</sup> In the present study, mother and father completed the SAI-C on behalf of children aged 6–11 years, and adolescents aged 12–18 years old completed it by themselves. Both the SAI and SAI-C comprise 20 items that are rated on a 4-point Likert scale (1–4) or a 3-point Likert scale (1–3), respectively. Higher total scores indicate higher anxiety levels.<sup>46,47</sup> The Korean version of the SAI-C was standardized by Cho and Lee<sup>40</sup> and its Cronbach's alpha was 0.88. The Korean version of the SAI was standardized by Han et al.<sup>47</sup> and its Cronbach's alpha was 0.93. In this study, the Cronbach's alphas of the SAI-C were 0.95. The Cronbach's alpha of the SAI among fathers and mothers was 0.94 and 0.95 respectively.

#### *Patient Health Questionnaire-9 (PHQ-9)*

The PHQ-9 is a self-report assessment to evaluate and determine the severity of depression in primary mental health clinics.<sup>48</sup> The PHQ-9 was used to assess depressive symptom of mothers and fathers, who completed the measure themselves. The PHQ-9 consists of 9 items, which are each rated on a 4-point Likert scale (0–3). A total score  $\geq 5$  indicates depression.<sup>49</sup> In the Korean version of the PHQ-9, the Cronbach's alpha was 0.85, and the sensitivity and specificity were 0.82 and 0.90, respectively.<sup>49</sup> In this study, the Cronbach's alpha among fathers and mothers was 0.78 and 0.84 respectively.

#### *Parental Stress Scale (PSS)*

The PSS is a self-report assessment that evaluates parenting-relevant emotions and perceived role satisfaction, regardless of the sex of the parents or the presence or absence of emotional/behavioral problems in their children.<sup>50</sup> In the present study, both mothers and fathers completed the PSS. The PSS consists of 18 items that are rated on a 5-point Likert scale (1–5). Parental role satisfaction (items 1, 2, 5, 6, 7, 8, 17, and 18) are reverse scored. Higher total

scores indicate higher levels of parental stress. In this study, the Cronbach's alpha among fathers and mothers was 0.89 and 0.88 respectively.

### Statistical analysis

We used IBM SPSS Statistics Version 26.0 (IBM Corp., Armonk, NY, USA). First, we conducted descriptive statistics to confirm participants' demographic data, such as children's sex, age, and mental health; and parents' age, education, job, marital status, and mental health. Job and education differences between mothers and fathers were confirmed using  $\chi^2$  tests, and differences in the ASRS, SAI, PHQ-9, and PSS scores between mother and fathers were confirmed using two-sample *t*-tests. Second, we used Pearson's product-moment correlation to examine the association between the K-ARS-IV scores of children and the SAI, PHQ-9, and PSS scores of their parents. Finally, we used the SPSS INDIRECT MACRO version 3.4 a multiple regression procedure—to test for the mediation effects of maternal state anxiety (mediation assessment by model 4 in process) and depressive symptoms (moderated mediation assessment by model 14 in process) in the relationship between children's ADHD symptoms and fathers' parenting stress.<sup>51</sup> We then used the bootstrapping method to test the significance of the indirect effect using 5,000 bootstrap samples and 95% confidence intervals.<sup>52</sup> Confidence intervals that did not include zero were considered significant.

### Ethics statement

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of the Soonchunhyang University Seoul Hospital (No. 2017-08-003). All participants voluntarily participated and provided written informed consent.

## RESULTS

### Demographic data of children with ADHD and their parents

Children's demographic characteristics are shown in **Table 1**. The mean age of children with ADHD was 10.84 years (standard deviation = 3.59 years), and there were 51 boys (72.9%) and 19 girls (27.1%). The children showed no evidence of clinically significant depressive symptoms and anxiety. Fathers were significantly older and more likely to be employed than mothers. The ADHD symptom severity of all parents fell below 31, indicating that none of the parents had clinically significant adult ADHD. However, mothers showed significantly higher parenting stress than fathers (**Table 2**).

**Table 1.** Children's demographic and psychological characteristics (N = 70)

Characteristics	Values
Age, yr	10.84 ± 3.59
Sex	
Male	51 (72.9)
Female	19 (27.1)
Parental marital status (married: yes)	70 (100)
First marriage	67 (95.7)
Remarried after divorce	3 (4.3)
Psychological assessment	
ADHD symptoms (K-ARS-IV score)	21.76 ± 11.68
Anxiety symptoms (SAI-C score)	33.74 ± 9.65
Depressive symptoms (CDI score)	16.20 ± 10.68

Values are expressed as mean ± standard deviation or number (%).

ADHD = attention deficit hyperactivity disorder, K-ARS-IV = Korean ADHD Rating Scale-IV, SAI-C = State-Anxiety Inventory for Children, CDI = Child Depression Inventory.

**Table 2.** Comparisons of characteristics between mothers and fathers of children with ADHD (N = 140)

Characteristics	Mothers (n = 70)	Fathers (n = 70)	t ( $\chi^2$ )	P
Age, yr	42.52 ± 4.79	44.66 ± 5.49	-0.67	0.016
Education level	70 (100)	68 (97.1)	2.04	> 0.99
Middle school (9 yr)	1 (1.4)	1 (1.4)		
High school (12 yr)	19 (27.1)	19 (27.1)		
University (≥ 16 yr)	50 (71.4)	48 (68.1)		
Job			29.87	< 0.001
Have a job	43 (61.4)	66 (94.3)		
Unemployed	27 (38.6)	4 (3.7)		
Psychological assessment				
ADHD symptoms (ASRS score)	12.36 ± 9.33	12.78 ± 9.03	-0.44	0.876
Anxiety (SAI score)	42.43 ± 12.84	39.54 ± 11.26	1.41	0.160
Depressive symptoms (PHQ-9 score)	5.14 ± 4.61	3.89 ± 4.12	1.70	0.089
Parenting stress (PSS score)	48.19 ± 11.38	42.53 ± 10.56	3.05	0.003

Values are expressed as mean ± standard deviation or number (%).

ADHD = attention deficit hyperactivity disorder, ASRS = Adult ADHD Self-Report Scale, SAI = State-Anxiety Inventory, PHQ-9 = Patient Health Questionnaire-9, PSS = Parental Stress Scale.

\*P < 0.05, \*\*P < 0.01.

### Correlation analyses of ADHD symptoms of children and parental mental health and parenting stress

We used Pearson’s product-moment correlation to examine the association between children’s ADHD symptoms (K-ARS-IV scores), and parents’ anxiety (SAI scores), depressive symptom (PHQ-9 scores), and parental stress (PSS scores).

**Table 3** displays the bivariate correlations of the variables included in the hypothetical model. First, children’s ADHD symptoms had a weak positive linear correlation with mothers’ anxiety. Children’s ADHD symptom scores were not correlated with mothers’ depressive symptoms or parenting stress or with fathers’ anxiety, depressive symptoms, or parenting stress. Second, mothers’ anxiety displayed a strong positive linear correlation with mothers’ parenting stress and depressive symptoms as well as a weak positive linear relationship with fathers’ parenting stress. However, mothers’ anxiety was not correlated with fathers’ anxiety and depressive symptoms. Fathers’ anxiety displayed a strong positive linear correlation with fathers’ depressive symptoms and a moderate positive linear correlation with fathers’ parenting stress.

### Moderated mediation models examining the relationship between ADHD symptoms of children, maternal anxiety, and paternal parenting stress

As shown in **Table 4**, the indirect effect analysis showed that maternal state anxiety fully mediated the effects of children’s ADHD symptoms on paternal parenting stress, whereby paths (a) and (c) were both significant; however, Path (b) was not significant. In the bootstrap analysis, the indirect effects were significant. In other words, although children’s ADHD symptoms had no direct effect on paternal parenting stress, they might increase mothers’ state anxiety, which contributes to fathers’ parenting stress (**Fig. 1**).

**Table 3.** Correlation coefficients between the study variables (N = 210)

Measure	1	2	3	4	5	6	7
1. Children’s ADHD symptom	-						
2. M_anxiety	0.304*	-					
3. M_depressive symptom	0.081	0.641**	-				
4. M_parenting stress	0.163	0.737**	0.445**	-			
5. F_anxiety	0.136	0.058	-0.038	-0.006	-		
6. F_Depressive symptom	0.160	-0.027	-0.019	-0.021	0.704**	-	
7. F_parenting stress	0.231	0.366**	0.128	0.352**	0.544**	0.402**	-

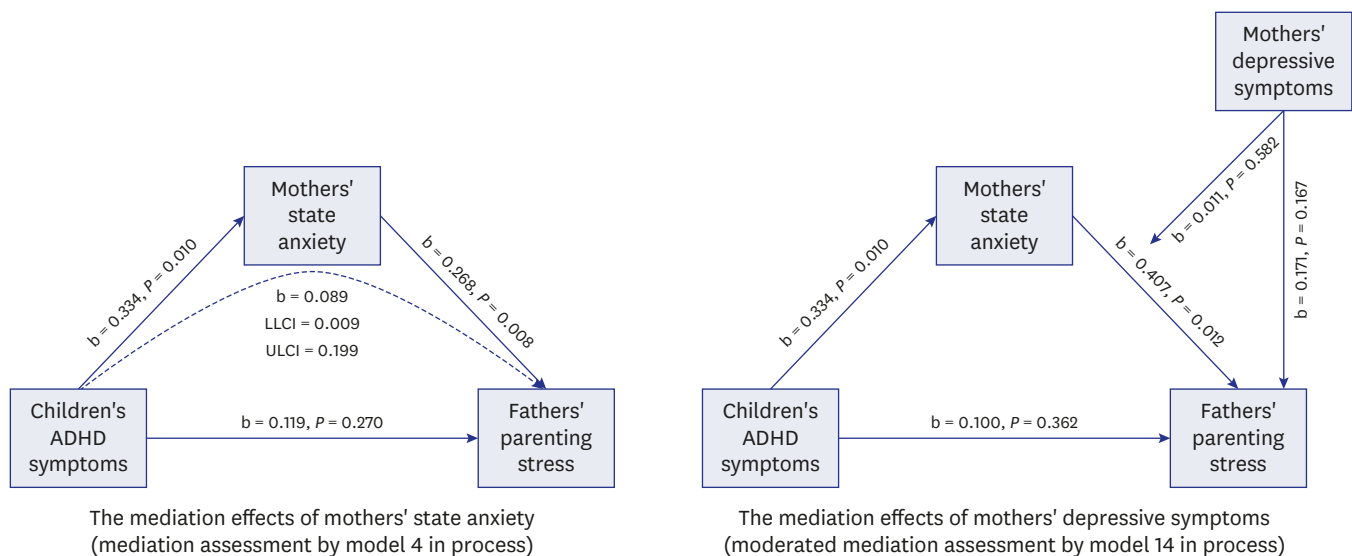
ADHD = attention deficit hyperactivity disorder, M = mothers, F = fathers.

\*P < 0.05, \*\*P < .01.

**Table 4.** Bootstrapping results of the mediation model examining the effects of maternal state anxiety on the relationship between adolescents' ADHD symptoms and fathers' parenting stress and the moderated mediation model of maternal depressive symptoms (N = 210)

Variable model	B	SE	t	LLCI	ULCI
Mediation variable model (dependent variable: maternal state anxiety)					
Constant	35.154	3.131	11.228**	28.906	41.402
(a) Children's ADHD symptoms (K-ARS-IV) → mothers' state anxiety (M_SAI)	0.334	0.127	2.633*	0.081	0.588
Dependent variable model (dependent variable: paternal parenting stress)					
Constant	25.059	5.792	4.326**	13.490	36.627
(b) ADHD symptoms severity (K-ARS-IV) → fathers' parenting stress (F_PSS)	0.100	0.109	0.918	-0.117	0.317
(c) Mothers' state anxiety (M_SAI) → fathers' parenting stress (F_PSS)	0.407	0.157	2.583*	0.092	0.721
(d) Mothers' depressive symptoms (M_PHQ-9) → fathers' parenting stress (F_PSS)	0.171	1.026	0.167	-1.877	2.220
(e) Mothers' state anxiety (M_SAI) × mothers' depressive symptoms (M_PHQ-9) → fathers' parenting stress (F_PSS)	-0.011	0.020	0.553	-0.051	0.029

SE = standard error, LLCI = lower limit within 95% confidence interval of boot indirect effect, ULCI = upper limit within 95% confidence interval of boot indirect effect, K-ARS-IV = Korean ADHD Rating Scale-IV, SAI = State-Anxiety Inventory, PHQ-9 = Patient Health Questionnaire-9, PSS = Parental Stress Scale, M = mothers, F = fathers. \*P < 0.05, \*\*P < 0.01.



**Fig. 1.** Model depicting the effects of ADHD symptoms and fathers' parenting stress. ADHD = attention deficit hyperactivity disorder. \*P < 0.05, \*\*P < 0.01.

The interaction effects of maternal state anxiety and maternal depressive symptoms were not significantly related to paternal parenting stress, and the moderating effect of maternal depressive symptoms on the relationship between maternal state anxiety and paternal parenting stress was not significant (Table 4). However, as shown in Table 5, when examining the conditional indirect effects (children's ADHD symptoms → maternal state anxiety → paternal parenting stress) of maternal depressive symptoms on maternal state anxiety, the maternal depression score was significant, at 4 and 10 points. Therefore, the conditional indirect effects of mothers' depression were significant when the maternal depression score was > 4.

**Table 5.** Mothers' depressive symptoms for conditional indirect effects of children's ADHD symptoms on fathers' parenting stress

Mothers' depressive symptoms (M_PHQ9)	Effect	Boot SE	LLCI	ULCI
0	0.136	0.085	-0.007	0.324
4	0.121	0.064	0.010	0.260
10	0.099	0.055	0.002	0.216

SE = standard error, LLCI = lower limit within 95% confidence interval of boot indirect effect, ULCI = upper limit within 95% confidence interval of boot indirect effect, PHQ-9 = Patient Health Questionnaire-9, M = mothers.

## DISCUSSION

In this study, we examined the relationship between ADHD symptoms of children and the mental health of their parents in South Korea. ADHD symptoms of children were significantly related to maternal anxiety, but not with paternal mental health. Maternal anxiety was significantly related to paternal parenting stress. The key results of this study are as follows: 1) mothers of children with ADHD experienced more parenting stress than fathers, 2) children's ADHD symptoms were significantly positively correlated with their mothers' state anxiety, and 3) the mediation model showed that maternal state anxiety fully mediated the path from children's ADHD symptoms to paternal parenting stress.

One noteworthy finding of the present study is that mothers of children with ADHD experienced more parenting stress than fathers. While most previous parenting stress studies have only evaluated mothers of children with ADHD,<sup>6</sup> our results support those of previous studies that have compared parenting stress between mothers and fathers.<sup>8,53-55</sup> Mothers might experience more parenting stress than fathers because they have a greater responsibility for raising children,<sup>54,55</sup> which is also reportedly the case for dual-income couples.<sup>53</sup> However, fathers of children with ADHD have been reported to experience greater role dissatisfaction than fathers with typically developing children.<sup>56</sup> Parenting is generally affected by marital relationships; however, the quality of paternal parenting is more affected by marital relationships than is the quality of maternal parenting.<sup>11,56,57</sup> In addition, mothers' state anxiety is related to maternal depression, and maternal depression is known to increase marital conflict.<sup>58</sup> Future research should examine the relationship between these factors by examining whether marital conflict and marital life satisfaction can affect parenting stress of fathers and mothers.

Children's ADHD symptoms were significantly positively correlated with mothers' state anxiety. Previous studies have consistently reported similar results—that having children with ADHD is associated with an increased incidence of maternal anxiety.<sup>24,59,60</sup> Children with ADHD display more noncompliance and inappropriate behaviors than typically developing children.<sup>61</sup> Mothers of children with ADHD must exert a great deal of effort to correct their children's problem behaviors and compensate for their lack of emotion self-regulation.<sup>19,61</sup> Eventually, these mothers may experience a decrease in parental efficacy, an increase in psychological burden, and heightened levels of anxiety and stress. Previous studies have reported raising children with ADHD is related to depression in mothers;<sup>6,13,21</sup> however, we did not find this result. In this study, the mean K-ARS-IV score, a measure of severity of ADHD in children, was slightly higher than the clinically significant cut-off score. Thus, the milder severity of children's symptoms may explain our contrasting results. To accurately identify the factors, a systematic study with a larger sample size is required.

The mediation model showed that mothers' state anxiety fully mediated the path from children's ADHD symptoms to fathers' parenting stress. The moderated mediation effect of maternal depressive symptoms on the relationship between maternal state anxiety and paternal parenting stress was non-significant; however, the conditional indirect effect of depressive symptoms was significant, at PHQ-9 score more than 4. This bidirectionality indicates that paternal parenting stress is affected by mothers' mental health. It is possible that maternal anxiety increases paternal parenting stress through various pathways. First, it could be related to social support. Social support is a protective factor for the mental health of parents of children with ADHD, as it leads to greater maternal satisfaction, lower maternal stress, and reduced marital conflict.<sup>10,25</sup> However, parents of children with ADHD participate less in



social activities, and have fewer interactions with extended family members, than do other parents.<sup>62</sup> Mothers of children with ADHD might look to their spouses for social support, which could explain why fathers' parenting stress was affected through maternal anxiety and depressive symptoms. Second, it is possible that maternal anxiety caused marital conflict to increase, which increased fathers' parenting stress.<sup>11,56,57</sup> Third, cross-cultural differences may exist. As noted, Korean mothers may face increased psychological burden owing to the social stigma related to rearing children with a disability, as well as their increased responsibility of care under the Confucian tradition.<sup>29,63</sup> Additionally, it is possible that Korean fathers feel less responsible for parenting than their Western counterparts; thus, they may have been more affected by the mothers' anxiety than the symptoms of their children with ADHD.

The present study has some limitations. First, this was a cross-sectional study; therefore, we cannot confirm causal relationships. Second, tool objectivity is lacking since all mental health evaluations were self-reported. In particular, the total score of the K-ARS-IV may vary depending on who among the parents evaluated it. Therefore, caution is required in interpreting the results. Third, ADHD symptoms, anxiety, and depressive symptoms among the participants were typically mild; therefore, the results cannot be generalized to those with more severe symptoms. Fourth, sample representativeness is lacking because of selection bias. Participants were limited to those recruited at one hospital in South Korea. Fifth, there is a lack of consideration for other intrafamilial factors that can affect parenting stress, such as the number of children raised, other comorbidities of children, and social economic status. In future studies, these factors should be supplemented. Additionally, to clearly understand the characteristics of parenting stress for parents of children with ADHD in South Korea, future work should directly compare parenting stress of parents of children with ADHD in other countries.

Despite these limitations, our results offer important insights on the mediation effect of maternal state anxiety on the relationship between the symptoms of children with ADHD and paternal parenting stress. This study confirmed the importance of the mental health of mothers of children with ADHD and the interaction with familial health. Assessment and treatment of children with ADHD should include not only the children, but also their parents. These family-based interventions could be an effective strategy for ADHD treatment. Prospective follow-up studies are necessary to confirm the causal relationships and additional related factors concerning the mental health of mothers and fathers of children with ADHD.

## REFERENCES

1. Patterson GR. Coercion as a basis for early age of onset for arrest. In: McCord J, editor. *Coercion and Punishment in Long-term Perspectives*. Cambridge, UK: Cambridge University Press; 1995, 81-105.
2. Storebø OJ, Ramstad E, Krogh HB, Nilausen TD, Skoog M, Holmskov M, et al. Methylphenidate for children and adolescents with attention deficit hyperactivity disorder (ADHD). *Cochrane Database Syst Rev* 2015;2015(11):CD009885.  
[PUBMED](#) | [CROSSREF](#)
3. Edwards G, Barkley RA, Laneri M, Fletcher K, Metevia L. Parent-adolescent conflict in teenagers with ADHD and ODD. *J Abnorm Child Psychol* 2001;29(6):557-72.  
[PUBMED](#) | [CROSSREF](#)
4. Fletcher KE, Fischer M, Barkley RA, Smallish L. A sequential analysis of the mother-adolescent interactions of ADHD, ADHD/ODD, and normal teenagers during neutral and conflict discussions. *J Abnorm Child Psychol* 1996;24(3):271-97.  
[PUBMED](#) | [CROSSREF](#)

5. Graziano PA, McNamara JP, Geffken GR, Reid A. Severity of children's ADHD symptoms and parenting stress: a multiple mediation model of self-regulation. *J Abnorm Child Psychol* 2011;39(7):1073-83.  
[PUBMED](#) | [CROSSREF](#)
6. Theule J, Wiener J, Tannock R, Jenkins JM. Parenting stress in families of children with ADHD: a meta-analysis. *J Emot Behav Disord* 2013;21(1):3-17.  
[CROSSREF](#)
7. Wiener J, Biondic D, Grimbos T, Herbert M. Parenting stress of parents of adolescents with attention-deficit hyperactivity disorder. *J Abnorm Child Psychol* 2016;44(3):561-74.  
[PUBMED](#) | [CROSSREF](#)
8. Baker DB. Parenting stress and ADHD: a comparison of mothers and fathers. *J Emot Behav Disord* 1994;2(1):46-50.  
[CROSSREF](#)
9. Mash EJ, Johnston C. A comparison of the mother-child interactions of younger and older hyperactive and normal children. *Child Dev* 1982;53(5):1371-81.  
[PUBMED](#) | [CROSSREF](#)
10. Neff PE. Fathering an ADHD child: an examination of paternal well-being and social support. *Sociol Inq* 2010;80(4):531-53.  
[PUBMED](#) | [CROSSREF](#)
11. Liu L, Wang M. Parenting stress and harsh discipline in China: the moderating roles of marital satisfaction and parent gender. *Child Abuse Negl* 2015;43:73-82.  
[PUBMED](#) | [CROSSREF](#)
12. Wirth A, Reinelt T, Gawrilow C, Schwenck C, Freitag CM, Rauch WA. Examining the relationship between children's ADHD symptomatology and inadequate parenting: the role of household chaos. *J Atten Disord* 2019;23(5):451-62.  
[PUBMED](#) | [CROSSREF](#)
13. Leitch S, Sciberras E, Post B, Gerner B, Rinehart N, Nicholson JM, et al. Experience of stress in parents of children with ADHD: a qualitative study. *Int J Qual Stud Health Well-being* 2019;14(1):1690091.  
[PUBMED](#) | [CROSSREF](#)
14. McDermut JF, Haaga DA, Bilek LA. Cognitive bias and irrational beliefs in major depression and dysphoria. *Cognit Ther Res* 1997;21(4):459-76.  
[CROSSREF](#)
15. Jensen PS, Martin D, Cantwell DP. Comorbidity in ADHD: implications for research, practice, and DSM-V. *J Am Acad Child Adolesc Psychiatry* 1997;36(8):1065-79.  
[PUBMED](#) | [CROSSREF](#)
16. The MTA Cooperative Group. Moderators and mediators of treatment response for children with attention-deficit/hyperactivity disorder: the Multimodal Treatment Study of children with Attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry* 1999;56(12):1088-96.  
[PUBMED](#) | [CROSSREF](#)
17. Faraone SV, Biederman J, Friedman D. Validity of DSM-IV subtypes of attention-deficit/hyperactivity disorder: a family study perspective. *J Am Acad Child Adolesc Psychiatry* 2000;39(3):300-7.  
[PUBMED](#) | [CROSSREF](#)
18. Park JL, Hudec KL, Johnston C. Parental ADHD symptoms and parenting behaviors: a meta-analytic review. *Clin Psychol Rev* 2017;56:25-39.  
[PUBMED](#) | [CROSSREF](#)
19. Gordon CT, Hinshaw SP. Parenting stress as a mediator between childhood ADHD and early adult female outcomes. *J Clin Child Adolesc Psychol* 2017;46(4):588-99.  
[PUBMED](#) | [CROSSREF](#)
20. Miranda A, Tárraga R, Fernández MI, Colomer C, Pastor G. Parenting stress in families of children with autism spectrum disorder and ADHD. *Except Child* 2015;82(1):81-95.  
[CROSSREF](#)
21. Chi TC, Hinshaw SP. Mother-child relationships of children with ADHD: the role of maternal depressive symptoms and depression-related distortions. *J Abnorm Child Psychol* 2002;30(4):387-400.  
[PUBMED](#) | [CROSSREF](#)
22. Craig F, Operto FF, De Giacomo A, Margari L, Froli A, Conson M, et al. Parenting stress among parents of children with neurodevelopmental disorders. *Psychiatry Res* 2016;242:121-9.  
[PUBMED](#) | [CROSSREF](#)
23. Ma JL, Lai KY. Paternal and maternal experiences in caring for Chinese children with attention deficit hyperactivity disorder in Hong Kong. *Asian Soc Work Pol Rev*. 2016;10(2):185-99.  
[CROSSREF](#)

24. Mirzaaghas R, Kohani Y, Baniasadi H, Tara F. Maternal Anxiety and Attention Deficit Hyperactivity Disorder (ADHD) in Children. *J Midwifery Reprod Health* 2014;2(4):233-7.
25. Podolski CL, Nigg JT. Parent stress and coping in relation to child ADHD severity and associated child disruptive behavior problems. *J Clin Child Psychol* 2001;30(4):503-13.  
[PUBMED](#) | [CROSSREF](#)
26. Deault LC. A systematic review of parenting in relation to the development of comorbidities and functional impairments in children with attention-deficit/hyperactivity disorder (ADHD). *Child Psychiatry Hum Dev* 2010;41(2):168-92.  
[PUBMED](#) | [CROSSREF](#)
27. McCleary L. Parenting adolescents with attention deficit hyperactivity disorder: analysis of the literature for social work practice. *Health Soc Work* 2002;27(4):285-92.  
[PUBMED](#) | [CROSSREF](#)
28. Schermerhorn AC, D'Onofrio BM, Slutske WS, Emery RE, Turkheimer E, Harden KP, et al. Offspring ADHD as a risk factor for parental marital problems: controls for genetic and environmental confounds. *Twin Res Hum Genet* 2012;15(6):700-13.  
[PUBMED](#) | [CROSSREF](#)
29. Chung KM, Ebesutani C, Bang HM, Kim J, Chorpita BF, Weisz JR, et al. Parenting stress and child behavior problems among clinic-referred youth: cross-cultural differences across the US and Korea. *Child Psychiatry Hum Dev* 2013;44(3):460-8.  
[PUBMED](#) | [CROSSREF](#)
30. Rescorla L, Achenbach T, Ivanova MY, Dumenci L, Almqvist F, Niels NB, et al. Behavioral and emotional problems reported by parents of children ages 6 to 16 in 31 societies. *J Emot Behav Disord* 2007;15(3):130-42.  
[CROSSREF](#)
31. Kim HO, Hoppe-Graff S. Mothers roles in traditional and modern korean families: The consequences for parental practices and adolescent socialization. *Asia Pac Educ Rev* 2001;2(1):85-93.  
[CROSSREF](#)
32. Ra HM, Lee HY. Analysis of research trends on parenting involvement of fathers with early childhood children in Korea. *J Fisheries Marine Sci Educ* 2012;24(2):246-62.  
[CROSSREF](#)
33. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Washington, D.C., USA: American Psychiatric Association; 2013.
34. Pappas D. ADHD Rating Scale-IV: checklists, norms, and clinical interpretation. *J Psychoed Assess* 2006;24(2):172-8.  
[CROSSREF](#)
35. Jang SJ, Suh DS, Byun HJ. Normative study of the K-ARS (Korean ADHD Rating Scale) for parents. *J Korean Acad Child Adolesc Psychiatry* 2007;18:38-48.
36. Kovacs M. The children's depression inventory: a self-rated depression scale for school-aged youngsters. [master's thesis]. Pittsburgh, PA, USA: University of Pittsburgh; 1983.
37. Costa NM, Weems CF, Pellerin K, Dalton R. Parenting stress and childhood psychopathology: An examination of specificity to internalizing and externalizing symptoms. *J Psychopathol Behav Assess* 2006;28(2):113-22.  
[CROSSREF](#)
38. Larson K, Russ SA, Kahn RS, Halfon N. Patterns of comorbidity, functioning, and service use for US children with ADHD, 2007. *Pediatrics* 2011;127(3):462-70.  
[PUBMED](#) | [CROSSREF](#)
39. Cho SC, Lee YS. Development of the Korean form of the Kovacs' Children's Depression Inventory. *J Korean Neuropsychiatr Assoc* 1990;29:943-56.
40. Kim JH, Lee EH, Joung YS. The WHO Adult ADHD Self-Report Scale: reliability and validity of the Korean version. *Psychiatry Investig* 2013;10(1):41-6.  
[PUBMED](#) | [CROSSREF](#)
41. Kessler RC, Adler L, Ames M, Demler O, Faraone S, Hiripi E, et al. The World Health Organization Adult ADHD Self-Report Scale (ASRS): a short screening scale for use in the general population. *Psychol Med* 2005;35(2):245-56.  
[PUBMED](#) | [CROSSREF](#)
42. Adler LA, Spencer T, Faraone SV, Kessler RC, Howes MJ, Biederman J, et al. Validity of pilot Adult ADHD Self- Report Scale (ASRS) to rate adult ADHD symptoms. *Ann Clin Psychiatry* 2006;18(3):145-8.  
[PUBMED](#) | [CROSSREF](#)

43. Heo S, Kim JH, Joung YS, Lee WI, Kim JJ, Sohn SH, et al. Clinical utility of the Korean version of the WHO Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale screener. *Psychiatry Investig* 2018;15(3):325-9.  
[PUBMED](#) | [CROSSREF](#)
44. Spielberger CD, Gorsuch R, Lushene R. *Manual for the State-Trait Inventory*. Palo Alto, CA, USA: Consulting Psychologists Press; 1970.
45. Spielberger CD, Edwards CD, Lushene RE, Montuori J, Platzeck D. *Preliminary Manual for the State-Trait Anxiety Inventory for Children*. Palo Alto, CA, USA: Consulting Psychologists Press; 1973.
46. Cho SC, Choi JS. Development of the Korean form of the state-trait anxiety inventory for children. *Seoul J Psychiatry* 1989;14:150-7.
47. Han DW, Lee CH, Tak JK. Standardization of Spielberger's manual for the state-trait anxiety inventory. *Proc Korean Psychol Assoc* 1993;(1):505-12.
48. Spitzer RL, Kroenke K, Williams JB. Primary Care Evaluation of Mental Disorders. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *JAMA* 1999;282(18):1737-44.  
[PUBMED](#) | [CROSSREF](#)
49. Choi HS, Choi JH, Park KH, Joo KJ, Ga H, Ko HJ, et al. Standardization of the Korean version of Patient Health Questionnaire-9 as a screening instrument for major depressive disorder. *J Korean Acad Fam Med* 2007;28:114-9.
50. Berry JO, Jones WH. The Parental Stress Scale: initial psychometric evidence. *J Soc Pers Relat* 1995;12(3):463-72.  
[CROSSREF](#)
51. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods* 2008;40(3):879-91.  
[PUBMED](#) | [CROSSREF](#)
52. Shrout PE, Bolger N. Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychol Methods* 2002;7(4):422-45.  
[PUBMED](#) | [CROSSREF](#)
53. Bianchi SM, Casper LM, King RB, editors. *Work, Family, Health, and Well-Being*. Mahwah, NJ, USA: Routledge; 2006.
54. Hosley CA, Montemayor R. Fathers and adolescents. In Lamb ME, editor. *The Role of the Father in Child Development*. 3rd ed. New York, NY, USA: Wiley; 1997, 163-78.
55. Parke RD. Father involvement: a developmental psychological perspective. *Marriage Fam Rev* 2000;29(2-3):43-58.  
[CROSSREF](#)
56. Elam KK, Chassin L, Eisenberg N, Spinrad TL. Marital stress and children's externalizing behavior as predictors of mothers' and fathers' parenting. *Dev Psychopathol* 2017;29(4):1305-18.  
[PUBMED](#) | [CROSSREF](#)
57. Grych JH, Raynor SR, Fosco GM. Family processes that shape the impact of interparental conflict on adolescents. *Dev Psychopathol* 2004;16(3):649-65.  
[PUBMED](#) | [CROSSREF](#)
58. Essex MJ, Klein MH, Cho E, Kraemer HC. Exposure to maternal depression and marital conflict: gender differences in children's later mental health symptoms. *J Am Acad Child Adolesc Psychiatry* 2003;42(6):728-37.  
[PUBMED](#) | [CROSSREF](#)
59. Costin J, Lichte C, Hill-Smith A, Vance A, Luk E. Parent group treatments for children with oppositional defiant disorder. *AeJAMH* 2004;3(1):36-43.  
[CROSSREF](#)
60. DeWolfe NA, Byrne JM, Bawden HN. Early clinical assessment of attention. *Clin Neuropsychol* 1999;13(4):458-73.  
[PUBMED](#) | [CROSSREF](#)
61. DuPaul GJ, McGoey KE, Eckert TL, VanBrakle J. Preschool children with attention-deficit/hyperactivity disorder: impairments in behavioral, social, and school functioning. *J Am Acad Child Adolesc Psychiatry* 2001;40(5):508-15.  
[PUBMED](#) | [CROSSREF](#)
62. Cunningham CE, Bennes BB, Siegel LS. Family functioning, time allocation, and parental depression in the families of normal and ADHD children. *J Clin Child Psychol* 1988;17(2):169-77.  
[CROSSREF](#)
63. Krulik T, Turner-Henson A, Kanematsu Y, al-Ma'aitah R, Swan J, Holaday B. Parenting stress and mothers of young children with chronic illness: a cross-cultural study. *J Pediatr Nurs* 1999;14(2):130-40.  
[PUBMED](#) | [CROSSREF](#)