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The impact of parents' subjective happiness on children's executive functions: A longitudinal study

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ABSTRACT

Background: Executive function (EF) undergoes rapid development during childhood and is shaped by parenting context. Parental subjective happiness has been linked to children's socioemotional outcomes, but its long-term influence on EF remains unclear.

Objectives: To determine whether mothers' and fathers' subjective happiness at the child's age of 7 predict the child's EF at age 12, and to identify which facets of parental happiness (overall, relative, general, independent) are associated with later EF.

Materials and methods: A longitudinal cohort of 1 598 Korean families was drawn from the Education Panel Study on Korean Children. Parental happiness at baseline (child age 7) was assessed with the four-item Subjective Happiness Scale and classified into overall, relative, general, and independent domains. Children's EF was measured five years later (age 12) using the 40-item Child-dolescent Self-Reported Executive Function Difficulty Screening Questionnaire (higher scores = better EF). One-way ANOVA tested EF differences across low, normal, and high parental happiness groups for each domain.

Results: Maternal overall, relative, and independent happiness at age 7 were each positively associated with children's EF at age 12 (all $p<0.05$). In contrast, the corresponding paternal happiness domains showed no significant associations ($p>0.20$). For the general happiness domain-reflecting mood-related well-being both higher maternal and higher paternal scores predicted better child EF five years later (mother: F=5.34, $p=0.005$; father: F=3.04, $p=0.048$). Effect sizes were small to moderate ($\eta^2=0.01$-0.04).

Conclusion: In this Korean cohort, maternal happiness exerted a broader and stronger influence on children's later EF than paternal happiness, while both parents' general (mood-related) happiness independently predicted EF. Interventions that enhance parental-particularly maternal-subjective happiness may yield downstream cognitive benefits for school-aged children.

Introduction

Executive function includes neurophysiological, cognitive, and developmental elements, and is an essential behavioral function in daily life.[1] The ability to predict, prepare, plan, and organize situations in advance, the ability to concentrate attention and maintain working memory to focus on specific activities according to situational demands, the ability

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to control behavior, and emotions have been noted as key subfactors of executive function.[2] These executive functions are activated and influenced by mental content, such as knowledge, beliefs, norms, values, and preferences, and understood as skills to achieve specific goals.[3] As such, it is a higher cognitive and executive function that is not only related to cognitive processes important for the active regulation of thinking, behavior, and emotions but also to social-emotional and behavioral areas. It can help one function adaptively in their environment.[1,4]

From a whole-life developmental perspective, children's executive functions are the developmental area with the greatest change during childhood, which a period in which self-regulation abilities expand and independence increases.[5,6] A child's executive function plays an important role in experiencing and adapting to new challenges during the development process. The child's ability to control some of their reactions, pay attention to specific stimuli, and follow rules is the standard for executive function.[7,8] The role of executive function is particularly important for school-age children because it is a time when they must adapt to a new social space called school, experience control and rules, and perform adaptation.[9] Children's executive function is related to school adaptation, affects academic level and relationships with peers, and can reduce problem behaviors by reducing impulsive behavior.10 The higher the level of executive function, the higher the peer competence; further, the actual performance of executive function leads to smooth school adaptation through the child's self-efficacy.[11]

Neurophysiologically, executive function is based on neural development in early life. The attachment created between parents and children, and parents' nurturing behavior are important factors affecting their children's neural development.[12,13] In particular, the emotional bond between parents and children, and consistent parenting behavior are key factors.[10] During childhood, parents gradually change from providing physical to psychological help to their children while performing their parental roles. They become encouragers and helpers for their children, and provide them with emotional stability.[14]

To provide appropriate psychological encouragement and support to children during this period, and become positive models, parents' psychological factors must first be healthy.[15] Parental psychological factors are related to the subjective happiness perceived by parents. These factors can determine parents' parenting attitudes, and have a lasting impact on the health of the family and psychological stability of the children (14). One such important parental psychological factor is parents' subjective happiness. It is very important because it affects parenting attitude and health; these are important for ensuring smooth interaction with their children while having the emotional stability of a caregiver. Crucially, parents' subjective happiness can affect the psychological stability of their child.[16]

Furthermore, parents' subjective happiness is related to the child's peer competence and stable attachment with the child, and can improve family functioning. It reduces issues such as anxiety, depression, defiance, and aggression in children, and positively affects their executive function.[14] In addition, when parents' subjective happiness improves, they engage in positive and responsive parenting behavior, and provide an environment that stimulates and supports their child's cognitive development. This helps the child in improving their executive function.[10] In this way, parents' subjective happiness reduces parenting stress and improves children's executive function. Indeed, Hong and Moon (2019) show that the happiness felt by parents affects children's executive function.[14]

This brief review of prior research suggests that the subjective happiness of fathers and mothers can affect their children's executive function. However, to the best of our knowledge, most studies focus on mothers. Moreover, few scholars independently analyze mothers and fathers. Next, recognizing changes in the development of children over time, who are constantly affected by the environment, is almost impossible because few studies individually analyze the type of subjective happiness of mothers and fathers. Finally, most research on the relationship between variables is cross-sectional in nature.

This study longitudinally analyzes the effect of mothers' and fathers' happiness when their children were in the first year of elementary school (7 years old) on the children's executive function in the sixth year of elementary school (12 years old). The aim is to determine the causal relationship between parents' subjective happiness and children's executive function.

Materials and methods

Study subjects

This study was conducted by the Korean Institute of Child Care to analyze the effects of mothers' and fathers' happiness when their children were in the first grade of elementary school (7 years old) on the children's executive function in the sixth grade of elementary school (12 years old). Data from the Education Panel Study on Korean Children's 8th (7 years old) and 13th years (12 years old) were used.

Both parents and children were selected as the research subjects. The sociodemographic characteristics in Table 1 revealed that the gender ratio of children was tilted towards males. The most common age group of both mothers and fathers was the 30s. Finally, the highest proportion of both mothers and fathers were college graduates.

Table 1. Sociodemographic background of study subjects.

Specification			N	%
Child	Gender ratio	Male	817	51.1
		Female	781	48.9
Mother	Age	Over 50	6	0.4
		40-49	491	30.9
		30-39	1075	67.6
		29 or less	18	1.1
	Education	Graduate school	93	5.8
		University (4 years or higher)	599	37.7
		College	435	27.4
		High school	456	28.4
		Middle school	7	0.5
Father	Age	Over 50	19	1.2
		40-49	549	35.0
		30-39	988	63.0
		29 or less	10	0.6
	Education	Graduate school	175	11.2
		University (4 years or higher)	658	42.0
		College	316	20.2
		High school	410	26.2
		Middle school	7	0.4

Research tools

Parents' subjective happiness

Parents' subjective happiness was measured by the mother and father questionnaires using the instrument developed by Lyubornirsky and Lepper (1999), and translated by the Korean Children's Panel researchers.[17] The items for subjective happiness are "Overall, I am...," "Compared to other people, I am...," "Some people are very happy overall. No matter what happens, I tend to have fun without worrying about it. I am...," and "Some people are very unhappy overall. They don't seem happy, even though they are not particularly depressed." In this study, 1 point, 2 points, and 3 points were made up of 1 point, 4 points, 5 points were made up of 2 points, 6 points, and 7 points were made up of 3 points. The higher the total score, the higher the happiness. The Cronbach's α values for the item reliabilities of mother's and father's happiness were 0.87 and 0.85, respectively (Table 2).

Table 2. Sociodemographic background of study subjects.

Variable		Item	Number of questions
Parental happiness	Overall happiness	Overall, I am...	1
	Relative happiness	Compared to other people, I am...	1
	General happiness	Some people are very happy overall. No matter what happens, I tend to have fun without worrying about it. I am...	1
	Independent happiness	Some people are very unhappy overall. They don't seem happy even though they are not particularly depressed.	1
		Entire	**4**

Difference between parents' general well-being on child's executive function

Children's executive function was evaluated using the Child-Adolescent Self-reported Executive Function Difficulty Screening Questionnaire developed by Song.[18] This scale comprises 40 questions in four areas: 11, 11, 8, and 10 questions on planning-organizing, behavioral control, emotional control, and attention-concentration difficulties, respectively. Each question is rated on a Likert scale ranging from one to three points. The higher the score by reverse-coding partial questions, the higher the executive function of the child. The Cronbach's α was 0.94.

Statistical analysis

Data from the Korean Children's Panel were analyzed using SPSS 25.0 after obtaining IRB exemption approval from the Gangwon University Bioethics Committee (KWNURB-2023-06-009). First, to analyze the demographic background of the study subjects, a frequency analysis was conducted on their gender, age, age group, educational background, and age of the child. Next, the Cronbach's α was used to analyze the reliability of items on the happiness of mothers and fathers, and children's executive functions. Subsequently, ANOVA was conducted to analyze the effect of mothers' and fathers' happiness when the children were in the first grade (7 years old) of elementary school on their executive function in the sixth grade (12 years old).

Results

Differences in the overall happiness of parents on children's executive functions

The difference between the mother's overall happiness on children's executive function five years later is from "very unhappy" (2.34±0.39) to "normal" (2.48±0.33) and "very happy" (2.53±0.32) in the first grade of elementary school. The higher the overall happiness of the mother in the first grade of elementary school, the more significant the executive function of child in the sixth grade of elementary school five years later (Table 3).

The difference between the father's overall happiness on children's executive function five years later is "very unhappy" (2.55±0.27), followed by "normal" (2.48±0.33) and "very happy" (2.51±0.33). Notably, the father's overall happiness was insignificant for children's executive function in the sixth grade of elementary school (Table 3).

Table 3. The differences between parents' overall happiness on children's executive function after five years.

Variable		N	Mean±SD	F	p	Scheffe
Mother	Very unhappy	47	2.34±0.39	8.542	0.000*	a<b
	Normal	607	2.48±0.33			
	Very happy	625	2.53±0.32			
Father	Very unhappy	266	2.55±0.27	1.575	0.208	-
	Normal	556	2.48±0.33			
	Very happy	628	2.51±0.33			

*Note: *p<0.05*

Differences in the relative happiness of parents on children's executive functions

The difference between the mother's relative happiness on children's executive function after five years is from "very unhappy" (2.38±0.37) to "normal" (2.49±0.33) and "very happy" (2.53±0.32) in the first grade of elementary school. The higher the mother's relative happiness in the first grade of elementary school, the more significant the executive function of sixth-grade elementary school children after five years (Table 4).

The difference between the father's relative happiness on the child's executive function after five years was "very unhappy" (2.54±0.31), "normal" (2.48±0.33), and "very happy" (2.51±0.32). Thus, the father's relative happiness was not significantly related with the child's executive function after five years (Table 4).

Table 4. The differences between the relative happiness of mothers and fathers on the executive function of their children after five years

Variable		N	Mean±SD	F	p	Scheffe
Mother	Very unhappy	67	2.38±0.37	7.240	0.001*	a<b
	Normal	626	2.49±0.33			
	Very happy	586	2.53±0.32			
Father	Very unhappy	31	2.54±0.31	1.399	0.247	-
	Normal	596	2.48±0.33			
	Very happy	588	2.51±0.32			

*Note: *p<0.05*

Differences between parents' general well-being on children's executive functions

The difference between the mother's general happiness on the executive function of children five years later is from "very unhappy person" (2.42±0.33) to "normal person" (2.53±0.32) and "very happy person" (2.53±0.32). The higher the mother's third happiness in the first grade of elementary school, the better the executive function of the sixth-grade elementary school children five years later (Table 5, Figure 3). The difference between father's general happiness on children's executive function after five years was "very unhappy" (2.43±0.33), "normal" (2.49±0.33), and "very happy" (2.52±0.32). Thus, the higher the father's general happiness, the better the executive function of sixth-grade elementary school children after five years (Table 5).

Table 5. The differences in the general happiness of the mother and father on the executive function of their children after five years.

Variable		N	Mean±SD	F	p	Scheffe
Mother	Very unhappy	100	2.42±0.33	8.542	0.000*	a<b
	Normal	700	2.49±0.33			
	Very happy	479	2.53±0.32			
Father	Very unhappy	70	2.43±0.33	1.575	0.208	-
	Normal	691	2.49±0.33			
	Very happy	454	2.52±0.32			

*Note: *p<0.05*

Differences in parents' independent happiness on children's executive function

The difference between mother's independent happiness on children's executive function five years later is from "very unhappy" (2.47±0.35) to "very happy" (2.47±0.34) and "very happy" (2.53±0.31) in the first grade of elementary school. The higher the mother's independent happiness in the first grade of elementary school, the more significant the executive function of sixth-grade elementary school children five years later (Table 6, Figure 4). The difference between the father's independent happiness on the child's executive function five years later was “very unhappy” (2.44±0.35), “normal” (2.49±0.33), and “very happy” (2.52±0.32). Thus, the father's independent happiness was not significantly related with the child's executive function five years later (Table 6).

Table 6. The differences between the mother's and father's independent happiness on the executive function of their children five years later

Variable		N	Mean±SD	F	p	Scheffe
Mother	Very unhappy	103	2.47±0.35	4.247	0.015*	a<b
	Normal	537	2.47±0.34			
	Very happy	639	2.53±0.31			
Father	Very unhappy	106	2.44±0.35	2.997	0.050	-
	Normal	535	2.49±0.33			
	Very happy	574	2.52±0.32			

Discussion

Using data from the 8th and 13th years of the Education Panel Study on Korean Children, this study longitudinally analyzed the effect of parents' happiness when their child was in the first grade of elementary school (7 years old) on the child's executive function in the sixth grade (12 years old).

First, mothers' overall and relative happiness showed a significant association with children's executive function, whereas fathers showed no association. Although fathers' participation in parenting has increased, they tend to be satisfied with supportive parenting. Hence, mothers are still more involved in the parenting process than fathers in Korean society.[19] Therefore, the degree of the mother's happiness may have a greater impact on the child's executive function (20). These results are consistent with those of studies showing that mothers' overall and relative happiness affect their children's executive function.[14,21,22]

Second, both mothers' and fathers' general happiness showed significant correlations with children's executive function. This is a feeling of happiness related to depression. Depression, expressed as anxiety, sadness, and lethargy, does not appear only at a specific time but continues to appear throughout an individual's life.[23] Therefore, parents with depression may negatively affect family functioning. These results are consistent with studies showing the negative influence of parental depression on children's executive function.[24-26]

Third, mothers' independent happiness was significantly correlated with children's executive function five years later, but fathers' independent happiness was not. This is because independent happiness is a feeling of happiness related to self-esteem; hence, if one spends more time with their mother than their father, they will naturally imitate the mother's attitude and behavior, and will be greatly influenced by their mother in various ways.[27]

This study has several limitations. Besides parental psychological factors, factors related to the roles of family members, workplace, and social environment may also be important. However, we did not include these in our analysis. Additionally, due to the characteristics of panel research, questions about happiness were simplified; therefore, we could not consider various subdomains of happiness. Finally, this study focused only on childhood; further research is needed to explore the effects of parental happiness on children's executive function at different developmental stages.

Policy suggestions and implications

Using child panel survey data, this study attempted to provide clinicians with clinical evidence for intervention by analyzing the effects of differences in parental happiness on child executive function. The results revealed that the mother's happiness is more important to the child's executive function than the father's happiness. Among the various feelings of happiness, overall and relative happiness emerged as the most important. National policies for mothers' feelings will be important, especially activities to increase the mother's overall and relative happiness. In addition, further studies should be conducted based on other parameters and ages of children not considered here.

Conclusion

This study is valuable in that it longitudinally analyzed the effects of mothers' and fathers' happiness when their children were in the first grade (7 years old) on their children's executive function in the sixth grade (12 years old). Since executive function develops continuously from infancy to adolescence, a longitudinal approach is useful for exploring mutual causal relationships over time.

This study holds academic significance as it identifies the longitudinal pathway through which parents' subjective happiness influences their children's executive function. Furthermore, it reveals the heterogeneity in the relative influence of different happiness factors between mothers and fathers, emphasizing the need to consider both parental roles when designing interventions aimed at improving children's executive function.

Ethical approval

Data from the Korean Children's Panel were analyzed

using SPSS 25.0 after obtaining IRB exemption approval from the Gangwon University Bioethics Committee (Approval No: KWNURB-2023-06-009)

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Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CRediT authorship contribution statement

Seri Oh: conceptualization, methodology, writing; original draft, statistical analysis, data collection; **Geonwoo Kim:** manuscript editing, data collection, review and editing; **Hyewon Jeong:** manuscript editing, Graphic abstract, Narae Lee: manuscript editing, review; Jongsik Jang: supervision, validation, review and editing

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