

The Relationship among Mother-Infant Attachment Security, Peer Play Interactions and School Readiness in Korea

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Abstract

In light of evidence suggesting child attachment and peer interactions are related to school readiness skills, the present study examined the associations among mother-infant attachment security, peer play interactions, and school readiness in the ages of 17 months to 7 years. We analyzed the data from years 2–7 (2009–2014) of the Panel Study on Korean Children. Data from 175 participants who completed the in-depth evaluation conducted in 2009, general survey in 2011, and general survey in 2014 were used for analysis using structural equation modeling. The results were as follows. First, attachment security at 17 months had a direct effect on social and emotional development, a domain of school readiness, at age 7. Second, positive peer play interaction at age 4 had direct effects on all domains of school readiness at age 7, that is social and emotional development, approaches to learning, communication, and cognitive development and general knowledge. Third, positive peer play interactions at age 4, influenced by stronger infant attachment security at 17 months led to positive effects on all domains of school readiness at age 7. The findings highlight the central role of the quality of early attachment relationships and the type of peer interactions on the development of school readiness from infancy into the school years.

Key words

Mother-infant attachment security, peer play interactions, school readiness, attachment theory, developmental ecological model

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Introduction

School readiness is essential for children's subsequent adjustment and performance (Duncan, Dowsett, Clasessens, Magnuson, Huston, Klebanov, & Japel, 2007). When children have adequate school readiness skills before school entry, they are more likely to succeed in school and beyond. In particular, academic (e.g., language, literacy, mathematics) and socioemotional (e.g., emotional competence, self-regulation, executive functioning) school readiness skills have been closely linked to successful performance and adjustment to elementary school (e.g., Choi & Kim, 2019; Williford, Carter, & Pianta, 2018). In contrast, children experiencing ineffective transition between early education settings and elementary school are more likely to be at greater risk of school failure, and show problems with social skills and adjustment, and weaknesses in academic skills (e.g., Duncan et al., 2007; Pears, Carpenter, Kim, Peterson, & Fisher, 2018; Williford et al., 2018). Although early childhood programs and policies have focused on building and promoting school readiness skills, some children face difficulties during the transition to elementary school. Thus, an in-depth understanding of the developmental process of school readiness prior to school entry is needed.

School readiness is the result of the process of development that cumulates over time and is affected by interactions within different environmental contexts (Bronfenbrenner & Morris, 1998). In particular, high quality interactions and learning opportunities with proximal environment such as home and early education settings play a pivotal role in school readiness (Mashburn & Pianta, 2006), and the cumulative skills and development acquired through these interactions and experiences influence children's school readiness skills (Park & Hong, 2019). Existing empirical evidence suggests that early attachment security and peer interactions are prospectively associated with school readiness skills (e.g., Belsky & Fearon, 2002; Moon & Jang, 2019; Bulotsky-Shearer, Manz, Mendez, McWayne, Sekino, & Fantuzzo, 2012; Ladd, Herald-Brown, & Reiser, 2008), and attachment relationships and peer experiences represent the underlying mechanisms that influence school readiness skills (e.g., Mashburn & Pianta, 2006; Williford et al., 2018). Although a range of early attachments and peer interactions have been explored as predictors of school readiness skills, the effect of mother-infant attachment security through the mediation of peer interactions over time has not received sufficient attention. Furthermore, these studies have mostly sampled Western populations; accumulating effects of early attachment security and peer interactions on Korean children's school readiness remain unknown. Given that attachment is a

cross-cultural and general emotional bond formed on a biological basis (Bowlby, 1969/1982) and that cultural values and pedagogical attitudes in society influence the developmental process of children's school readiness (Xia, Hackett, & Webster, 2020), the purpose of this study was to examine the longitudinal association among mother-infant attachment security, peer play interactions, and school readiness as well as analyze the mediating effects of peer play interactions in this association from infancy to the transition to school age by using the nationally representative the Panel Study on Korean Children (PSKC) data.

School readiness

School readiness is the set of cognitive, social, and behavioral skills that enable children to learn and adjust in school effectively (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006). According to the National Education Goals Panel (NEGP, 1995), school readiness is a multidimensional construct, encompassing children's physical health, social/emotional development, and approaches to learning, language, and cognitive development. It is a broader concept than learning readiness alone, a notion that emphasizes the basic learning abilities essential for successful performance of learning tasks. However, school readiness in Korea is viewed as a prerequisite of successful performance of specific learning tasks to be completed in elementary school, and the emphasis is placed on basic skills related to learning (Min, 2019). Families or early childhood education programs tend to focus on the academic aspects of school readiness, such as counting, reading, and writing, when preparing young children for school (Kim, Kim, & Kim, 2020). According to KICCE survey (2016), 84.3% of the parents perceived the need for private education to prepare their children for elementary school, and 83.6% of five-year-old children were receiving private education, most commonly in the subjects of Korean language (reading and writing), followed by math, physical education, art, and music. Most of Korean children aged 5–7 years (87.9%) attend either childcare centers or kindergartens, which provide an educational service (Ministry of Health and Welfare, 2021). Entering elementary school is considered the onset of formal schooling. Thus, school readiness is indicative of children's readiness for elementary schools in the current study.

Attachment theory and the developmental ecological model provide the conceptual frameworks for understanding a child's development of school readiness. Attachment theory posits that early attachment relationships fundamentally influence development and contribute to continuities in adaptation throughout the life-

span (Bowlby, 1969/1982). Consequently, this theory provides a framework to investigate developmental pathways and is relevant for studying both normal and atypical developmental processes (see Bretherton & Munholland, 2018). Also, the developmental ecological model (Bronfenbrenner & Morris, 1998) which is nested within a broader ecological framework suggests that school readiness is defined not only by qualities of the child (e.g., sex, monthly age, temperament, ability) but also by the context in which learning occurs such as home, school environments, and community (Hair et al., 2006). This model of school readiness emphasizes the role of context, seeing a child's skills as situated within and dependent on the environment (Williford et al., 2018). It considers school readiness skills to be developmental outcomes of reciprocal interactions children have with their environments, in particular, at home and early education settings (Rimm-Kaufman & Pianta, 2000). Each of these frameworks is the basis for the current study, which examined lasting effects of early attachment security and peer interactions on the development of school readiness throughout infancy and into the school years.

Mother-infant attachment security and school readiness

Interactions between children and parents during early childhood are integral for early learning and provide the essential conditions that support children's development of academic and socioemotional competences related to school readiness (e.g., Bulotsky-Shearer et al., 2012; Mashburn & Pianta, 2006). Since most children spend a significant amount of time with their mother, who is usually their primary caregiver, at home before beginning elementary school, mother-child interactions are crucial (Shim & Lim, 2019). These interactions are perhaps the most salient aspect of young children's early experiences (Bernier, Beauchamp, Carlson, & Lalonde, 2015). The quality of early attachment relationships varies according to the quality of mother-child interactions, and consequently a mother's sensitivity and responsiveness are of crucial importance (Ainsworth, 1978). For instance, infants who experience sensitive and responsive caregiving from their mother develop the feelings of security and trust in others (Bretherton & Munholland, 2018). In contrast, infants who experience insensitive or inconsistent caregiving by their mother develop a negative view and distrust themselves or others (Belsky & Fearon, 2002). As a result of early interactions with caregivers, attachment relationships become internalized in the form of internal working models which connote a dynamic representational system that allows humans to imagine and habitually experience sequential patterns of social interactions (Bretherton & Munholland,

2018). Such models become generalized over time and continuously influence subsequent social development and adaptation of children (Groh, Fearon, Bakermans-Kranenburg, van IJzendoorn, Steele, & Roisman, 2014).

There has been some research documenting the relationship between mother-infant attachment security, subsequent child behavior, and later school success (e.g., Belsky & Fearon, 2002; Bergin & Bergin, 2009; Jacobsen & Hofmann, 1997; Moon & Jang, 2019; West, Matthews, & Kerns, 2013). For example, infants showing secure attachment at 18 months have been found to show higher language development, school readiness, and social competence (Hong, An, Lee, & Choi, 2018) and lower behavioral problems at age 3 than children who had consistent histories of insecure attachment (Belsky & Fearon, 2002). Compared to children with an insecure attachment, children who formed a secure attachment tend to exhibit higher reading and pre-reading skills as well as attitudes toward reading (Bergin & Bergin, 2009). Meanwhile, children with an insecure attachment have shown lower levels of social and emotional skills (Granot & Mayseless, 2001). Children who form a secure attachment at 24 months or 36 months exhibit high cognitive abilities in later childhood (West et al., 2013), whereas children who form an insecure attachment at these ages show poor verbal and mathematical abilities, reading comprehension, and overall academic achievement (Jacobsen & Hofmann, 1997). Taken together, these studies provide strong evidence that the consequences of secure or insecure working models derived from early attachment relationships is linked to school readiness skills across a wide range of academic and socioemotional learning skills.

Moreover, mother-infant attachment security is central in forming the basis for socializing (Bergin & Bergin, 2009) and predicts children's relationships with peers later on (Oh & Lee, 2020). According to longitudinal studies on attachment, children who form a secure attachment in infancy show more peer competence and have more friends than their counterparts, while children with an insecure attachment experience many problems with peers (i.e., Dallaire & Weinraub, 2007; Fearon, Bakermans-Kranenburg, Lapsley, & Roisman, 2010; Groh et al., 2014; Raikes & Thompson, 2008). For example, securely attached children were found to engage in more peer play interactions (Sroufe, 2005), were popular among their peers (Kerns & Barth, 1995), showed high peer acceptance and social competence (DeMulder, Denham, Schmidt, & Mitchell, 2000), and had low play disruption and play disconnection (Kim & Shin, 2015). In contrast, insecurely attached children were more aggressive and were rejected by or isolated from peers, and consequently, had difficulties adjusting to early education settings (Dallaire &

Weinraub, 2007; Fearon et al., 2010). Securely attached children at 17 months engaged in positive interactions with peers at age 4, while children with insecure attachments showed frequent play disruption and play disconnection during peer play at age 4 (Shim & Lim, 2019). Additionally, secure children experienced better school adjustment and a higher social status with peers (Groh et al., 2014). Findings from these studies support the predictive significance of early attachment security for children's peer relationships.

Peer play interactions and school readiness

Although home is a major proximal environment for the development of young children, as they grow older and start to attend early education settings they begin to spend a large part of their day with peers. Peer interactions in classrooms exert the most direct influence on children's development (Bulotsky-Shearer et al., 2012) and represent another key context in which children develop academic and social competencies essential for school entry. Indeed, interactive peer play interactions provide a setting for children to learn from each other and acquire social behavior, sophisticated language, academic skills, and social and emotional regulation skills through play and peer conversations (Slicker & Hustedt, 2020). Mashburn and Pianta (2006) have emphasized that peer relationships act as mechanisms through which children acquire academic and social competencies needed for entering school ready to learn and adapt. Consequently, peers have significant implications on school readiness skills and subsequent school success.

Several studies have established that peer interactions in a classroom are a predictor of school readiness skills in the transition to school age (e.g., Choi & Kim, 2019; Fantuzzo, Manz, Atkins, & Meyers, 2005; Ladd et al., 2008; Min, 2019; Schelble, Franks, & Miller, 2010). Specifically, children who engage in more positive interactions while playing with their peers exhibit higher school readiness skills, including language (Fantuzzo, Sekino, & Cohen, 2004), academic (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; Lin, Justice, Paul, & Mashburn, 2016), and social skills (Oh & Lee, 2020) as well as social and emotional development, learning attitude, communication, and cognitive development and general knowledge (Min, 2019; Song, 2019). Meanwhile, children showing more peer play disruption and disconnection demonstrate lower levels of school readiness skills (Lim, 2020). Negative peer interactions have been found to be negatively associated with sociability as well as learning abilities (Bulotsky-Shearer et al., 2012; Hong et al., 2018). In particular, children who are rejected by their peers or face

difficulties in engaging in play interactions tend to form less favorable perceptions of school and show higher levels of school avoidance (Hair et al., 2006), while also exhibiting problematic behaviors, such as inattentiveness, aggression, depression, and anxiety (Choi & Shin, 2008). These findings indicate that interactions with peers can have both positive and negative effects on school readiness skills.

Mother-infant attachment security, peer play interactions and school readiness

School readiness skills are most often defined as the skills that a child acquires through their interactions and experiences in the home and early education settings prior to entering formal schooling (Williford et al., 2018). Relationships with the mother at home and interactions with peers in early education settings are considered to be one of the key ongoing experiences that contribute significantly to the development school readiness skills (e.g., Mashburn & Pianta, 2006; Moon & Jang, 2019). Consequently, emotionally secure relationships between children and adults, and interactions of children with peers may play a determining role in the acquisition of school readiness skills (Williford et al., 2018).

Although several longitudinal studies (e.g., Belsky & Fearon, 2002; Bulotsky-Shearer et al., 2012; Duncan et al., 2007; Ladd et al., 2008) have identified that school readiness skills can be predicted both by early attachment relationships and peer interactions, the association among early attachment security, peer play interactions, and school readiness is scarce in samples of young children in South Korea. Only one Korean study has reported the effects of mother-child attachment and effortful control at age 1 on preschoolers' school readiness at age 6 (Moon & Jang, 2019). In this regard, it is necessary to identify whether the relation of early attachment security and peer play interactions to school readiness lasts throughout infancy and into the school years, if there is any important mediator impacting this association, does this relationship endure over time, and are early attachment security and peer play interactions reliable predictors of school readiness developmental pathways. Our study addresses these issues using the nationally representative PSKC data to explore the association among the major variables, and identify the mediator in this association throughout infancy and into the school years. To our knowledge, our study is the first to examine the accumulating effects of mother-infant attachment security and peer play interactions on the development of school readiness in Korea.

The present study

The current study examined temporal and causal association among mother-infant attachment security, peer play interactions, and school readiness throughout infancy and into the school years, and extended previous research in several ways. First, we used a nationally representative PSKC data, in which a Korean child's development was assessed at 17 months, 4, and 7 years of age. Second, using structural equation modeling, we examined whether infant attachment at 17 months and peer play interactions at age 4 were directly or indirectly associated with school readiness skills at age 7. We then analyzed whether children's peer play interactions at age 4 mediate the association between mother-infant attachment security at 17 months and school readiness at age 7. Of particular interest was how mother-infant attachment security manifested across time from the age of 17 months to 7 years. We expected to find evidence of lasting effects of early attachment security and peer interactions on the development of school readiness.

To address this aim, first, we controlled for the potential confounders that may affect the relationships among the major variables. Specifically, we controlled for children's temperament, in order to accurately examine the effects of mother-infant attachment security on peer play interactions since the quality of peer interactions can differ according to children's temperamental characteristics (Shim & Lim, 2019). Next, we controlled for sex and monthly age that impact children's school readiness (e.g., Hair et al., 2006; Min, 2019) to examine the effects of individual differences on school readiness skills at age 7. After controlling for the possible confounders, we analyzed whether school readiness skills at age 7 are influenced by attachment security at 17 months and peer play interactions at age 4. Finally, we divided school readiness into four domains (social and emotional development, approaches to learning, communication, and cognitive development and general knowledge) to examine the prospective association among security of attachment relationships in infancy, peer play interactions in early childhood, and school readiness skills at the transition to school age.

Method

Data

This study used data from the Panel Study on Korean Children (PSKC) that follows up and investigates the growth of children from birth to identify their devel-

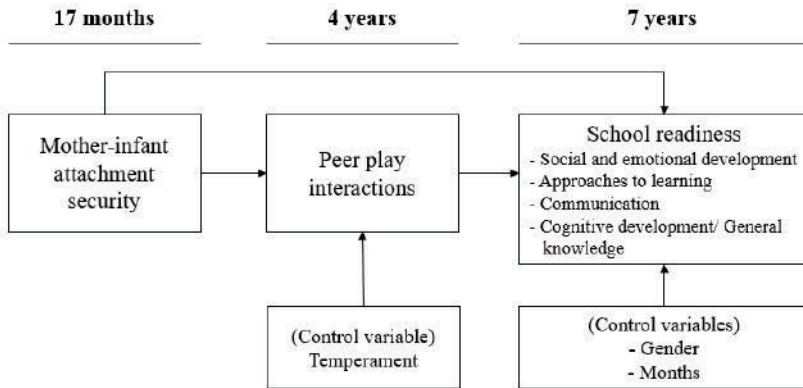


Figure 1. The hypothesized research model.

opmental and lifestyle characteristics and examines the relationships among factors that influence their growth and development (Korea Institute of Child Care and Education, 2017). The Institutional Review Board (IRB) of the Korea Institute of Child Care and Education (KICCE) approved this panel study (approval no. 2015-03). The KICCE has been funded by the national government for conducting the PSKC. The PSKC performed two stages of sampling to ensure statistical rigor. Healthcare facilities were extracted in stage 1, and households were extracted in stage 2. In stage 1, a list of healthcare facilities with at least 500 cases of childbirth in 2006 were selected as the population to be studied, and 30 of them were systematically sampled in each of the six provinces in Korea. In stage 2, households with an infant born between April and July 2008 at the selected healthcare facilities were set as the population to be studied, and 2,150 of them were sampled via multi-stage stratified sampling.

Beginning with the 1st general survey in 2008, the PSKC survey was conducted annually, and the 12th general survey was completed in 2019. Children enrolled in the PSKC were 0 years old at the time of the 1st survey (2008), and they turned 11 years old at the time of the 12th survey. Upon recognizing the need for further evaluation in addition to the general survey, 220 volunteering households that completed the 2nd general survey in 2009 were enrolled in an in-depth evaluation which consisted of major developmental tests that had not been included in the general survey. The surveys and tests were performed by relevant experts (experts with a graduate degree in child development or early child education) who had completed education and training for the tests included in the in-depth evaluation

(roles of evaluator, precautions, PAI, Q-set, ECBQ training, interrater reliability, and supervision) either by visiting the sample households or by having the parents visit the survey facility (Korea Institute of Child Care and Education, 2010).

Analysis participants

In this study, data from 175 participants who completed the in-depth evaluation conducted between October to December 2009, general survey (4th survey) in 2011, and general survey in 2014 (7th survey) were used for analysis. The demographic and household characteristics of 175 children and their mothers are as follows: of the 175 children, 91 (52.0%) were boys, and 84 (48.0%) were girls. The mean age of the children at time of the in-depth evaluation was 17.15 months (SD: 0.96), and there were 99 (56.6%) first-born and 62 (35.4%) second-born children. Among the mothers, the mean age was 32.29 years (SD: 3.46), and 85.1% had an associate degree or higher. A total of 155 (88.6%) participants were from a parents-child family structure, while others had family structures consisting of parents, children, and grandparents or relatives. The mean household income (including mother's income) was 4.78 million KRW.

Research Procedure

We sought to eliminate any confounding effects from factors other than attachment security impacting the relationship between peer interaction and school readiness by reviewing the data from the in-depth evaluation and up to the 7th general survey to check whether there were any events or incidents involving the child or any notable family structures that might have influenced the child's attachment security. We investigated the family composition and occurrences of events or incidents involving the child at three different time points (17 months, 4 years, and 7 years). All mothers included in the survey were married, with 99.5% in their first marriage and 0.5% in their second or additional marriages, and this marital status was maintained for nearly all participants from the 4th to the 7th survey. In terms of household composition, the majority of the sample households (88.6%) comprised of parents and child, while 11.4% comprised of parents and child plus grandparents or relatives. The proportion of families with extended family members decreased over the years, and 90.7% of the families only included immediate family members by the 7th survey.

Further, since family life events may influence child-mother attachment

(McCubbin, Patterson, & Wilson, 1985), we carefully reviewed the responses provided by the mothers from the 2nd survey to 7th survey. The life events included illness or injury of mother, parents, or spouse (15.8–19.7%), severe illness or injury of child (6.0–15.3%), death of parents, parents-in-law, close relatives, or friend (9.8–14.2%), and domestic violence (0.5–1.1%). To eliminate the possibility of these family life events affecting attachment formation, peer interactions, and school readiness skills in our participants, we analyzed the differences in these items between children raised by mothers who had experienced such life events and those whose mothers had not experienced such life events using t-tests. The results confirmed that there were no statistically significant differences between the two groups ($p < .05$).

Further, while the children were in good health at birth in general, 13.7% of the children had received inpatient care or were admitted to the intensive care unit (ICU) immediately after birth. However, only 4.4% of the children had been admitted to a neonatal ICU or had been placed in an incubator, which indicated they might have faced serious health risks, but most of the children who received inpatient or ICU care had relatively mild neonatal diseases, such as diarrhea and jaundice. There were no children with serious diseases (e.g., heart disease, cancer) in the 4th and 7th surveys either.

Measures

Data regarding attachment security was obtained from the in-depth evaluation data, and that for peer play interactions was obtained from the 4th survey data. Data regarding school readiness was obtained from the 7th survey data.

Mother-infant attachment security

The PSKC used the Korean version (Lee, Park, & Rah, 1997) of the revised version (Waters, 1987) of the Attachment Behavior Q-set (ABQ) developed by Waters and Deane (1985). The ABQ comprises 90 cards that show natural attachment behaviors demonstrated by an infant at home and during daily life. Since the ABQ cards require assessing a child's behavior during various situations at home, the child's mother is considered the most reliable observer (Waters, 1995). Hence, mothers participating in the study were asked to classify their child's ABQ. Since sorting the Q-set cards (known as Q-sorting) can be challenging, mothers were first trained to carry out Q-sorting by a trained interviewer during the in-person

testing. Mothers first read each card describing a characteristic of an infant and score how well the characteristic aligns with their child on a scale of 1–9. Then, they sorted the 90 cards into three piles depending on their salience as a descriptor of the child (uncharacteristic, moderately characteristic, and very characteristic). The three piles were each further divided into three sub-piles (uncharacteristic, moderately characteristic, and very characteristic), to create a total of nine piles. Of the 90 cards, the cards that were the most characteristic of an infant were placed in pile 9, and those that were the least characteristic were placed in pile 1.

In this study, the attachment security score was calculated by first having four experts evaluate the content validity of the 90 items with reference to secure attachment behaviors exhibited by 12-month-old infants. Factor analysis was performed to categorize the items into those that described positive attachment and those that described negative attachment. Items that did not belong in either category were identified and removed, resulting in 36 items under positive attachment and 25 items under negative attachment. The reliability was .78 for negative attachment items, .73 for positive attachment items, and .86 for all 61 items. The correlation between the 61 items and security criterion score by Waters (1987) was .77, and that between the 61 items and Korean security criterion score for 12-month-old infants (Lee et al., 1997) was .81.

Peer Play Interaction

Peer play interaction was measured using the Penn Interactive Play Scale developed by Fantuzzo, Coolahan, Mendez, McDermott, and Sutton-Smith (1998) and validated by Choi and Shin (2008). This instrument comprises 30 items in 3 subscales: 9 items for play interaction, 13 items for disruption, and 8 items for disconnection. Each item is rated on a four-point Likert scale (1: never; 2: rarely; 3: sometimes; 4: always). Play interaction refers to a child's prosocial characteristics and ability to engage in play smoothly, and disruption refers to a child's characteristic of demonstrating aggressive and negative emotions. Disconnection refers to a child's characteristic of being ignored or rejected by others. In this study, items for disruption and disconnection were reverse scored, and a higher score indicated more positive peer play interactions. The reliability (Cronbach's α) was .782 for the play interaction subscale, .679 for the disruption scale, .640 for the disconnection scale, and .71 for the overall interactive play scale.

School Readiness

School readiness was measured using an assessment developed by Murphey and Burns (2002), which was translated and pilot-tested by the PSKC research team. This scale was used by teachers at childcare facilities and comprises 22 items in four domains: 6 items for social and emotional development (example: The child expresses changes in emotion in an appropriate manner), 8 items for approaches to learning (example: The child follows simple rules and knowledge), 3 items for communication (example: The child verbally expresses their needs, things needed, and thoughts), and 5 items for cognitive development and general knowledge (example: The child can recall an activity and describe the order of an event). Each item is rated on a four-point Likert scale (1: strongly disagree; 2: disagree; 3: agree; 4: strongly agree). The reliability (Cronbach's α) was .767 for the social and emotional development domain, .856 for the approaches to learning domain, .813 for the communication domain, .763 for the cognitive development and general knowledge domain, and .917 for the overall scale.

Covariates

In this study, children's sex, monthly age, and temperament were adjusted for as covariates. Since sex and monthly age influence school readiness (Hair et al., 2006) we obtained data pertaining to them from the 7th survey to add controls, and also used temperament as a control variable since it influences peer play interactions (Shim & Lim, 2019). Temperament was measured using EAS (The Emotionality, Activity and Sociality-Temperament Survey for Children-Parental Rating) (Mathiesen & Tambs, 1999) that uses a five-point Likert scale rated by parents (1: strongly disagree; 2: disagree; 3: neutral; 4: agree; 5: strongly agree). This scale comprises 5 items for emotionality (degree of child's expression of negative emotions), 5 items for activity (degree of child's activeness), and 10 items for sociability (child's ability to get along with others without being too shy). The reliability (Cronbach's α) was .824 for sociability, .767 for emotionality, .831 for activity, and .757 for the overall scale.

Data analysis

SEM procedure using AMOS 18.0 was used to investigate the relationship among attachment security, peer play interaction, and school readiness. To evaluate the overall

fit of the model for the data, several indices recommended by Hu and Bentler (1999) were calculated in the study: Chi square statistics; root-mean-square error of approximation (RMSEA) of .06 or less; Standardized Root-Mean-Square Residual (SRMR) of .08 or less; and Comparative Fit Index (CFI), best if above .95. Three item parcels for each of the school readiness sub factors (social and emotional development, approaches to learning, communication, and cognitive development and general knowledge) were formed to control for inflated measurement errors caused by multiple items. These parcels were created using an item-to-construct balance approach, that is., successively assigning highest and lowest loading items across parcels (Little, Cunningham, Shahar, & Widaman, 2002).

Results

Preliminary analysis

The correlations among the variables, and the mean, standard deviation, skew-

Table 1
Mean, Standard Deviation (SD), and intercorrelations among the study measures.

	Gender	Months	Sociability	Activity	Emotionality	AS	PPI	SED	AL	Comm	CD & GK
Gender	1										
Months	.040	1									
Sociability	-.094	.033	1								
Activity	-.127	.039	.466**	1							
Emotionality	.165*	.067	-.287**	-.107	1						
AS	-.039	.016	.136	.076	-.262**	1					
PPI	.171*	-.127	.286**	-.016	-.222**	.240**	1				
SED	-.138	-.126	.242**	.079	-.308**	.137	.110	1			
AL	.127	-.051	.202**	.103	-.132	.163*	.262**	.594**	1		
Comm	.117	-.076	.243**	.104	-.112	.133	.252**	.486**	.678**	1	
CD & GK	.100	-.074	.167*	.059	-.141	.158*	.264**	.455**	.655**	.702**	1
M	0.480	74.88	3.435	3.847	2.861	0.478	3.412	3.505	3.513	3.613	3.663
SD	0.501	1.451	0.544	0.682	0.675	0.256	0.474	0.394	0.399	0.440	0.357
Skewness	0.081	.394	-0.274	-0.599	0.246	-1.960	-0.247	-0.638	-0.554	-0.640	-0.865
Kurtosis	-2.017	.076	-0.439	0.413	-0.198	5.742	0.028	-0.218	-0.663	-1.029	0.025

AS: attachment security; PPI: peer play interactions; SED: social and emotional development; AL: approaches to learning; Comm: Communication; CD & GK: cognitive development & general knowledge.

* and **: Correlation is significant at the 0.05 and 0.01 level (2-tailed), respectively.

ness, and kurtosis values of the variables are presented in Table 1. The criteria for the assumption of a normal distribution were satisfied with an absolute skewedness value of three or less and an absolute kurtosis value of 10 or less (Curran, West, & Finch, 1996).

Measurement model

The measurement model comprised of four latent factors (peer play interaction, social and emotional development, approaches to learning, communication, and cognitive development & general knowledge) and 12 observed variables. The preliminary analysis of the measurement model provided an excellent fit to the data. $\chi^2 = 81.479$, $df = 63$; $p = .059$; CFI = .982, TLI = .973, SRMR = .041, RMSEA = .041 (the 90% confidence interval of RMSEA was .000 -.065). Reliable factor loadings were found for the indicators of the latent variables, indicating that respective indicators were true representative of their latent factors.

Table 2
Bootstrapping indirect effects and 95% confidence intervals (CI) for the mediational model.

Model pathways	Point estimates	95% CI	
		LI	UI
AS → PPI → SED	.059*	.001	.139
AS → PPI → AL	.061*	.016	.145
AS → PPI → Comm	.062*	.013	.144
AS → PPI → CD & GK	.079**	.015	.156

AS: attachment security; PPI: peer play interactions; SED: social and emotional development; AL: approaches to learning; Comm: Communication; CD & GK: cognitive development & general knowledge

* and **: Correlation is significant at the 0.05 and 0.01 level (2-tailed), respectively.

Structural model

To test the hypothesized model, the partial mediation model with direct paths from attachment security and school readiness domains (social and emotional development, approaches to learning, communication, and cognitive development & general knowledge) and indirect paths from attachment security and school readiness mediated via peer play interaction, was estimated. The partial mediation model had $\chi^2 = 224.204$, $df = 143$; $p = .000$ and all fit indices indicating a good approximate fit: CFI = .930, TLI = .907, SRMR = .225, RMSEA = .057 (the 90%

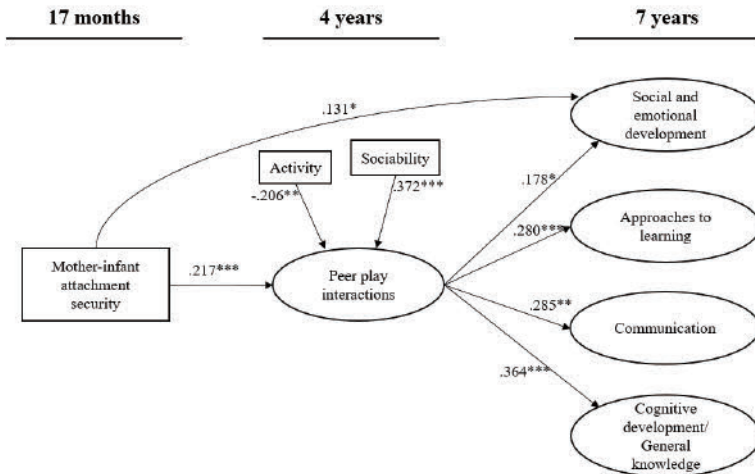


Figure 2. The structural equation model regarding the relationship between mother-infant attachment security, peer play interactions, and school readiness domains. Note: Path coefficients are standardized.

confidence interval of RMSEA was .042 - .071). On the basis of these results, it could be concluded that the hypothesized model was suitable. Standardized parameters are presented in Figure 2. In the model, attachment security had a direct influence on social and emotional development ($\beta = .131, p < .05$) and a positive influence on peer play interaction ($\beta = .217, p < .001$), followed by school readiness. Specifically, peer play interaction had an influence on social and emotional development ($\beta = .178, p < .05$), approaches to learning ($\beta = .280, p < .01$), communication ($\beta = .285, p < .01$), and cognitive development & general knowledge ($\beta = .364, p < .001$).

Assessment of mediation

Bootstrapping procedures were used to test the significance of the mediation effects of peer play interaction. We generated 200 bootstrapping samples from the original data set ($N = 175$) by random sampling. The mediating effect of peer play interaction and its associated 95% confidence intervals are displayed in Table 2. It was found that attachment security exerted indirect effect on school readiness domains (social and emotional development, approaches to learning, communication, and cognitive development & general knowledge) through the mediating effect of peer play interaction.

Discussion

School readiness is understood as a product of the developmental process that cumulates over time and is affected by social relationships within different environmental contexts (Bronfenbrenner & Morris, 1998; Mashburn & Pianta, 2006). Studies have shown that child–mother attachment at home and peer relationships in classroom play critical roles in the developmental trajectories of school readiness skills (e.g., Belsky & Fearon, 2002; Moon & Jang, 2019; Bulotsky-Shearer et al., 2012; Ladd et al., 2008; Williford et al., 2018). Building upon this body of research, the present study examined the prospective associations among mother–infant attachment security, peer play interactions, and school readiness and the role of early attachment security and peer play interactions as developmental pathways for school readiness from infancy to the transition to school age, using contemporary and nationally representative PSKC data.

The current findings revealed that attachment security at 17 months had a direct effect on the social and emotional development domains of school readiness in the transition to school age over time. In other words, social and emotional development at age 7 increased with increasing infant attachment security at 17 months. This shows that attachment relationship established with mother at 17 months continues on as an internal working model, impacting social and emotional development at age 7 (Ainsworth, 1978) and early attachment security plays an important role in the development of social and emotional readiness skills (i.e., the ability to follow directions, work in a group, engage in classroom tasks, and control impulses). Sroufe (1983) found that children who formed an insecure attachment at 12 months and 18 months exhibited lower levels of interest, empathy, compliance, and sociability in early childhood, revealing a close link between attachment relationship and social and emotional development. Granot and Mayseless (2001) confirmed the link between insecure attachment and lower levels of socioemotional skills. The current study supports previous findings that school readiness, particularly social and emotional development, can be predicted on the basis of mother–infant attachment relationship (e.g., Belsky & Fearon, 2002; Moon & Jang, 2019; Raikes & Thompson, 2008). On the other hand, children with insecure attachments are at an increased risk of facing behavior problems and these may lead to poor socioemotional school readiness skills (Moon & Jang, 2019). In a longitudinal study from infancy to early childhood, Shim and Lim (2019) found that insecurely attached infants at 17 months exhibit more internalizing behaviors, such as depression, withdrawal, and anxiety, and externalizing behavioral prob-

lems, such as aggression, impulsivity, and distraction at age 6 than their counterparts with secure attachments. Kochanska and Kim (2013) reported that insecure attachment during infancy has a causal relationship with child anger proneness and subsequent antisocial behavioral problems. Taken together, these findings are consistent with the view that a secure attachment is influential during the emergence of developmental outcomes (Raikes & Thompson, 2008), and that the security of mother-infant attachment relationships is a reliable predictor of children's later social and emotional development (Belsky & Fearon, 2018). Consequently, education and counseling programs for parents of infants need to be developed and implemented to help mothers foster a secure relationship with their infants through sensitive and responsive interactions (Lee, 2002). Specifically, practical programs that impart knowledge about infant development and parenting, desirable parenting methods, and age-specific play activities that promote attachment are needed to bolster parent-child attachment.

As expected, peer play interactions at age 4 had a positive effect on school readiness at age 7. In other words, school readiness at age 7 increased in all four domains with increasing positive peer play interactions at age 4. From the perspective of the zone of proximal development by Vygotsky (1978), peers play the pivotal role of a helper during young children's transition from the level of actual development to level of potential development. Ladd et al. (2008) found that young children achieve development by helping peers, through which they undergo social and cognitive learning. Singer, Golinkoff, and Hirsh-Pasek (2006) also stressed that children actively practice their understanding of language and expand their cognition during peer play. Slicker and Hustedt (2020) observed that children may not only gain exposure to sophisticated language and other academic skills through play and peer conversation, but also acquire varied approaches to learning and other essential social and emotional regulation skills required for school readiness. These studies have shown that peer interactions during play have a powerful impact on the development of school readiness skills. The findings of the current study are in line with previous results that show that reciprocal and positive peer interactions during play reinforce young children's learning readiness skills (e.g., Lim, 2020; Song, 2019) and that interactions in a peer play context are strongly associated with young children's school readiness (e.g., Choi & Kim, 2019; Fantuzzo et al., 2005; Min, 2019). The current findings also bolster the results of previous studies in that positive peer experience in preschool is associated with social and academic competence in formal schooling (e.g., Bulotsky-Shearer et al., 2012) and that children with high levels of disconnection from peers show the lowest levels

of achievements in reading, language, and mathematics in third grade (e.g., Sekino, 2007). Considering the importance of peer play interactions, the classroom must provide opportunities to promote positive peer interactions through which peers can support, model, and extend early learning, literacy, or mathematics skills (e.g., Bulotsky-Shearer et al., 2012). Therefore, teachers need to develop and implement support for positive peer interactions within the classroom.

In line with our expectations, attachment security at 17 months affected school readiness at age 7 through the mediation of peer play interactions at age 4. In other words, higher infant attachment security at 17 months was associated with more positive play interactions at age 4, and this led to higher school readiness at age 7. Particularly, attachment security at 17 months improved school readiness at age 7 through the mediation of peer play interactions at age 4 even after controlling for temperament, which is a determinant of peer play interactions at age 4 (Shim & Lim, 2019), and controlling for sex and monthly age, which significantly impact school readiness at age 7 (Hair et al., 2006; Min, 2019). More specifically, higher attachment security at 17 months was associated with reciprocal and positive peer play interactions at age 4, which in turn led to a positive effect on all four school readiness domains. It can be interpreted that infant attachment security determined the quality of peer play interactions (Oh & Lee, 2020), and peer play interactions, in turn, manifested as social and interactive play behaviors, which ultimately improved school readiness skills.

These findings suggest that, first, attachment security during infancy served as a safe haven and secure base for children as they transitioned to school age, when their significant social environment shifts from home to school (Yun, 2021). That is, children with secure histories of attachment consider parents as a secure base from which they begin to explore new environments and a safe haven to return to when they need to feel safe, comforted, or delighted (Ainsworth, 1978). Thus, those having a secure base and safe haven tend to function better emotionally, socially, and academically than their counterparts (Sroufe, 2005) in the transition to school age. In the developmental process toward school readiness, the security of infant attachment relationships provides a foundation for the formation of the peer group, and peer interactions during play, in turn, promote academic, language, and social-emotional competencies (Williford et al., 2018). Particularly, these findings, from a sample of the Korean population, add to the general literature as they highlight the stability of early attachment over time (e.g., Sroufe, 2005) and provide consistent evidence that the relationship between quality of parenting and attachment security is observable across a wide range of cultural con-

texts (e.g., Belsky & Fearon, 2018). Consequently, it is imperative that infants form a secure relationship with their parents in order to successfully prepare for school, achieve successful performance, and adjust to elementary school. Second, school readiness skills resulted from the accumulating effects of the benefits of secure attachment and positive peer interactions. Consequently, the quality of daily interactions experienced at home and in the classroom may be the key mechanism supporting young children's learning and development (Bronfenbrenner & Morris, 1998). Fisher, Hirsh-Pasek, Golinkoff, Singer, & Berk (2011) emphasized that young children's learning and social and emotional adjustment are more heavily influenced by the quality of social interactions they experience in their daily lives, as opposed to their individual academic skills. Maxwell and Clifford (2004) noted that young children's skills and development before school entry are substantially influenced by their interactions with family and others as well as the environment. Williford et al. (2018) stressed that school readiness skills such as academic, language, and social-emotional competencies are developed through social relationships with peers, family, and teachers. Taken together, our findings demonstrate that sensitive and supportive interactions with mother and peers are the basis and the most important foundation for developing school readiness skills in young children and that school readiness is dependent upon the contexts in which learning occurs—contexts which include the home and school environment (Hair et al., 2006).

The present study is the first empirical study to examine the predictive significance of early attachment security and peer play interactions for school readiness developmental pathways in Korea. The findings of this study highlight the central role played by the quality of early attachment relationships and types of peer interactions in achieving the goal that all children enter school ready to learn (Mashburn & Pianta, 2006). In particular, we found that infant attachment security at 17 months had an indirect effect on all domains of school readiness skills at age 7 through the mediation of peer play interactions at age 4, and simultaneously, it had a direct effect on the social and emotional development domain of school readiness at age 7. These findings suggest that security of early attachment relationships provide children with specific social and emotional skills required for successful school performance (Berneir et al., 2015), and is essential for all domains of school readiness (social and emotional development, approaches to learning, communication, and cognitive development and general knowledge). Additionally, this study not only found a temporal and causal association among early attachment security, peer play interactions, and school readiness skills, but

the mediating effect of peer play interactions on the relation between infant attachment security and children's school readiness was also observed. These findings support that school readiness skills are a function of a child's early attachment history and their subsequent developmental experience with peers (Belsky & Fearon, 2002). Moreover, there is evidence of mechanisms linking both infant attachment security and peer play interactions with school readiness skills.

These findings lead to the identification of many potential targets for primary prevention and intervention efforts that improve school readiness, such as building and strengthening relationships between children and parents and children and peers. There are four specific implications of these findings. First, children need to engage in sensitive and responsive interactions with their mother at home, that is, their primary environment. This is because the quality of interaction with one's mother determines the quality of the attachment relationship, and leads to the development of an internal working model that continuously influences subsequent approaches to building social relationships (Bretherton & Munholland, 2018). Thus, various parental education programs should be initiated to help mothers engage in positive interactions and establish secure attachment with their infant. For example, education programs emphasizing the importance of attachment, caregiver roles, and sensitivity, responsiveness, consistency, and skills of parenting can help foster secure infant attachment (Shim & Lim, 2019). Second, various educational activities and programs must be provided to young children to allow them to experience meaningful play interactions with their peers. Recently, in Korean society, an increasing number of young children have been placed in an "intentional play disconnection" set-up owing to the rampant "early education" by parents (Choi & Kim, 2019). Play disconnection, the inability to participate in play, and play disruption, the aggressive and negative expression of oneself, have an adverse effect on children's school readiness skills (e.g., Bulotsky-Shearer et al., 2012; Sekino, 2007). Particularly, negative peer play interactions not only have a detrimental effect on social and emotional development but also adversely impact mathematical thinking and linguistic abilities of young children (Choi & Kim, 2019). Thus, it is important to note that peer play interactions among young children can influence their social relationships as well as the development of school readiness in later years, and therefore, actively pay attention to ways to facilitate and support peer play interactions. For instance, programs that target improvement of social and emotional skills, such as sharing interest in others' areas of interest, understanding others' emotions, sharing ideas with peers, cooperative problem solving, and self-regulation, can facilitate and boost peer interactions (Youn,

Kwon, & Son, 2004). Third, early childhood education programs should actively implement parental education regarding elementary school entry to assist in children's smooth transition to elementary school. Since Korean parents recognize elementary school as the onset of formal schooling and understand school readiness as a concept related to focusing on academic skills (Kim & Chung, 2017), their understanding of the importance of a holistic view of the child should be deepened, considering multiple school readiness domains, including social-emotional, learning behaviors, cognitive, and physical development, by offering an elementary school transition program. These programs should aim to teach parents the importance of helping their children acquire skills such as self-regulation, problem solving, and maintaining social relationships, as opposed to focusing only on academic skills, such as reading, writing, and counting. Moreover, the results of the current study will serve as evidence to rectify the incorrect belief—that cognitive skills and literacy are indicators of later successful school performance and adjustment—prevalent among Korean parents. Finally, a new teacher, a new peer group, a larger child-to-adult ratio, an unfamiliar school environment, and less time for free play along with a heightened orientation toward learning trigger tremendous stress in children (Bernier et al., 2015). It is necessary to expand elementary school curricula to include components which promote children's behavioral and emotional adjustment (Ladd et al., 2008). Various practice programs that help young children adjust to elementary school are also required. For example, intensive programs to improve elementary school readiness, kindergarten–elementary connection program to help children adjust to elementary school, and elementary school adjustment program should be developed and implemented (An, 2014). These programs will enable young children to develop positive emotions, such as hopeful expectations for a new environment and understand and practice the attitudes and abilities demanded in elementary school.

Several limitations from this study need to be considered. First, although we controlled for temperament, sex, and monthly age, which influence peer interactions in early childhood and school readiness in transition to school age, respectively, future studies should also control for other covariates of infant attachment, such as infant's temperament and cognitive development, mother's attachment to their parents, temperament, personality, and education level (Sroufe, 2005), in order to examine the relation among attachment security, peer play interactions, and school readiness in more depth. Second, we distinguished attachment security between infancy and early childhood, but continued collection of the PSKC longitudinal data would allow future studies to also include childhood and

adolescence while examining whether attachment security continues to influence educational achievement and social and emotional competences during elementary school years, whether school readiness skills influenced by attachment security and peer interaction endure over time, and whether they are associated with later academic, social and emotional outcomes in middle childhood. Finally, young children's school readiness results from a large number of interinfluencing factors that are related to the children themselves, their immediate environment (Rimm-Kaufman & Pianta, 2000), and changes societal pedagogical attitudes. Thus, investigating the effects of these factors in consideration of various environmental variables that can influence school readiness (e.g., child's personal traits, parenting behaviors, family environment, teacher-child interaction) based on an ecological developmental perspective is necessary.

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