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Home learning activities and parental autonomy support as predictors of pre-academic skills: the mediating role of young children's school liking

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Abstract

This study investigated the mediating role of children's school liking between parent-child interactions and children's pre-academic skills. Specifically, parent-child interactions included frequency of mothers' and fathers' formal and informal home learning activities with children, as well as their autonomy support during these activities. Three hundred first-year kindergarteners were tested on two aspects of pre-academic skills, namely oral vocabulary and object counting, while their mothers and fathers reported parent-child interactions and children's school liking. Structural equation modeling showed that after controlling for demographic variables, mother-child informal learning activities and mothers' and fathers' autonomy support were positively linked to children's pre-academic skills via school liking. Father-child informal learning activities and mother- and father-child formal learning activities were not related to children's school liking nor to pre-academic skills. Our findings suggest that more coaching can be provided to parents on how to promote children's school liking and pre-academic skills.

Keywords: autonomy support, pre-academic skills, home learning activities, school liking

Home Learning Activities and Parental Autonomy Support as Predictors of Pre-academic Skills: The Mediating Role of Young Children's School Liking

Children's pre-academic skills including emergent language and numeracy skills are important academic precursors (Beecher et al., 2018; Mascareño et al., 2014; McCoy et al., 2019), which are often predictive of later academic success (Aunio & Niemivirta, 2010; Duncan et al., 2007; LeFevre et al., 2010; Lever & Sénéchal, 2011). In recent years, there has been growing evidence that the home learning environment plays a vital role in the development of pre-academic skills (e.g., Cheung et al., 2021; Mutaf-Yıldız et al., 2020; Silinskas et al., 2020). The home learning environment includes not only the learning activities provided by parents at home, but also the ways they guide children's learning (Dearing & Tang, 2010). Some notable research gaps, however, exist. First, despite numerous studies on the relations between the frequencies of formal and informal home learning activities and children's academic outcomes (e.g., Skwarchuk et al., 2014), the possible effects of parents' interaction style during such activities have not been thoroughly explored. Second, prior studies show that parent-child interaction processes during joint activities sometimes vary according to the gender of parents (Huang et al., 2020). Nevertheless, relatively little is known whether the home learning experiences provided by mothers and fathers have differential contributions to children's pre-academic skills. Third, though children's academic socialization can take place in both the family and school, few studies have examined the link between the children's home learning environment and their feelings towards school. This topic is worth pursuing because school liking can motivate children to participate actively in classroom activities and thus facilitate their acquisition of academic skills (Ladd et al., 2000).

In view of the above, this study sought to investigate whether formal home learning activities, informal home learning activities, and autonomy support by mothers and fathers

were associated with children's pre-academic skills. We also explored whether these relations were mediated by children's school liking.

1. The Home Learning Environment and Children's Pre-academic Skills

The bioecological systems theory states that children's development is shaped by their interactions with the environmental contexts in which they live (Bronfenbrenner & Morris, 2006). At the proximal level, parents' engagement of children in home learning activities and their style of interactions are important factors in the home environment that influence children's academic skill acquisition (Cheung et al., 2021; Denton et al., 2003; Katz et al., 2011; Melhuish et al., 2008; Rodriguez & Tamis-LeMonda, 2011; Zhang et al., 2019).

1.1. Home Learning Activities

Home learning activities can be classified into two types according to their goals. Formal home learning activities refer to activities in which parents teach children academic skills explicitly and directly (Sénéchal & LeFevre, 2002; Skwarchuk et al., 2014). Examples include direct instruction of vocabulary, practice writing of alphabets in workbooks, and communication about number facts (LeFevre et al., 2010; Manolitsis et al., 2013; Sénécha et al., 1998). Informal home learning activities refer to activities in which teaching is not the primary goal but takes place implicitly (Sénéchal & LeFevre, 2002; Skwarchuk et al., 2014). Examples include reading storybooks, measuring ingredients during cooking activities, and playing games that involve letters and numbers (Sénécha et al., 1998; Huang et al., 2017; Mutaf-Yıldız et al., 2018). From the perspective of skill development models, home learning activities can promote academic performance because they provide opportunities for children to be taught by parents and to practice the skills (Pomerantz et al., 2012).

In the literature, there is some support for the positive impact of both formal and informal home learning activities on young children's pre-academic skills. For instance, in the study by Hindman and Morrison (2012), the more frequently the parents taught letters and

sounds at home, the better their preschool children's alphabet knowledge. Huntsinger et al. (2016) found that the frequency of formal mathematics activities initiated by parents (such as asking children to practice simple addition and subtraction) predicted preschool and kindergarten children's mathematics performance the following year. With respect to informal home learning activities, Barnes and Puccioni (2017) demonstrated that shared reading was associated with preschoolers' reading skills. Cheung and McBride (2017) showed that regular number board game playing improved kindergarten children's ability to identify numbers. Nevertheless, in the study by Liu et al. (2018), neither formal nor informal home literacy activities had significant correlations with kindergarteners' word reading skills. Meanwhile, S.-Z. Zhang et al. (2020) found that second grade children's reading comprehension was predicted by their participation in formal but not informal literacy activities during the kindergarten years. X. Zhang et al. (2020) revealed that although informal numeracy activities contributed to preschool children's mathematical knowledge, formal numeracy activities did not.

These inconsistent results, on the one hand, may be attributed to methodological differences across studies (Cheung et al., 2018). On the other hand, they may imply that some important aspects of the home learning environment have not been taken into consideration when the topic is investigated.

1.2. Autonomy Support

One major aspect of the home environment concerns the ways parents interact with children (Dearing & Tang, 2010; Katz et al., 2011; Pomerantz, et al., 2012), among which the role of parental autonomy support in children's academic achievement has attracted considerable attention from researchers. Autonomy support refers to the practices of fostering children's ability to plan and regulate their own behaviors (Ryan & Deci, 2008; Ryan et al., 2006). Examples include engaging children in problem solving and supporting children to

explore the surrounding environment independently. In general, parents who are more autonomy supportive tend to have children with better pre-academic skills (for review, see Vasquez et al., 2016). One common explanation for this is based on the self-determination theory, which suggests that autonomy is one of the basic psychological needs. Thus, learning settings that support autonomy can boost children's academic motivation and academic achievement (Chirkov, 2009; Ryan & Deci, 2000; Vasquez et al., 2016).

In spite of these findings, studies in the field often focus on the effects of general autonomy-supportive parenting practices, or autonomy support for homework completion, on school-aged children and adolescents (Cimon-Paquet et al., 2020; Katz et al., 2011). Of the several studies conducted with young children, there is evidence that autonomy support provided by mothers in infancy was associated with expressive vocabulary at age two (Matte-Gagné & Bernier, 2011) and pre-mathematical skills at age three (Sorariutta et al., 2017). Similarly, in the study by Cimon-Paquet et al. (2020), the more the mothers supported toddlers' autonomy during joint play, the better their mathematical performance in elementary school. Bindman et al. (2015) even showed that maternal autonomy support in the first three years of life predicted children's elementary and high school achievement in reading and mathematics. Despite the above, there is still a lack of research on parents' autonomy support for preschool children during home learning activities.

1.3. Mothers Versus Fathers

Another possible reason for the inconsistent findings regarding the relation between home learning activities and children's pre-academic skills is that many prior studies have not examined the home learning experiences provided by mothers and fathers separately. However, mothers and fathers sometimes vary in their ways of interacting with children. For example, Aram (2010) observed that fathers provided four- to six-year-old children with less guidance than mothers during writing activities. In contrast, Malin et al. (2014) found that

fathers used more metalingual talk than mothers when reading with two-year-old children. In a study by Huang et al. (2021), compared to mothers, fathers showed less cognitive support to their kindergarten children during a worksheet activity and a game activity, but more autonomy support in the game activity. Perhaps because of such differences, the activities and support provided by mothers and fathers exert some differential influences on children's learning outcomes. Specifically, del Rio et al. (2017) found that mother-child formal numeracy activities predicted kindergarteners' mathematical achievement, but father-child formal numeracy activities did not. Huang et al. (2021) also demonstrated that the level of cognitive support provided by mothers, but not fathers, during role play was related to kindergarten children's numeracy skills. To date, few if any studies have examined the effects of different types of home learning activities provided by mothers and fathers concurrently on children's early academic development. Further investigations are thus warranted to address this research gap.

2. School Liking as Mediator

School liking refers to positive feelings toward school (Ladd et al., 2000). It is a form of emotional engagement in school and indicates good school adjustment (Birch & Ladd, 1997; Ladd & Dinella, 2009).

2.1. Children's School Liking and Pre-academic Skills

Theoretically, school liking is imperative for pre-academic skills. According to the school engagement hypothesis, mere attendance at school does not necessarily guarantee learning (Fredricks et al., 2004). Children develop pre-academic skills only when they engage in school in ways conducive to learning (Fredricks et al., 2004; Ladd & Dinella, 2009). Therefore, school liking can motivate children to participate more in the classroom and engage in cooperative behaviors, such as being attentive and following teachers' instructions, which in turn boost their academic performance (Ladd et al., 2000). To date, this notion has

received some empirical support from studies on children of different grade levels: Ladd et al. (2000) found that kindergarten children's school liking was positively linked to achievement via cooperative participation in classroom activities. Ladd and Burgess (2001) showed that school liking was an antecedent of first graders' performance in reading and mathematics. In the study by Valiente et al. (2007), a positive correlation was observed between elementary school children's school liking and pre-academic skills. Ladd and Dinella (2009) even demonstrated that lower elementary school children's school liking predicted their academic achievement trajectories from Grades 1 to 8.

2.2. The Home Learning Environment and Children's School Liking

Children's level of school liking is determined by their experiences at school, such as the degree to which they are accepted by peers or have conflicts with teachers (Birch & Ladd, 1997; Eggum-Wilkens et al., 2014). There are, however, theoretical arguments that home learning activities and autonomy support provided by parents can also contribute to children's school liking; and this may help explain how the home learning environment benefits children's achievement given the importance of school liking in the development of pre-academic skills. As proposed by motivation development models (Pomerantz et al., 2012), parents' involvement in children's learning and autonomy support can foster children's understanding about the value of schooling and develop their confidence in learning the tasks. This subsequently can motivate children to engage in school and enjoy schooling (Pomerantz et al., 2012). Among existing studies, Lau and Power (2018) showed that mothers' engagement of children in language and cognitive activities during kindergarten years predicted children's adjustment to primary school, including school liking. Jung (2016) demonstrated that the frequency of parent-child reading and play activities at home was positively associated with kindergarten children's attitudes towards school. Annear and Yates

(2010) found that the higher the mothers' autonomy support level, the more their primary school-aged children liked the school.

To sum up, both theoretical analysis and empirical findings suggest that the home learning environment is linked with children's school liking, and children's academic performance is partly affected by their school liking. Nevertheless, there is minimal attention in past research regarding the potential mediating role of young children's school liking between the home learning environment and pre-academic skills. It is hence worthwhile to explore the issue.

3. Current Study

In light of the research gaps discussed above, this study examined whether school liking mediated the relation between young children's home learning environment and pre-academic skills. Family plays an important role in the development of pre-academic skills (Cheung et al., 2021), which in turn has significant contributions to subsequent school achievement (Duncan et al., 2007; Watts et al., 2014). Nonetheless, little has been done to examine different aspects of the home environment during early childhood years. In the current study, three aspects of the home learning environment, including the frequency of formal home learning activities, the frequency of informal home learning activities, and the level of autonomy support provided by parents during home learning activities were of our interest. Together, these processes could provide a comprehensive picture of the home learning environment, as they captured the frequency, types, as well as the quality of the home learning experiences. To investigate whether the home learning experiences provided by mothers and fathers were similarly associated with children's outcomes, the processes were examined as a function of the parents' gender. We used oral vocabulary and object counting skills as indicators of children's pre-academic skills because they are two key academic skills that are expected to develop rapidly during early kindergarten years

(Curriculum Development Council, 2017). Last but not least, children's gender, age, parental education, and families' income were included in our model as control variables, as they have been found to be associated with children's school liking and pre-academic skills in some previous studies (Cheung et al., 2018; Dulay et al., 2018; Eggum-Wilkens et al., 2014; Valiente et al., 2007).

Data from this study were collected from families in Hong Kong. Generally, parents in Hong Kong place high importance on children's academic performance (Lam, 1999). They tend to prioritize behavioral discipline over autonomy supportive parenting practices (Chao, 1994; Wang et al., 2007). In recent decades, with the advocacy of the government, the importance of child-centered learning in early childhood education has been increasingly valued by local parents (Chan & Yeung, 2020). They are thus more likely to respect children's thoughts and feelings and help children become autonomous. In terms of gender roles in parenting in Hong Kong, though fathers traditionally play the role of breadwinners and do not get involved much in childrearing, it is now becoming more common for fathers to be involved in children's education, perhaps because of the influence of Western ideology of parenting (Kwok et al., 2013; Lau, 2016).

Based on the literature (e.g., Annear & Yates, 2010; Barnes & Puccioni, 2017; Bindman et al., 2015; Huntsinger et al. 2016; Ladd et al., 2000; Lau & Power, 2018), a conceptual model regarding the relations between the home learning environment, children's school liking, and children's pre-academic skills were proposed (see Figure 1). Specifically, we hypothesized that formal home learning activities, informal home learning activities and autonomy support provided by mothers and fathers would be significantly correlated with children's pre-academic skills after controlling for children's gender, age, parental education and families' income, with the links between maternal variables and children's pre-academic

skills stronger than the links between paternal variables and children's pre-academic skills. In addition, the relations would be mediated by children's school liking.

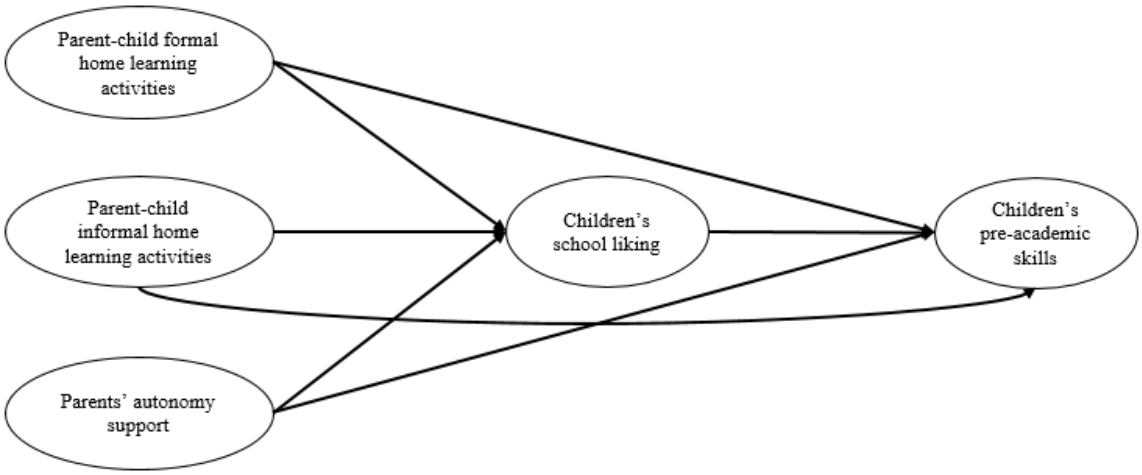

Fig. 1. Conceptual Model Regarding the Relations Between the Home Learning Environment, Children's School Liking, and Children's Pre-academic Skills.

4. Method

4.1. Participants

This study was part of a larger project aiming to study children's school readiness [MASKED]. Human subjects approval was obtained from the University of the corresponding author, and the study was conducted in accordance with the ethical standards of the American Psychological Association. Three hundred first-year kindergarten children (49.10% girls) and their maritally intact mothers and fathers were recruited in Hong Kong through school invitations and mass mailing. Informed consent was collected from the schools and the parents. Single-parent families which made up about 4% of our original sample were excluded. This percentage was slightly smaller yet comparable to children living in single-parent households in Hong Kong (i.e., 9% of the families with children under 18 years old; Hong Kong Council of Social Service, 2021).

The age of children ranged from 34.73 to 55.66 months (M = 46.36, SD = 3.77). The median monthly household income was HK$30,001-HK$40,000 (~US$3,846.28-US$5,128.21), as represented by a score of 5 on our scale. The figure was similar to government data obtained in Hong Kong (Census and Statistics Department, 2019). In terms of education, a total of 51.93% of mothers and 54.44% of fathers completed secondary school or above.

4.2. Measures and Procedures

Parents completed questionnaires on home learning activities, style of learning involvement, children's school liking attitude, and demographics. Children completed behavioral tasks that assessed their pre-academic skills.

4.2.1. Formal and Informal Home Learning Activities

Home learning activities were assessed using a 14-item scale adapted from Stipek et al., 1992). Mothers and fathers rated the frequency of different types of formal literacy and numeracy activities (4 items) and informal ones (10 items) over a week on a 5-point scale from 1 (*never*) to 5 (*nearly every day*). The sample items included, "Teach about letters or reading with store-bought or homemade materials, like flashcards or workbooks (formal activities)" and "Play with toys that involve numbers or arithmetic, for example, number-related blocks and puzzles (informal activities)". Higher averaged scores indicated a higher frequency of engaging in formal or informal home learning activities with children. Confirmatory factor analysis indicated that the two-factor model of formal home learning activities (4 items) and informal home learning activities (10 items) yielded acceptable fit to the data, mother-report: $\chi^2(68) = 221.35$, $p < .001$, CFI = .93, TLI = .91, RMSEA = .09, SRMR = .05, father-report: $\chi^2(68) = 195.12$, $p < .001$, CFI = .96, TLI = .95, RMSEA = .08, SRMR = .04. Hence, the measure was adequate for use in the sample. In this sample, the Cronbach's alphas of mothers' and fathers' reports of formal home learning activities

were .82 and .91 respectively. The Cronbach's alphas of mothers' and fathers' reports of informal home learning activities were .91 and .95, respectively.

4.2.2. Parents' Autonomy Support

Mothers and fathers completed a 5-item scale of parents' autonomy support of children's learning activities (Katz et al., 2011). Participants rated their style of involvement in children's learning activities on a 5-point scale, ranging from 1 (*never*) to 5 (*always*). Sample items included, "I allow my child to talk about things that annoy him/her in the learning activities" and "I explain to my child why it is important to learn and do the learning activities". We believe that parents' self-reported autonomy support is consistent with their observed behaviors, as the meta-analysis by Hendriks et al. (2017) found a significant correlation between parent-reported and observed parenting (including positive, negative and controlling practices). Higher scores indicated a higher level of autonomy support towards children's learning activities. In this sample, the Cronbach's alpha of mothers' and fathers' reports were .83 and .87, respectively.

4.2.3. Children's School Liking

Mothers and fathers completed a 5-item measure of children's school liking (Ladd et al., 2000). Specifically, they rated their children's positive attitude towards the school on a 5-point scale, ranging from 1 (*never*) to 5 (*always*). Sample items included "Tells me about good things that have happened at school" and "Tells me about school events that he/she thinks are funny or humorous". Higher scores indicated a higher level of school liking. The reliability and validity were tested in a study with modest support of reliability and validity (Smith, 2011). In this sample, the Cronbach's alpha of mothers' and fathers' reports were .59 and .64, respectively.

4.2.4. Children's Pre-academic Skills

4.2.4.1. Object Counting Task

The Object Counting Task by Cheung et al. (2018) was used. There was a total of 14 trials in the task. In each trial, children were asked to tell the number of animals shown on a sheet by counting them aloud. Each correct answer was awarded a score. Higher total scores indicated better performance in object counting. In this sample, the Cronbach's alpha of the task was .92.

4.2.4.2. Oral Vocabulary Task

The Oral Vocabulary Task by Ho et al. (2011) was adopted (see also Fung & Chung, 2021). The task consisted of 20 trials, each with a word that often appeared in books for kindergarteners. In each trial, participating children looked at a picture (e.g., a spoon) and were asked to tell its name and function. Each correct answer on the name or function was awarded a score of two, whereas a relevant but ambiguous name or function was awarded a score of one. Higher total scores indicated better performance in oral vocabulary. In this sample, the Cronbach's alpha = .80.

4.3. Statistical Analyses

Structural equation model was conducted using MPLUS, Version 8 (Muthén & Muthén, 2017). A structural equation model was used to investigate the mediating effect of school liking between children's home learning environment (i.e., formal or informal learning activities and parents' autonomy support) and children's pre-academic skills, over and above the effects of gender, age, parental education level, and household income level. A latent construct of mothers' and fathers' reports of children's school liking was created to assess children's school liking more objectively. Another latent construct was also created for children's pre-academic skills via the object counting task and the oral vocabulary task. In the structural equation model, we tested all possible direct paths from children's home learning environment and exogenous predictors to children's pre-academic skills, as well as indirect paths via children's school liking. The fit of the model was considered as acceptable if the

CFI and TLI values were .90 or above (Bentler, 1990), the RMSEA value were .10 or below (MacCallum et al., 1996), and the SRMR value were .05 or below (Byrne, 1998).

5. Results

Table 1 shows the zero-order correlations, means, and standard deviations of the variables. As shown in Table 1, the zero-order correlations of the home learning environment variables and children's school liking with children's pre-academic skills (i.e., oral vocabulary and object counting) were all low, with ρs ranging from .06 to .22. This indicated that the effect sizes were rather small according to Cohen (1992).

The structural equation model fit adequately to the data, $\chi^2(41) = 49.31$, $p = .18$, CFI = .97, TLI = .97, RMSEA = .03, SRMR = .03 (see Figure 2 and Table 2). In the measurement model, children's school liking and pre-academic skills were significantly indicated by their respective manifest variables, ps < .001. In the structural model, after controlling for demographic variables including children's gender, age, mothers' education, fathers' education, and families' monthly income, mother-child informal home learning activities (B = .15, SE = .06, β = .22, p < .01), mothers' autonomy support (B = .27, SE = .07, β = .32, p < .001), and fathers' autonomy support (B = .14, SE = .06, β = .19, p < .05) were positively associated with children's school liking. However, mother-child formal home learning activities, father-child formal home learning activities, and father-child informal home learning activities were not related to children's school liking (ps > .05). Children's school liking, in turn, was associated with children's pre-academic skills (B = 1.71, SE = .86, β = .23, p < .05). Children's gender was related to school liking (B = .17, SE = .06, β = .17, p < .01), but not pre-academic skills (p > .05). Children's age was related to pre-academic skills (B = .37, SE = .09, β = .37, p < .001), but not school liking (p > .05). Similarly, fathers' education was related to pre-academic skills (B = .61, SE = .21, β = .35, p < .01), but not

school liking ($p > .05$). Mothers' education and families' monthly income were not associated with school liking and pre-academic skills ($ps > .05$).

Building on the above findings, bootstrapping was conducted to determine the indirect effects. Based on 10,000 bootstrap samples with replacement, the 95% confidence interval (CI) indicated that the unstandardized indirect effect between mother-child informal home learning activity and children's pre-academic skills did not include a zero (CI: [.02, .89]). Similarly, the 95% CI indicated that the indirect effect between mothers' autonomy support and children's pre-academic skills did not include a zero (CI: [.04, 1.43]). Finally, the 95% CI indicated that the indirect effect between fathers' autonomy support and children's pre-academic skills also did not include a zero (CI: [.002, .95]). Therefore, children's school liking was a mediator between these predictors and children's pre-academic skills.

Table 1

Zero-order Correlations, Estimated Means, and Standard Deviations of the Variables in the Structural Equation Model

Variable	Min	Max	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Children's gender (0 = boys; 1 = girls)	N/A	N/A	N/A	N/A	-														
2. Children's age (in months)	34.73	55.66	46.36	3.77	.03	-													
3. Mothers' education	1	8	4.51	2.05	.03	-.01	-												
4. Fathers' education	1	8	4.77	2.18	-.05	.08	.66**	-											
5. Families' monthly income	0	12	6.33	3.38	.04	.07	.69**	.68**	-										
6. Mother-child formal home learning activities	1.00	5.00	3.25	1.01	.05	-.05	.19**	.17**	.11	-									
7. Father-child formal home learning activities	1.00	5.00	3.22	1.05	-.06	-.01	.18**	.28**	.21**	.44**	-								
8. Mother-child informal home learning activities	1.60	5.00	3.75	.78	.06	-.09	.11	.05	-.00	.65**	.32**	-							
9. Father-child informal home learning activities	1.00	5.00	3.49	.91	.01	-.03	.16**	.22**	.18**	.32**	.77**	.39**	-						
10. Mothers' autonomy support	1.00	5.00	4.32	.60	.08	.01	.24**	.11	.18**	.21**	.06	.27**	.09	-					
11. Fathers' autonomy support	1.20	5.00	4.14	.68	.01	.07	.17**	.20**	.16**	.17**	.36**	.17**	.44**	.37**	-				
12. Mothers' report of children's school liking	2.00	5.00	3.87	.61	.17**	.07	.09	.03	.07	.15**	.14*	.28**	.21**	.39**	.28**	-			
13. Fathers' report of children's school liking	2.00	5.00	3.75	.58	.15*	-.01	.01	-.05	-.01	.09	.20**	.20**	.27**	.26**	.36**	.57**	-		
14. Children's oral vocabulary	16.00	60.00	42.67	8.10	-.02	.15**	.16**	.23**	.17**	.07	.16**	.06	.18**	.12*	.22**	.19**	.17**	-	
15. Children's object counting	0.00	14.00	6.88	4.54	.03	.32**	.24**	.33**	.27**	.20**	.15*	.15*	.12*	.16**	.16**	.18**	.10	.35**	-

Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Mothers' and fathers' education range from 1 to 8: 1 = Primary school; 2 = Middle school; 3 = High school; 4 = Preparatory; 5 = Diploma; 6 = Associate degree; 7 = Undergraduate degree; 8 = Postgraduate degree. Families' monthly income ranges from 0 to 12: 0 = <HK$5,000; 1 = HK$5,001-10,000; 2 =

HK$10,001-15,000; 3 = HK$15,001-20,000; 4 = HK$20,001-30,000; 5 = HK$30,001-40,000; 6 = HK$40,001-50,000; 7 = HK$50,001-60,000; 8 = HK$60,001-70,000; 9 = HK$70,001-80,000; 10 = HK$80,001-90,000; 11 = HK$90,001-100,000; 12 = >HK$100,001.

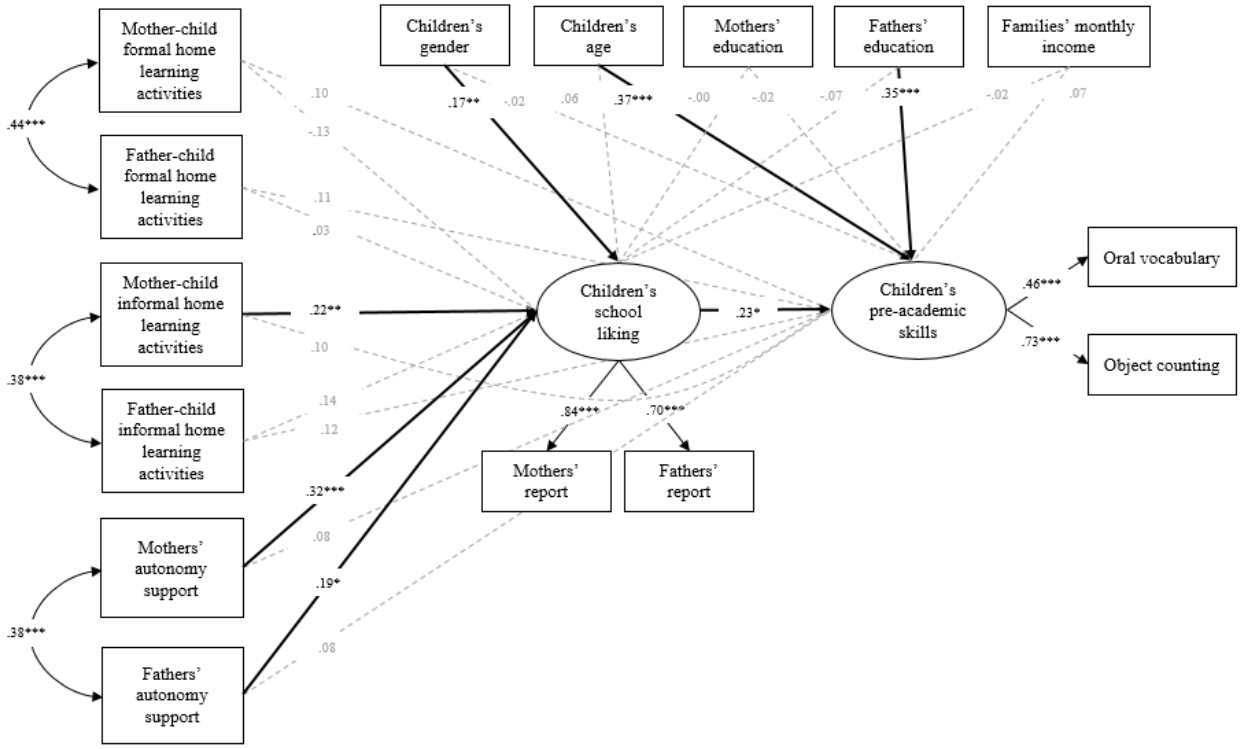

Fig. 2. Mediation Findings Between the Home Learning Environment, Children's School Liking, and Children's Pre-academic Skills, with Estimates of Demographics.

Note. $\chi^2(41) = 49.31$, $p = .18$, CFI = .97, TLI = .97, RMSEA = .03, SRMR = .03. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Standardized parameter estimates are presented. See Table 2 for further details.

Table 2

Parameter Estimates of the Structural Equation Model

Parameter	Unstandardized *B* (*SE*)	Standardized β
Measurement Model		
Children's school liking		
→ Mothers' report	1.00 [f]	.84***
→ Fathers' report	.87 (.17)	.70***
Children's pre-academic skills		
→ Oral vocabulary	1.00 [f]	.46***
→ Object counting	.78 (.10)	.73***
Structural Model		
Mother-child formal home learning activities		
→ Children's school liking	-.07 (.04)	-.13
→ Children's pre-academic skills	.47 (.37)	.13
Father-child formal home learning activities		
→ Children's school liking	.02 (.05)	.03
→ Children's pre-academic skills	.02 (.42)	.01
Mother-child informal home learning activities		
→ Children's school liking	.15 (.06)	.22**
→ Children's pre-academic skills	.29 (.49)	.06
Father-child informal home learning activities		
→ Children's school liking	.08 (.06)	.14
→ Children's pre-academic skills	-.06 (.49)	-.02
Mothers' autonomy support		
→ Children's school liking	.27 (.07)	.32***
→ Children's pre-academic skills	-.07 (.54)	-.01
Fathers' autonomy support		
→ Children's school liking	.14 (.06)	.19*
→ Children's pre-academic skills	.28 (.49)	.05
Children's school liking		
→ Children's pre-academic skills	1.71 (.86)	.23*
Children's gender		

→ Children's school liking	.17 (.06)	.17**
→ Children's pre-academic skills	-.16 (.54)	-.02
Children's age		
→ Children's school liking	.01 (.01)	.06
→ Children's pre-academic skills	.37 (.09)	.37***
Mothers' education		
→ Children's school liking	-.00 (.02)	-.00
→ Children's pre-academic skills	.04 (.19)	.02
Fathers' education		
→ Children's school liking	-.02 (.02)	-.07
→ Children's pre-academic skills	.61 (.21)	.35**
Families' monthly income		
→ Children's school liking	-.00 (.01)	-.02
→ Children's pre-academic skills	.08 (.12)	.07
Mother-child formal home learning activities		
←→ Father-child formal home learning activities	.46 (.07)	.44***
Mother-child informal home learning activities		
←→ Father-child informal home learning activities	.27 (.05)	.38***
Mothers' autonomy support		
←→ Fathers' autonomy support	.15 (.03)	.38***

Note. [f] parameter is fixed to 1.00. *$p < .05$, **$p < .01$, ***$p < .001$.

6. Discussion

The present study sought to examine whether mothers' and fathers' formal home learning activities with children, informal home learning activities with children, and autonomy support during home learning activities were associated with children's pre-academic skills, and whether children's school liking mediated the relations. Our findings showed that after controlling for children's gender, age, parental education, and families' income, the relationships of mother-child informal home learning activities, mothers' autonomy support, and fathers' autonomy support to children's pre-academic skills were mediated by children's school liking. The other three types of home learning activities, namely mother-child formal learning activities, father-child formal learning activities, and father-child informal learning activities, had no direct or indirect links with children's pre-academic skills.

In contrast to our hypotheses and to the results of some prior studies (e.g., Hindman & Morrison, 2011; Huntsinger et al., 2016), the frequency of formal home learning activities did not predict children's school liking nor pre-academic skills in the structural equation model of the present study, regardless of the gender of the parent. This finding also contradicts the motivation development models, which suggest that parents' engagement of children in learning activities enhances children's cognitive skills and motivation to excel at school (Pomerantz et al., 2012). On the one hand, this result may be because not all parents are skilled at mentoring young children's literacy and numeracy learning (Cannon & Ginsburg, 2008; Lin et al., 2011). Moreover, some parents may not know how to make the learning process fun. In particular, there is evidence to suggest that parents in Chinese societies, including those from Hong Kong, tend to help children acquire literacy and mathematical concepts through rote memorization and drill-and-practice method (Rao et al., 2010; Lam & McBride-Chang, 2013). Therefore, parents' direct teaching of literacy and mathematical

skills at home does not necessarily help promote young children's learning motivation, positive feelings towards school, and academic skills. On the other hand, it is possible that formal home learning activities were not linked to children's school liking and academic skills because we had controlled for informal home learning activities and parents' autonomy support in our structural equation model. In fact, as shown in Table 1, formal home learning activities had significant zero-order correlations with many measures of children's school liking and pre-academic skills. Perhaps parents' autonomy support and mother-reported informal home learning activities had a stronger predictive power of children's school liking than did formal home learning activities.

Partially consistent with our hypotheses, the frequency of mothers' but not fathers' informal learning activities with children was significantly associated with children's pre-academic skills, but the relation was mediated by children's school liking. Similar to formal home learning activities, informal home learning activities do not make a direct contribution to children's pre-academic skills in the present study. It might have been that not all parents are sensitive to the moments that can be used to effectively teach children's literacy and mathematical skills during play and daily routines (Cheung & McBride, 2017; Vandermaas-Peeler et al., 2009; Vandermaas-Peeler et al., 2011). Thus, we fail to replicate the benefits of informal home learning activities shown in some prior research (e.g., Barnes & Puccioni, 2017; Cheung & McBride, 2017). Meanwhile, given that informal learning activities expose children to words and numbers in authentic contexts (Sénéchal & LeFevre, 2002; Skwarchuk et al., 2014), they may be more likely than formal learning activities to foster children's school liking by bringing fun to children, letting children understand the practical values of various language and mathematical concepts, and helping children develop positive attitudes towards school. This, in turn, may motivate children to participate more actively in learning activities at school and develop better pre-academic skills. Nonetheless, it should be noted

that only mother-child informal home learning activities were related to school liking, but father-child informal home learning activities were not. One potential explanation is that mothers might be more skilled at guiding children during play than fathers (John et al., 2013). As a result, mothers might be better than fathers in arousing children's interest in vocabulary and numeracy learning when playing with children, thereby giving children greater motivational assets to participate actively in school activities and enjoy school more.

In line with our hypotheses, as well as with studies conducted with older children (e.g., Annear & Yates, 2010), both mothers' and fathers' autonomy support during home learning activities showed positive relations with children's pre-academic skills via children's school liking. Autonomy support provided by parents, regardless of their gender, is also crucial for young children's pre-academic skills in Chinese societies, even though Chinese parents often show higher levels of control and place less emphasis on autonomy support (Chao, 1994; Wang et al., 2007). Our study also provides support for self-determination theory, which postulates that autonomy-supportive learning contexts can enhance children's motivation to learn and their subsequent academic achievement (Chirkov, 2009; Ryan & Deci, 2000; Vasquez et al., 2016). As proposed by Pomerantz et al. (2012), parents' autonomy support can facilitate children's academic performance through various means. For example, allowing children to solve problems by themselves may give them more confidence in accomplishing learning tasks and more intrinsic motivation to engage in school activities (Pomerantz et al., 2012). With better parent-child relationships, children may also become more competent in developing relationships with others, including those in school (Pomerantz et al., 2012). All of these may foster children's positive feelings towards school, promote their involvement in learning tasks at school, and enhance academic skills.

One issue that warrants attention is that the children participating in the current study are at kindergarten age, and it is uncertain whether our findings can be generalized to other

age groups. We speculate that among school-aged children, parent-child formal and informal home learning activities, as well as parents' autonomy support during these activities would be positively associated with children's pre-academic skills, and children's school liking would mediate the relation. It is because according to past studies (e.g., Annear & Yates, 2010; Castro et al., 2015; Gonida & Cortina, 2014; Katz et al., 2011; Vasquez et al., 2016), the benefits of parental involvement in children's learning and parental autonomy support upon children's learning motivation and academic achievement are evident throughout childhood. Parent-child formal learning activities might, in particular, gain importance in promoting children's pre-academic skills through their school liking, as school-aged children often have an increased amount of homework. The frequency and style of direct teaching by parents at home are thus likely to matter more. Further investigations, however, are required to test the above speculations.

6.1. Implications

Our results have several important practical implications. First, our study shows that informal home learning activities make unique contributions to children's pre-academic skills via promoting children's school liking. Therefore, parents can be reminded not to overlook the value of informal learning activities, such as shared book reading, number board game playing, and learning mathematical concepts during cooking. This may particularly be important in societies like Hong Kong, where rote memorization and drill-and-practice method have often been adopted by parents to help children learn literacy and mathematics (Rao et al., 2010; Lam & McBride-Chang, 2013). Second, the present study showed that both mothers and fathers play a critical role in children's pre-academic skills by supporting children's autonomy during home learning activities. Even though father involvement is becoming more prevalent in Hong Kong (Kwok et al., 2013; Lau, 2016), it is necessary to encourage fathers to be further involved in children's learning at home. Lastly, as children's

school liking is a predictor of their pre-academic skills, parents should be reminded to create a positive learning environment and enhance children's positive feelings towards school when they help children learn at home.

6.2. Limitations and Future Directions

Despite its contributions to the literature, the present study has some limitations. First, the strength of effects found were small, and only cross-sectional data were collected. Thus, it is uncertain whether home learning environment and children's school liking and academic competence are related over time, and how robust the relations are, if any. Second, the construct of pre-academic skills was rather narrow in the present study, as we only used oral vocabulary and object counting as indicators of children's pre-academic skills. It is possible that formal and informal home learning activities may be associated with pre-academic skills that are not assessed in the present study, as the previous literature have shown that home learning activities are associated with letter knowledge, word reading and number recognition (LeFevre et al., 2002; Liu & Chung, in press; Manolitsis et al., 2013). Therefore, our conclusion regarding the relations between the home learning environment, children's school liking and pre-academic skills should be interpreted with caution. Third, the internal consistency of the scale on children's school liking was only fair. Last but not least, we relied on self-report data to assess the level of autonomy support provided by parents, and the quality of the literacy and mathematical input provided by fathers and mothers was not assessed in our study.

As future directions, longitudinal studies can be conducted to examine the relation between home learning activities and children's subsequent pre-academic skills. In addition, the quality of the activities may be further explored by examining the level of appropriateness of parents' academic input as well as parents' communication behaviors, such as explicit attention to concepts. Besides, different measures of language, literacy, and mathematics

(e.g., phonological awareness, morphological awareness, and patterning skills) can be adopted to obtain a more comprehensive picture of children's pre-academic skills. As parents from different cultures may vary in the values they attach to different types of joint activities and parenting practices (Bornstein, 2012; Cheung et al., 2021), further studies may examine the relations among home learning activities (e.g., play-based learning activities, drill-and-practice) and parents' guidance behaviors (e.g., behavioral control) of different cultures, children's attitudes towards school, and children's academic outcomes. In places where domestic helpers commonly take up the role of daily caregiver of young children (e.g., Hong Kong), it may also be interesting to further consider the activities and interactions between domestic helpers and young children in the family context.

To conclude, the present study showed that mother-child informal learning activities and mothers' and fathers' autonomy support were associated with children's pre-academic skills via their school liking. These findings suggest that the home learning environment plays a crucial role in children's feelings towards school, which may in turn facilitate their academic development. Moreover, both mothers and fathers can make unique contributions to children's pre-academic skills. Thus, it is worthwhile to provide more support to parents on how to guide children's learning at home, and encourage them to recognize the importance of developing children's positive attitudes about school during home learning activities.

Declaration of Competing Interest

None.

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