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Are screen devices soothing children or soothing parents?Investigating the relationships among children's exposure to different types of screen media, parental efficacy and home literacy practices

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ABSTRACT

Use of screen devices has become a standard practice in modern parenting. Research has shown that screen devices can be strategically used as tools, either for babysitting or for educational support. We surveyed 4,907 parents of preschool children from China to investigate how different devices (including TV, tablet, computer and paper-based books) may channel parental efficacy (or the lack of it) to home literacy practices. We found that parents with low parental efficacy were more likely to give their children all three kinds of screen devices, among which TV and tablet were detrimental to home literacy practices whereas computers, like books, were complementary to home literacy practices. Latent profile analysis showed that parents who allowed their children a high frequency of TV or tablet use had the poorest home literacy practices. In comparison, parents who provided fewer books but allowed high frequency of computer use while restricting TV or tablet use came from the lowest SES backgrounds in the sample, but they reported average levels of parenting efficacy and an average amount of home literacy practices. Only parents who felt efficacious about their parenting capabilities provided more paper-based picture books, thus generating optimal home literacy practices. Given the evidence from our finding that parents' lack of efficacy is a predictor of increased child TV and tablet viewing time and decreased home literacy practices, we need to consider whether such practices arise from a chronic sense of anxiety about parenting effectively rather than efforts to temporarily soothe or entertain the children. More effort is needed to help parents manage their anxiety and to teach parents how to realize and exploit the educational values afforded by the advancing media technology.

1. Introduction

On December 12, 2014, *People Magazine* (Perry, 2014) reported, "His father, Prince William, revealed during the royal couple's trip to New York City that the little prince [George at 15 months old] is already tapping out commands on an iPad—something his parents believe is helping him on his way to understanding electronics." Giving young children smart screen devices, such as tablets or computers, has become a widespread practice, if not a fashion, in modern parenting.

In the United States, as of the year 2015, three-fourths of 4-year-olds had their own mobile device, more than 90% used smart tablet devices prior to age 1, and 43.5% of < 1-year-olds used mobile devices on daily basis (Kabali et al., 2015). In China, 72% of preschool children own at least one smart tablet device. Along with the decade-long debate over the impact of television viewing on young children's development (Christakis, Zimmerman, DiGuiseppe, & McCarty, 2004; Hess & Goldman, 1962; Leonard, 1982; Maccoby, 1951; Sharif & Sargent, 2006), increasing academic and social discussion has focused on the increasing presence of smart screen devices in the hands of children (Cooper, 2018; Paulus et al., 2019; Tandon, Zhou, Lozano, & Christakis, 2011).

The question arises why parents choose to give their very young children such rich access to screens, especially in light of professional advice to severely limit screen time for preschool children (American Academy of Pediatrics, 2016), and the recommendation to read more paper-based picture books to, or with, young children (Hammer, Farkas, & Maczuga, 2010; Niklas & Schneider, 2015; Sénéchal & LeFevre,

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2014). Are parents promoting screen time with the hope of achieving educational benefits that are comparable with book reading, or are they offering children devices to pacify or entertain them? In other words, is the use of screens associated with intentional choices and high parental efficacy, or with frustration and anxiety around parenting? Do parents use new media technologies in order to improve their children's educational environment, or simply for babysitting? This study investigated parental reports about screen viewing (on phones, TVs, tablets, and computers, in comparison to picture books) by Chinese preschoolers and its relationship to parental efficacy and parental home literacy practices.

2. Literature

2.1. Parental control

Researchers have identified age (Vandewater, Bickham, & Lee, 2006), gender (Huston, Wright, Marcquis, & Green, 1999; Wright et al., 2001), race (Bickham et al., 2003; Roberts, Foehr, Rideout, & Brodie, 1999), and social economic status (Bickham et al., 2003; Truglio, Murphy, Oppenheimer, Huston, & Wright, 1996) as predictors of preschool children's screen viewing time. Social economic status (SES hereafter) is a strong associate. Lee, Bartolic, and Vandewater (2009) found (a) low income and low parent education to be associated with longer television viewing time, (b) high income (but not parent education) to be associated with more computer use, while (c) high income and high parent education to be associated with more time reading books with children.

Numerous studies have focused on parental media control (Van den Bulck & Van den Bergh, 2000; Vandewater, Park, Huang, & Wartella, 2005), in particular parents' setting of rules to limit and reduce their children's media consumption out of concern that screen viewing may hurt young children's development (Conseil supérieur de l'audiovisuel, 2008). However, the definition of parental media control should also incorporate attention to occasions when parents deliberately offer their children screen access. For example, since 1970s experts have strongly recommended that parents engage their children with educational television (Ball & Bogatz, 1970; Linebarger, Moses, Garrity, & McMenamin, 2013; Prince, Grace, Linebarger, Atkinson, & Huffman, 2002), especially in low-SES families (Bogatz & Ball, 1971; Moses, Linebarger, Wainwright, & Brod, 2010). Indeed, low-SES and minority parents expressed a greater need for and greater interest in expert recommendations for high-quality educational media content on various platforms (Rideout, 2015). Parents who are hopeful that media technology can bring educational value to their children were more likely to allow their children to spend time with digital media (Lauricella, Wartella, & Rideout, 2015).

In addition to their educational value, some parents may choose screen devices as a way to "escape." In families with high conflicts between adults, children were allowed more television time (Lee et al., 2009). Parents evidently use screen time not only as an entertaining escape for the children, but also as their own escape from parenting stress. For decades, parents have strategically used television as a tool for bedtime coping or for babysitting their young children (He, Irwin, Bouck, Tucker, & Pollett, 2005). Likewise, preschoolers' smart screen viewing should also be discussed in the broader context of parent-child interactions, because parents introduce smart screen devices to their children with a mixture of intentions (Sekarasih, 2016, pp. 129–146). For example, parents use co-playing on mobile devices as a time to interact with their children (Christakis, 2014); according to a survey by Cooney (2013), co-play accounted for one-third of the time that 2- to 4-year-olds spend with mobile devices. In addition, 65% of parents report letting their 6-month- to 4-year-old children play with mobile devices in order to keep them calm in public, and 28% of parents use mobile devices to assist their children to fall sleep quickly (Kabali et al., 2015), similar to the babysitting strategy using TV.

2.2. Parental efficacy

The fact that low-SES and high-conflict families allow young children to spend longer periods with a screen suggests that children's screen usage is related to the stress of parenting and to parents' anxiety or lack or efficacy. Parental efficacy is broadly defined as the "expectation caregivers hold about their ability to parent successfully" (Jones & Prinz, 2005, p. 342) by fostering a positive environment for the development of their child (Ardelt & Eccles, 2001). Compared to parents with low parental efficacy, parents with high efficacy adopt a variety of positive parenting strategies (Bandura, 1997; Coleman & Karraker, 1998; Furstenberg, 1993, pp. 231–258; Hill & Bush, 2001), have warmer and more interactive parent-child relationships (Bohlin & Hagekull, 1987; Izzo, Weiss, Shanahan, & Rodriguez-Brown, 2000; Williams et al., 1987), and are more capable of setting limits (MacPhee, Fritz, & Miller-Heyl, 1996), which promotes the school readiness of their preschool children (Pelletier & Brent, 2002). Prior studies have shown parental efficacy to be negatively associated with children's TV viewing or video game playing (Carson & Janssen, 2012; Jago, Sebire, Edwards, & Thompson, 2013; Jago, Wood, Zahra, Thompson, & Sebire, 2015; Smith et al., 2010). Nevertheless, high-efficacy parents were more convinced of the educational benefit of new media and tablet technology (Livingstone, Haddon, Görzig, & Ólafsson, 2011; Family Online Safety Institute, 2013; 2014) than were low-efficacy parents, who were warier of them and more likely to set restrictions or inconsistent rules on the use of new media technology by their children (Livingstone, Mascheroni, Dreier, Chaudron, & Lagae, 2015; Nikken & Schols, 2015).

Notably, research has shown that parents coping with low efficacy or stress are more likely to adopt passive and psychological separation strategies such as negligence, nonreactiveness, or detachment towards their children (Barnett, Hall, & Bramlett, 1990; Dumka, Stoerzinger, Jackson, & Roosa, 1996; Jarvis & Creasey, 1991; Levy-Shiff, Dimitrovsky, Shulman, & Har-Even, 1998; McCubbin, Larsen, & Olson, 1981). Extensive study has shown that adults coping with social anxiety and stress become addicted to their smartphones (Rosen, Whaling, Rab, Carrier, & Cheever, 2013; Sander, Calam, Durand, Liversidge, & Carmont, 2008); it is not unlikely that adults coping with low efficacy in interacting with or educating their children give them screens as a distraction. In such cases, valuable teachable moments are being missed in the home education environment (Perkins, Finegood, & Swain, 2013).

2.3. Home literacy practices

Among all the components of a home educational environment, home literacy practices are most strongly related to children's language development (Chow, McBrideChang, Cheung, & Chow, 2008; Hood, Conlon, & Andrews, 2008; Lonigan & Whitehurst, 1998; Martini and Sé n é chal, 2012; Sénéchal, 2006; Stephenson, Parrila, Georgiou, & Kirby, 2008). Indeed, parents who adopt more negative behavior control strategies (e.g., non-empathy, annoyance, or anger) had children who performed worse in language and literacy measures than children whose parents adopt strategies of guidance or explanation (Taylor et al., 2009b). With the advancement of smart screen technology, parents can easily disguise non-empathy or annoyance by handing a smartphone to their child.

Nevertheless, device use does not have to undermine home literacy practices. Young children pick up and make sense of literacy information from their home environment, whether it comes from print or screen (Clay, 1991; Hisrich & Blanchard, 2009; Sulzby & Teale, 1991, pp. 727–758). Parents can take advantage of new media and technology to foster emergent writing and letter knowledge (see the detailed review by Neumann & Neumann, 2017), especially with the help of an intuitive touch-based interface (Crescenzi, Jewitt, & Price, 2014; Fletcher-Watson, 2013; Goodwin & Highfield, 2012). Apps have been developed that allow young children to practice literacy skills from doodle making (Crescenzi et al., 2014; Beschorner & Hutchison, 2013)

to book reading (Hoffman & Paciga, 2014; Miller & Warschauer, 2014; Salmon, 2014), and even to story writing (Dunn & Sweeney, 2018; Verenikina & Kervin, 2011). Numerous studies have shown pre-school children's access to screen devices to be positively correlated with emergent literacy skills such as knowledge of letters and sounds, print awareness, name-writing, and vocabulary (Anderson et al., 2001; Clark & Rumbold, 2006; Foy & Mann, 2003; Hastings et al., 2009; Neumann, 2014; Schmitt, Hurwitz, Duel, & Linebarger, 2018; Van Evra, 2004). Further, research has shown that parents can use tablets to scaffold their pre-school children's literacy development (McManis & Gunnewig, 2012; Neumann & Neumann, 2014) by sharing stories (Kucirkova, Messer, Sheehy, & Flewitt, 2013), encouraging children to express themselves (Geist, 2014), and learn (Conn, 2012; Flewitt et al., 2015; Hatherly & Chapman, 2013; Lee, 2015). Nevertheless, not all interventions in kindergartens found a significant difference between classes that incorporated tablets in their curriculum and classes that did not (Brown & Harmon, 2013; Cubelic, 2013). Marsh et al. (2018) found that some tablet apps support creative free play and others inhibit it. Krcmar and Cingel (2014) showed that parents who share picture books on iPads engaged in more distractive talk and asked fewer questions of their children than parents using printed books, leading to poorer recall of the stories by the children. Moreover, many researchers found that young children prefer using tablets to play games rather than to read or to learn (Livingstone, Marsh, Plowman, Ottovordemgentschenfelde, & Fletcher-Watson, 2014; Marsh et al., 2018; Neumann, 2014). Huber, Highfield, and Kaufman (2018) found among Australian children younger than 8 that the dominant activities on tablets were reading and watching television. Thus, tablets can be seen both as a book replacement—typically considered to be positive for child development—and a television replacement—typically considered to be negative. Despite these findings, many researchers have remained hopeful that the home use of screen devices has the potential to enhance the home literacy environment (Korat & Or, 2010; Korat, Shamir, & Arbiv, 2011; Neumann & Neumann, 2017), especially if the parents combine device use with proper literacy scaffolding strategies involving physical, verbal, and emotional multimodal support (Petkovski, 2014).

2.4. The Chinese context

Most of the abovementioned studies of new media use in the home literacy environment have been conducted in middle- or high-SES families from developed countries. In a meta-analysis of the impact of television on the vocabulary development of children across SES levels in developed countries, researchers concluded that low-SES children attained larger gains in language development from educational media-based interventions, and low-SES parents were reported to engage in shared TV viewing in ways similar to the middle-SES parents' shared book reading (Linebarger, Barr, Lapierre, & Piotrowski, 2014; Moses et al., 2010). In developing countries with rapid social mobility, highly anxious parents may be eager for their children to master information technology and use it as a tool or medium to promote home literacy practices so that their children can excel.

One such culture is composed of Chinese parents. Traditionally, in Chinese culture, education is anticipated to be the greatest equalizer across socio-economic classes (Elman, 1991; Hannum & Xie, 1998; Liu, 2006; Suzuki, 1977). The Chinese parenting style has been commonly described as anxious, coercive, and stressing academic excellence as a route for children to surpass the level of achievement of their parents, an attitude that is stronger among low SES families (Chao, 1994; Chen et al., 1998; Fong, 2007a, 2007b; Woronov, 2007). The dramatic economic developments of the past three decades have spurred Chinese parents' anxiety about preparing their children for an unpredictable future (Yoshikawa, Way, & Chen, 2012). Per Fong (2007a, 2007b), as parents realize their inability to keep pace with the changing world, their anxiety increases, and they become more demanding and insistent that children excel at learning. When parents find themselves unequipped intellectually to tutor their children, they might well turn to the convenience of advanced technologies, notably screen devices.

Interestingly, the adoption of mobile technology in everyday life has been dramatically more rapid in China than in the United States in many respects. The grassroots innovation and consumption of smart technology, from smart home devices to smart toys, has enjoyed an untrammeled free market with little social criticism concerning potential downsides (Appelbaum, Cao, Han, Parker, & Simon, 2018; Hvistendahl, 2019). For example, preschool children's toys that are interactive and "smart" by virtue of either connecting physical toys to screens or by inserting tablets in physical toys are gaining market share (Mascheroni & Holloway, 2017; O'Brien, 2019). There has been considerable investment in targeting sales of these devices to the Chinese market (Gottlieb, 2017; Koty, 2017; Zion Market Research, 2018). Most such toys have been branded as educational and promote features related to reading, talking, and socializing with other young children (Everobo, 2017; Hong Kong Trade Development Council, 2018; Ng, 2017). Brito, Dias, and Oliveira (2018) reported that parents who bought such toys were motivated by the toys' educational potential. Therefore, the success of such developments in China confirms the possibility that screen exposure can be complementary to home literacy practices for Chinese parents, especially those who are challenged by high anxiety and a sense of low efficacy in promoting their children's educational success.

Nevertheless, recent research with a sample of urban Chinese parents with low-medium education levels has shown that only 9% read to their preschool-aged children, 16% tell stories to their children, and 19% have their children read by themselves at least once a day. Fewer than 25% read more than twice a week to their children (Chen, Snow, & Liu, 2018). A culture of home literacy practices is evidently lacking among Chinese families. Yet, 98% of Chinese preschool children use at least one type of screen device (Zhang et al., 2018), and 72% owned smart tablets (Dai, 2013). In regional surveys, Liu (2017) estimated that 66% of Chinese preschool children used smart phones or tablets more than 1 h per day. Dai (2013) estimated the number to be 25%, and Zhang et al. (2018) estimated it to be 15%. Liu (2017) also reported that most parents were not involved in their children's screen time. Thus, it is probable that Chinese parents who gave their children screen devices were not engaged in parent-child co-viewing or home literacy practices.

This study is focused on exploring relations among the several factors that this review suggests might relate to Chinese parenting. There is a high press for educational success, combined in some families with anxiety about the rapid social and economic changes, a sense of low efficacy in supporting children's development, lack of a culture of family book-reading, and ubiquitous access to smart devices, some of which are marketed as being educational. We are interested in exploring how to characterize Chinese parents' use of screens in child-rearing, the relation of SES and parenting efficacy to their choices to engage in book- or screen-mediated interactions with their children, and what the consequences are for home literacy practices.

2.5. Research questions

In this study, we investigated the relationship among Chinese parents' self-perceived parenting efficacy, children's screen exposure to television, tablets (including smartphones), and computers, children's exposure to paper-based picture books, and home literacy practices. Specifically, using a path model followed by a latent profile analysis, we asked:

1. What is the association between parenting efficacy and children's exposure to screens or books?
2. What is the association between parenting efficacy and home literacy practices?
3. What effects do different types of devices (TV, tablet, computer, book) have on home literacy practices? How do they compare with each other?

4. What are the salient typologies of device exposure, and how does exposure vary as a function of SES background, parental efficacy, and home literacy practices?

3. Method

3.1. Sample

Fifteen kindergartens from the same district participated in this study. The district was a medium-to-low SES community located on the outskirts of a first-tier city in China. The kindergarten administrators sent online survey links to parents of the children enrolled in the kindergartens. We recruited 5,412 parents from 20 kindergartens and received responses from from 4,907 parents, of whom 80.4% were mothers. The response rate was 90.67%. Their children ranged in age between 3 and 6, with a mean of 49.64 months. Of the children, 52.90% were boys, and 36.2% were from single-child families.

3.2. Measurement

In general, the survey asked participants to provide background information, to self-report on their parenting efficacy, to indicate the frequency with which their children watched TV and used a tablet (e.g., smartphone or iPad) or a computer, the number of picture books at home (henceforth, device exposure variables), the frequency of parent-child book reading, parent story-telling to child, and child self-reading (henceforth, home literacy practice variables). The variable names and coding of the above variables were shown in Table 1. It is noteworthy that parental efficacy (variable name EFFICACY) was the standardized mean score (after inverting the signs for reverse worded items) of 18 items measuring (on a 4-point-Likert-scale from strongly disagree to strongly agree) parents' self-perceived efficacy and security, or inversely, anxiety and doubtfulness about their own parenting skills. These items were adopted and modified from Yang's (2013) Chinese parenting anxiety scale, which has undergone a thorough validity test of the items. The measurement had good internal consistency with a Cronbach alpha of 0.94. The scale showed a unidirectionality that yields a one-factor solution (eigenvalue = 9.17) according to principal component analysis. The specific wording of the items and their item-test correlations are shown in the Appendix. Table 2 presents the descriptive statistics for all variables.

Table 1
Variable coding and explanation.

Variable name	Variable type	Coding	Notes
MOM	Exogeneous	1 = mother of the child, 0 = father of the child	
BOY	Exogeneous	1 = child is male, 0 = child is female	
AGE	Exogeneous	Continuous, counted in months	
PAR-EDU	Exogeneous	1 = below high school; 2 = high school; 3 = associate degree; 4 = college degree; 5 = graduate degree	The highest education level achieved by either parent
SINGLE_CHI	Exogeneous	1 = child is a single child, 0 = child is not a single child	
INCOME	Exogeneous	Continuous, unit by 1,000 RMB	Income per year
EFFICACY	Endogenous	standardized mean score	18 4-point-Likert-scale items that measure parent' efficacy in their parenting skills
BOOK	Endogenous	Continuous, counted in units	number of paper-based picture books for the child at home
TV	Endogenous	Continuous, counted in hours	hours per day spent watching TV
TABLET	Endogenous	Continuous, counted in hours	hours per day spent using tablets, including smartphone and larger format smart panels such as iPad
COMPUTER	Endogenous	Continuous, counted in hours	hours per day spent using computers, including laptop and desktop
READ_PAR	Endogenous	1 = 1 or fewer than 1 time/month, 2 = 2 or 3 times/month, 3 = 1 time/week, 4 = 2–6 times/week, 5 = 1 or more than 1 time/day	frequency of parent-child book reading
STORY_PAR	Endogenous	1 = 1 or fewer than 1 time/month, 2 = 2 or 3 times/month, 3 = 1 time/week, 4 = 2–6 times/week, 5 = 1 or more than 1 time/day	frequency of parent storytelling to child
READ_CHI	Endogenous	1 = 1 or fewer than 1 time/month, 2 = 2 or 3 times/month, 3 = 1 time/week, 4 = 2–6 times/week, 5 = 1 or more than 1 time/day	frequency of child self-reading

3.3. Analysis

First, we adopted a path analysis approach. In the path model, we specify that (a) all endogenous variables are predicted by all exogenous variables control for the background information, (b) the three home literacy variables covary with each other and were predicted by EFFICACY and device exposure variables, (c) the four device exposure variables covary with each other and were predicted by EFFICACY. In other words, EFFICACY had direct paths to home literacy practices and indirect paths to home literacy practices via device exposure variables. Second, we adopted a latent profile analysis to identify salient typologies (classes) in device exposure. Afterwards, we described the characteristics of each class by reporting its mean SES, EFFICACY, and scores on the three home literacy variables.

4. Results

4.1. Path analysis

We first constructed a multilevel path model accounting for the kindergarten clustering effect. The model had a good fit, with χ^2 (7) = 5.22, p = 0.63, RMSEA = 0.001 (90% confidence interval between 0.00 and 0.02), and CFI = 0.99. The intraclass correlation for each of the variables was smaller than 0.03, indicating an extremely low clustering effect by kindergartens, which was expected as the sampled kindergartens all served the same district. Therefore, we simplified the model reported below to one level.

The path model yielded a good model fit, with χ^2 (7) = 8.06, p = 0.33, RMSEA = 0.006 (90% confidence interval between 0.00 and 0.02), and CFI = 0.99. Table 3 showed all paths' coefficients. To summarize briefly the paths associated with the controlled variables, we found that parents of low SES (low income and low education) were more likely to report low efficacy. Lower parental education was associated with higher child screen-use frequency and a lower number of picture books provided to the children. In the following, we report the relationship among the measures of efficacy, device exposure, and parenting literacy practices.

Self-reported parenting efficacy (EFFICACY) significantly and negatively predicted children's exposure to screen devices (for TV, b = 0.077, se = 0.016, p < 0.001; for TABLET, b = 0.082, se = 0.017, p < 0.001; and for COMPUTER, b = 0.039, se = 0.018, p < 0.05), but EFFICACY significantly and positively predicted use of picture books (BOOK, b =

Table 2
Descriptive statistics (mean, standard deviation, variance and covariance matrix) of variables.

	BOOK	READ_PAR	READ CHI	STORY PAR	IPAD	TV	COMPUTER	EFFICACY	INCOME	SINGLECHI	PAR EDU	BOY	AGE CHI	MOM
MEAN	24.351	3.753	3.639	3.349	1.102	1.396	0.785	2.371	3.303	0.362	4.727	0.529	49.630	0.804
SD	36.027	1.150	1.280	1.310	1.097	1.144	1.177	0.633	4.944	–	1.037	–	5.070	–
BOOK	1059.820													
READ_PAR	7.051	1.273												
READ_CHI	5.401	0.660	1.575											
STORY_PAR	7.560	0.813	0.653	1.677										
IPAD	−5.257	−0.104	−0.103	−0.112	1.212									
TV	−7.186	−0.135	−0.096	−0.128	0.614	1.417								
COMPUTER	−4.960	−0.020	−0.015	−0.037	0.629	0.594	1.284							
EFFICACY	2.701	0.087	0.080	0.124	−0.055	−0.061	−0.034	0.393						
INCOME	27.754	0.305	0.040	0.523	−0.180	−0.283	−0.029	0.211	24.480					
SINGLECHI	0.425	0.049	−0.014	0.047	−0.012	−0.046	−0.024	0.017	0.187	0.228				
PAR_EDU	9.333	0.130	0.016	0.202	−0.048	−0.121	−0.075	0.075	1.306	0.121	1.069			
GEN_CHI	−0.029	−0.002	−0.001	−0.009	0.004	0.029	0.016	0.001	−0.044	0.007	−0.011	0.249		
AGE_CHI	72.930	0.167	−2.788	−1.568	1.623	1.527	1.883	0.696	15.811	−0.708	1.212	1.172	8679.340	
MOM	1.017	0.015	−0.014	0.009	−0.021	−0.027	−0.022	−0.003	−0.114	−0.010	−0.009	−0.007	−0.807	0.167

Note: the first two rows are means and standard deviations respectively, the diagonal cells are variances, and lower diagonal cells are covariances.

Table 3
Coefficients (standardized) of the path model.

	b	se	
EFFICACY			
INCOME	0.055	0.015	***
SINGLECHIL	0.028	0.015	*
PAR_EDU	0.106	0.016	***
BOY	−0.008	0.015	
AGE	−0.064	0.015	***
MOM	−0.007	0.015	
TV			
EFFICACY	−0.077	0.016	***
INCOME	−0.012	0.016	
SINGLECHIL	−0.064	0.016	***
PAR_EDU	−0.087	0.017	***
BOY	0.031	0.016	*
MOM	−0.037	0.016	*
TABLET			
EFFICACY	−0.082	0.017	***
INCOME	−0.019	0.018	
SINGLECHIL	−0.017	0.017	
PAR_EDU	−0.039	0.018	*
BOY	0.008	0.017	
MOM	−0.033	0.017	*
COMPUTER			
EFFICACY	−0.039	0.018	*
INCOME	0.035	0.019	*
SINGLECHIL	−0.038	0.019	*
PAR_EDU	−0.061	0.019	***
BOY	0.030	0.018	
MOM	−0.029	0.018	
BOOK			
EFFICACY	0.093	0.014	***
INCOME	0.108	0.015	***
SINGLECHIL	−0.031	0.015	*
PAR_EDU	0.307	0.015	***
BOY	0.001	0.014	
MOM	0.115	0.014	***
READ_PAR			
TV	−0.080	0.018	***
TABLET	−0.020	0.020	
COMPUTER	0.061	0.021	**
BOOK	0.200	0.016	***
EFFICACY	0.095	0.015	***
INCOME	−0.003	0.015	
SINGLECHIL	0.030	0.015	*
PAR_EDU	0.017	0.016	
BOY	0.014	0.015	
AGE	−0.065	0.015	***
MOM	0.030	0.015	*
READ_CHI			
TV	−0.076	0.019	***
TABLET	−0.031	0.021	
COMPUTER	0.051	0.022	*
BOOK	0.150	0.017	***
EFFICACY	0.094	0.015	***
INCOME	−0.017	0.016	
SINGLECHIL	−0.012	0.016	
PAR_EDU	−0.057	0.017	***
BOY	−0.035	0.015	*
AGE	0.014	0.015	
MOM	−0.047	0.015	**
STORY_PAR			
TV	−0.043	0.019	*
TABLET	−0.050	0.020	*
COMPUTER	0.055	0.022	*
BOOK	0.163	0.017	***
EFFICACY	0.104	0.015	***
INCOME	−0.015	0.015	
SINGLECHIL	0.053	0.015	***
PAR_EDU	0.059	0.017	***
BOY	−0.001	0.015	
AGE	−0.057	0.015	***
MOM	−0.002	0.015	
Intercepts			
BOOK	−1.576	0.068	***
READ_PAR	3.401	0.105	***

(*continued on next page*)

Table 3 (*continued*)

	b	se	
READ_CHI	3.270	0.105	***
STORY_PAR	2.528	0.104	***
TABLET	1.232	0.085	***
TV	1.681	0.079	***
COMPUTER	0.957	0.091	***
EFFICACY	0.271	0.095	**

Note: ***p < 0.001; **p < 0.01; *p < 0.05.

−0.093; se = 0.014, p < 0.001). These relationships are illustrated in Fig. 1.

Further, the number of picture books that parents provided to their children had significant and positive relations to all three literacy practices (for parent-child book reading, b = 0.200, se = 0.016, p < 0.001; for parent storytelling, b = 0.163, se = 0.017, p < 0.001; and for child self-reading, b = 0.150, se = 0.017, p < 0.001). Children's frequency of TV watching had significant and negative relations to all three literacy practices (for parent-child book reading, b = −0.080, se = 0.018, p < 0.001; for parent storytelling, b = −0.043, se = 0.019, p < 0.01; and for child self-reading, b = −0.076, se = 0.019, p < 0.001). Children's tablet usage frequency was not statistically significantly related to parent-child book reading or child self-reading, but was significantly and negatively related to parent storytelling (b = −0.050, se = 0.020, p < 0.05). Children's computer usage frequency was significantly and positively related to all literacy practices (for parent-child book reading, b = 0.061, se = 0.021, p < 0.01; for parent storytelling, b = 0.055, se = 0.022, p < 0.01; and for child self-reading, b = 0.051, se = 0.022, p < 0.05), similar to the effect of the picture books but with smaller effect sizes. The effects of devices on the frequencies of each of the literacy practices was illustrated in Fig. 2.

EFFICACY also had a direct positive effect on the frequencies of parent-child picture book reading (b = 0.095, se = 0.015, p < 0.001), parent storytelling to children (b = 0.104, se = 0.015, p < 0.001), and children's book reading by themselves (b = 0.094, se = 0.015, p < 0.001). Of the total effect from efficacy to parent-child book reading, 20.6% was mediated through device exposures (via book z = 7.99, p < 0.001; via tv z = 3.57, p < 0.001; via tablet z = 0.96, p = 0.33; via computer z = −1.72, p = 0.08). Of the total effect from efficacy to parent storytelling, 16.9% was mediated through device exposure (via book z = 5.475, p < 0.001; via tv z = 2.293, p < 0.001; via tablet z = 2.101, p = 0.04; via computer z = −1.64, p = 0.09). Of the total effect from efficacy to child self-reading, 17.8% was mediated through device exposure (via book z = 5.200, p < 0.001; via tv z = 3.223, p < 0.001; via tablet z = 1.519, p = 0.13; via computer z = −1.64, p = 0.10). The marginal significance of indirect effects via computer can be attributed to the lack of statistical power: The power of the product of two paths is smaller than the power of the joint test of those two paths (MacKinnon, 2012). Overall, all of the significant paths we reported above were summarized in the path diagram in Fig. 3. For display purposes, the controlled background variables and the covariation among endogenous variables are not shown in the diagram, but they were nonetheless accounted for in the model.

One noticeable background variable is SINGLE_CHI (if the child is a single child). As shown in Table 3, parents with a single child provided their children with less TV and COMPUTER time (no significant difference in TABLET time), fewer picture books, and a higher frequency of parental reading and storytelling (no significant difference in children's self-book-reading) than parents with more than one child. We also found that parents with a single child had higher parental efficacy than parents with more than one child. The mediation effect from SINGLE_CHI to endogenous variables via EFFICACY explains 3%–8% of the total effect.

4.2. Latent profile analysis

The path analysis reported above examined the effect of each device controlling for other devices' uses. Nevertheless, it was not always the case empirically that a child had only one dominant device, as device uses were moderately or strongly associated with each other (correlation between tv and tablet = 0.47, between tv and computer = 0.45, between tablet and computer = 0.52; between book and tv, tablet, or computer = −0.16, −0.12, −0.11 respectively. All correlations were statistically significant at the level of 0.001). To categorize various combinations of device exposure as data emerged, we used latent profile analysis (LPA). LPA is a mixture model that clusters the sample into a few salient latent profile classes. As a result of LPA, each individual would have an estimated probability of allocation in each class, and the individual is assigned to the class with the largest probability.

Because each device exposure variable had a different range and was very dispersed at the high end, for the ease of interpretation and visual

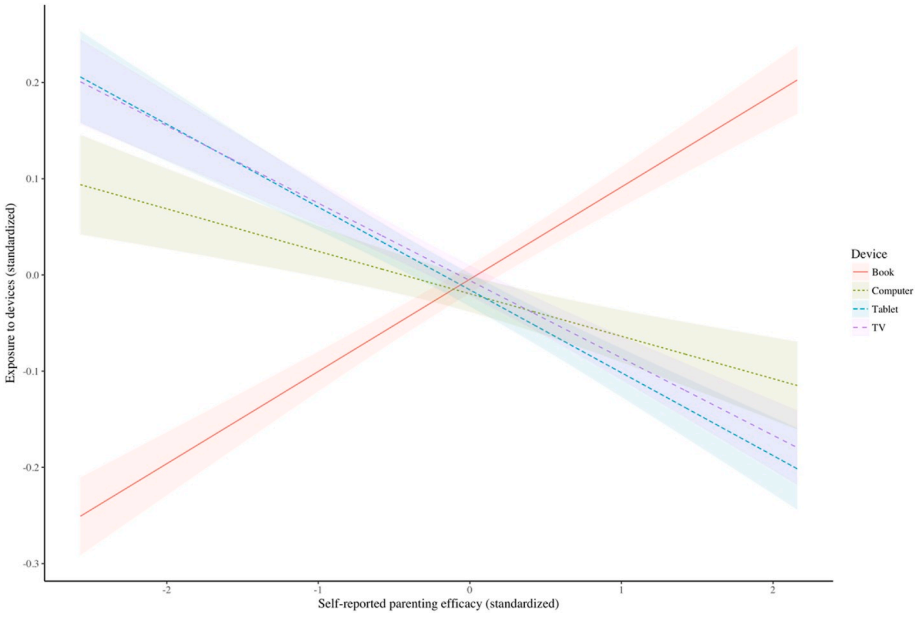

Fig. 1. The effect of parents' self-reported parenting inefficacy on their children's device exposure (book, computer, tablet, and TV), with 1 standard error intervals, controlling for background variables.

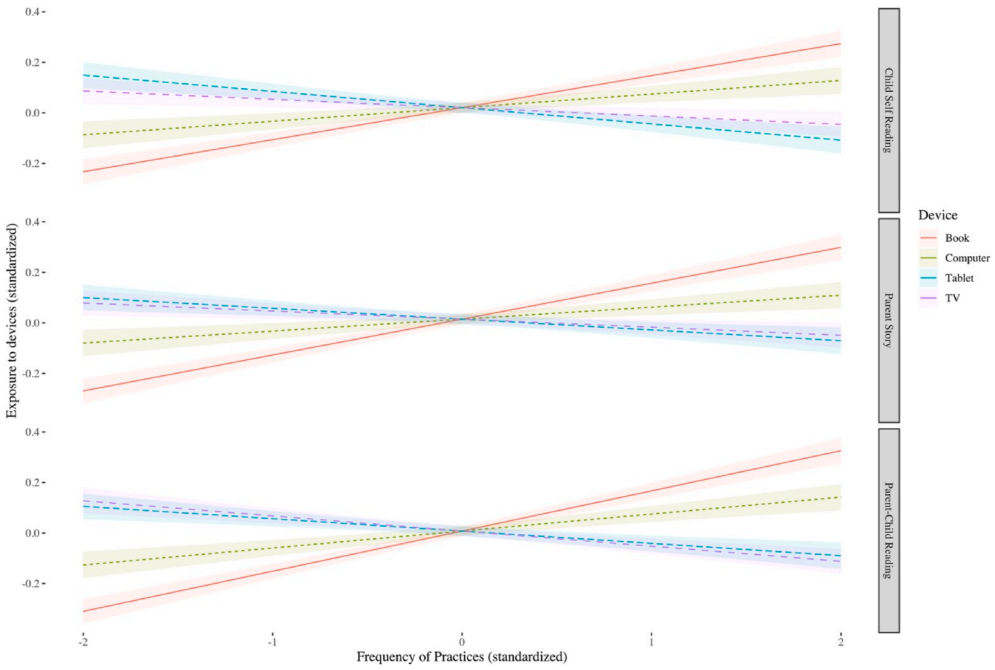

Fig. 2. Effects of each of the device exposure variables (book, computer, tablet and TV) on each of the home literacy practice variables (child self-reading, parent storytelling to child, and parent-child book reading), with one standard error interval, while controlling for background information and parent self-report parenting inefficacy.

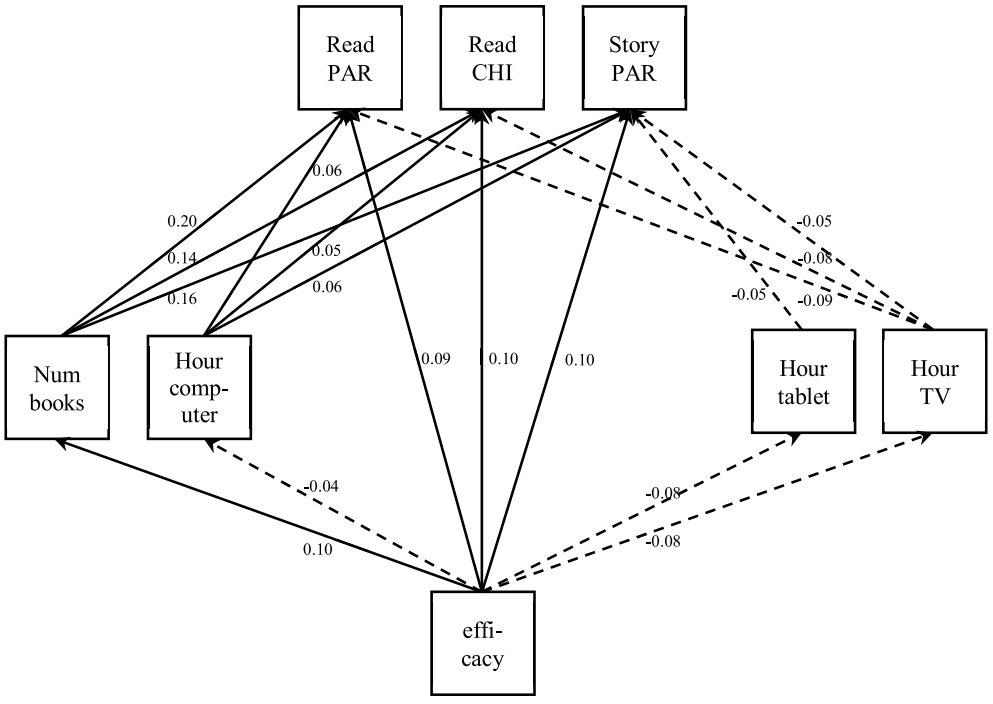

Fig. 3. Path model diagram. Solid lines indicate positive effects, and dashed lines indicate negative effects. The other covariates being controlled for are not shown in this diagram, covariance between endogenous variables are not shown, for illustration purpose.

presentation we converted all device use variables to the scale of 0–3. For screen devices, we truncated the values to a maximum of 3 h/day (4.7% of the sample had screen hours more than 3 per day). For books, we truncated the value to a maximum of 75 (5.0% of the sample had more than 75 books at home) and rescaled the values to 0 to 3 so that 25 was rescaled to 1, 50 was rescaled to 2, and 75 was rescaled to 3.

LPA analysis yielded a 5-class solution. Fig. 4 shows the constellation of device uses by each class. We qualitatively defined a value larger than 2 to be high, between 1 and 2 to be moderate, and between 0 and 1 to be low. Based on Fig. 4, we defined and labeled the 5 classes: (a) *High Book*: have a high number of books, merely a moderate number of TV and tablet hours, and low number of computer hours; (b) *Moderate TV and tablet*: none of the devices used were in the high range, but use of TV and tablet was in the moderate, close to high range, while number of books and computer hours were low; (c) *High PC*: high computer hours, moderate TV and Tablet hours, and low number of books; (d) *High PC,*

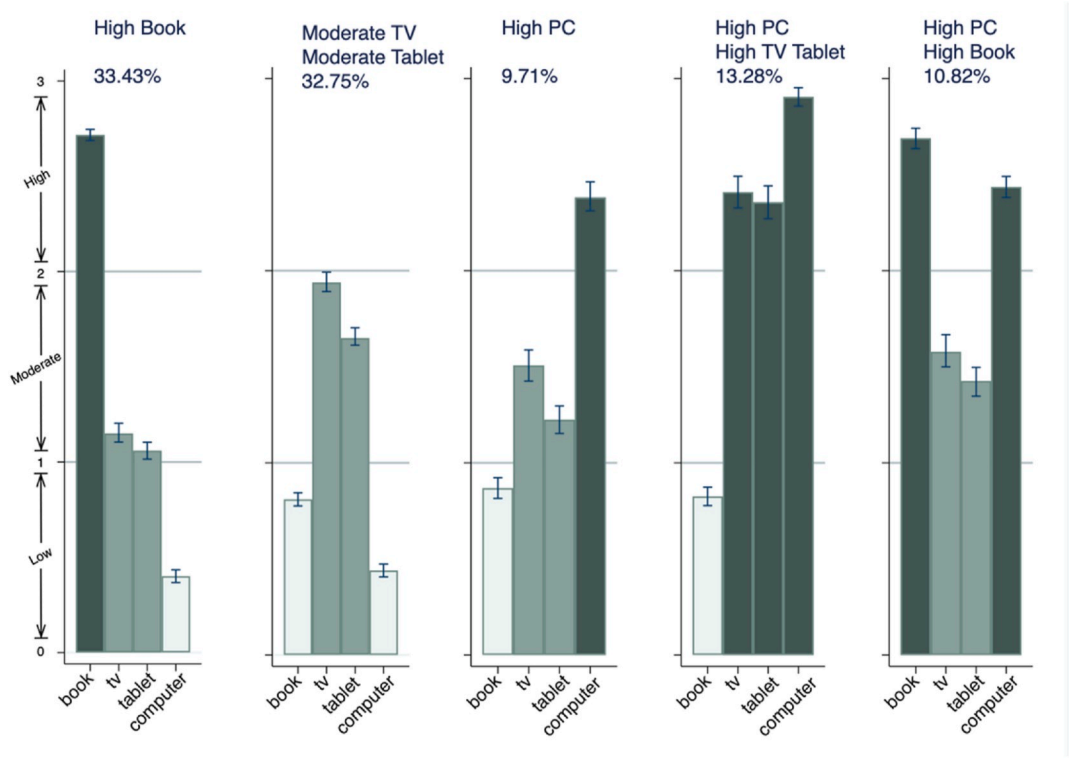

Fig. 4. The average value of each device uses by each profile group as a result of latent profile analysis. For TV, tablet and computer, 0 = "0 h"; 1 = "1 h"; 2 = "2 h"; 3 = "3 or more than 3 h". For book, 0 = "0 books"; 1 = "25 books"; 2 = "50 books"; 3 = "more than 75 books". Light color indicates few usages; median color indicates moderate usages; and dark color indicates high usages. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

TV, & Tablet: high hours on all three screen devices but low number of books; and (e) *High PC and Book*: high computer hours and high number of books, but a moderate number of TV and tablet hours. About one-third of the sample (33.43%) was in the High Book class, about one-third (32.75%) was in the moderate TV and tablet class, and another one-third (33.51%) was in the High PC class and had high computer hours. The high computer hours category further split to three classes: (a) only the computer was dominantly high; (b) computer was combined with a high dosage of TV and tablet; and (c) computer was combined with a high number of books.

Compared to a 4-class solution, the 5-class solution had significant improvement in sample adjusted BIC ($\chi^2(5) = 200$, $p < 0.001$), whereas the improvement in BIC for a 6-class solution was not significant ($\chi^2(5) = 7$, $p < 0.22$). Furthermore, the one additional class in the 6-class solution branched from the Moderate TV and Tablet class, splitting it into a class with the lower end of moderate TV and tablet hours and into another class with the higher end of moderate TV and tablet hours. Both classes had the similar pattern (moderate TV and tablet, and low books and computer), and the rest of the four classes were unchanged between the 5-class and 6-class solution. Therefore, we deemed a 5-class solution to be optimal.

The LPA solutions showed that TV and tablet uses were tightly clustered with each other in each class. We did not identify any class in which TV and tablet were distinct. In addition, book exposure did not cluster with TV or tablet in any class. High book exposure either stood by itself or clustered with a high dosage of the computer.

Further, we described home literacy practices, SES and parenting efficacy for each class, as shown in Table 4. Fig. 5 facilitates a between-class comparison by plotting the mean and ± 1 standard error of the standardized values in each variable by classes. We could see that the High Book class consistently had the highest SES, parenting efficacy, and home literacy practices, whereas the High PC and Book class ranked second and close to the High Book class on most variables (the difference was 0.07 SD on efficacy, 0.01 SD on income, 0.18 SD on parent education, 0.01 SD on child-self-reading, 0.06 SD on parent-child-reading, and 0.02 SD on parent storytelling). The High PC class had the lowest SES among all five classes but ranked third in parenting efficacy and home literacy practices. In particular, its child-self-reading frequency was above the sample average and close to the level of the High Book (lower than the High Book class by only 0.08 SD) or the High PC & Book classes (lower by 0.07 SD). Parental efficacy for the High PC class was around the sample average, lower than High Book class by 0.12 SD, and parent-child-reading and parent story-telling frequencies were around the sample average as well, lower than the High Book class by 0.23 and lower than High PC & Book class by 0.24 SD. Parenting efficacy and home literacy practices in the High PC & TV & Tablet class and the Moderate TV and Tablet class were close to each other, ranked lowest of the five classes, lagging the High PC class by 0.11 and 0.16 SD respectively, although SES was higher than in the High PC class (by 0.07 and 0.12 SD).

Table 4
Means and standard deviations in home literacy practices, inefficacy and SES.

Group	Value	Read PAR	Read CHI	STORY PAR	EFFI-CACY	INCOME	PAR EDU
High Book	Mean	3.99	3.81	3.62	1.72	4.21	5.09
	Std.	(1.03)	(1.18)	(1.23)	(0.62)	(5.78)	(0.97)
Mod TV Tablet	Mean	3.55	3.47	3.10	1.56	2.64	4.50
	Std.	(1.21)	(1.34)	(1.35)	(0.61)	(4.01)	(1.02)
High PC	Mean	3.72	3.70	3.29	1.65	2.36	4.37
	Std.	(1.11)	(1.22)	(1.31)	(0.65)	(3.52)	(0.97)
High PC TV Tablet	Mean	3.55	3.44	3.10	1.52	2.69	4.45
	Std.	(1.24)	(1.36)	(1.31)	(0.64)	(4.47)	(1.00)
High PC Book	Mean	3.92	3.79	3.59	1.68	4.17	4.91
	Std.	(1.06)	(1.12)	(1.12)	(0.66)	(5.77)	(0.98)

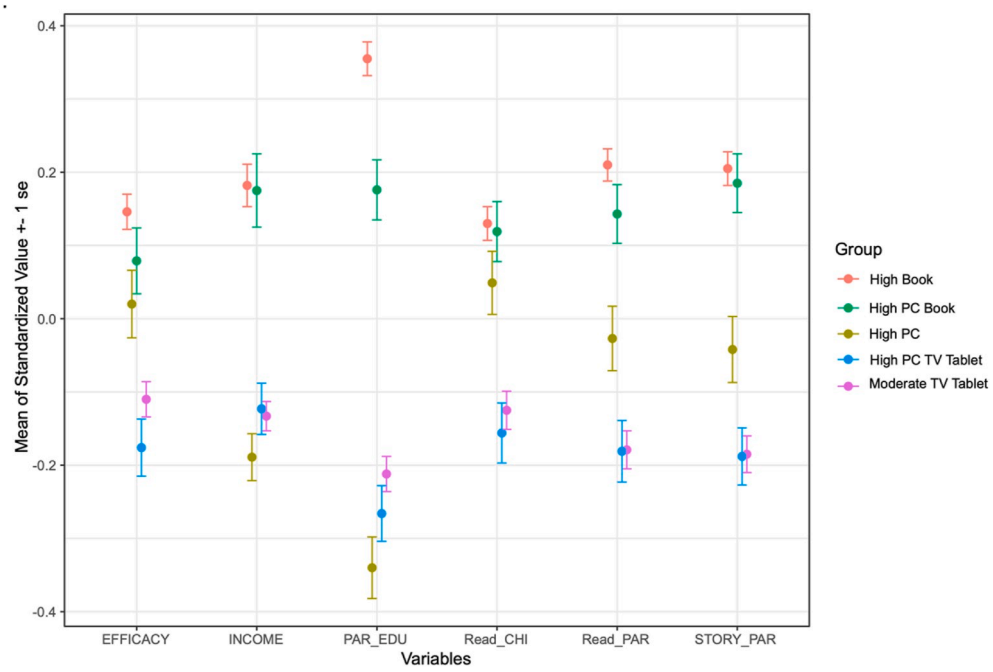

Fig. 5. Mean and ± 1 se of the standardized values in parenting efficacy (inverse of the inefficacy score), family income, parent education, and home literacy practices, by latent profile groups.

5. Discussion

We found the following answers to our research questions:

(RQ1) Parenting efficacy was negatively associated with screen exposure and positively associated with children's book exposure.
(RQ2) Parenting efficacy was positively associated with home literacy practices, including the frequency of parent book reading and storytelling with children and children's self-reading.
(RQ3) TV and tablets were negatively associated with home literacy practices, and tablets had a smaller negative effect than TV. Computers and picture books were positively associated with home literacy practices and computers had a smaller positive effect than picture books.

(RQ4) There were 4 salient typologies of device exposure: high book, high book and computer, high computer only, high screen devices (including computer, TV, and tablet), and moderate TV and tablet. The two groups with high books had higher than average SES background, parental efficacy, and home literacy practices. The two groups that had high or moderate TV and tablet use had a lower than average SES background, parental efficacy, and home literacy practices. An intriguing group was the high computer only group, which had the lowest SES background but average parental efficacy and home literacy practices.

5.1. Effects of the devices

This study shows that parents who felt inefficacious, anxious, or doubtful about their own parenting capability and were of low SES backgrounds tended to provide their children with fewer picture books, while allowing their children to spend more time on screen devices, such as TV, tablet, or computer. Among the four media (including three screen devices and books), TV-watching frequency was consistently detrimental to all three home literacy practices measured in our study (including parent-child book reading, parent storytelling, and child self-reading); tablet frequency was associated with lower parent storytelling frequency, but not with the other two measures. Computer frequency and the number of picture books were positively associated with all three home literacy practices. In other words, the effect of tablets on home literacy practices was similar to the effects of TV, i.e., negative, but with smaller effect sizes than TV; and the effects of computer use were similar to the effects of books, i.e., positive, but with smaller effects sizes than books.

One explanation for this result is that when parents are anxious about their own parenting skills, they keep their children occupied with screen technologies. We did not find support for the hypothesis that when parents are anxious or lacking in resources, they tend to buy more books to support their children's future social mobility. Instead, when parents perceive themselves as incapable, they evidently turn to the devices at hand, seeking recourse in media technology devices to entertain their children rather than seeking out books to use for that purpose. Offering television time has been known to be a popular strategy when parents do not wish to be disturbed (Kabali et al., 2015) Tablets can serve this same purpose, with the same negative effects on home literacy practices, only with smaller effect sizes. Although tablets did not have a statistically significant relationship to parent-child book reading or child self-reading after controlling for all covariates, the signs of the effects were negative. We can conclude with certainty that at least tablets do not have a positive effect on any of the home reading practices. The fact that tablet viewing hours had a significant and negative relationship to parent storytelling suggests that parents gave their children tablets as a replacement for telling them stories. For example, parents could replace bedtime story telling with a bedtime iPad story, which might either exhaust their children quickly to make them fall asleep or stop the children from crying for parents' attention. The optimistic hope—that parents can make use of the convenient and large pool of picture books from tablet apps to tell stories to their children—is unsubstantiated by our data. Previous studies have shown that parents use tablets to calm their children in public or put their children to sleep (Kabali et al., 2015), which can be considered as a temporary solution for emergency occasions. However, given our finding that parent inefficacy is a predictor of increased TV and tablet viewing time and decreased home literacy practices, we need to consider that such practices might arise from chronic parental ineffectiveness or concerns about effectiveness.

Computer usage is another strategy that inefficacious and low-SES

parents often adopt; however, this has positive relationships to all three of home literacy practices, which indicates that parents use computers as a different kind of strategic tool from TVs and tablets. It is possible that computers afford more teachable moments. For example, computer operation is not as intuitive as tablets and requires more in-person instruction from parents. Computers also require more complex and finer motor skills (Marsh et al., 2018) that usually demand the physical presence of parents to assist (especially for young children), which encourages parent-child interaction. Some popular early childhood educational programs (for literacy and numeracy) in China, such as *Qiaohu Magazine,* with a monthly subscription over 1.14 million as of 2018 (CHALK Academy, 2018; Chinese Welfare Association, 2018), ship paper-based picture books accompanied with DVDs to families (Xiao, 2012). These DVDs are typically watched on computers, side-by-side with paper-based picture books, for home literacy (or numeracy) practices. Parents may have given their children computers in the hope their children would acquire useful skills. Such parents tend to assign a high value to their children's education and be more engaged in home literacy practices in addition to computer use. In short, our study suggests that anxious parents who allow longer computer time were not using computers simply to distract and entertain children, but to encourage their children's learning.

Interestingly, background variables such as income, parental education, and single child status that had positive effects on parental efficacy also had a direct effect (if they were significant) on device use and home literacy practices that is largely consistent with the effect of parental efficacy. One exception was that single child families had fewer books than families with more than one child. A possible reason is that when a parent has multiple children, he/she needs to provide more books that are tailored to different age levels.

5.2. Parent profiles

Few parents use only one device in the home education environment. To understand the whole picture of parental use of devices, it is necessary to examine the combination of book reading and device use in families. Based on the result of latent profile analysis, we can categorize parents' media control styles. There are "book-parents," who are not anxious about their parenting skills, who primarily come from above-average SES backgrounds, who buy substantial numbers (more than 50) of picture books for their children, and who spend substantial time reading or telling stories to their children and encourage them to read by themselves. Some of the book-parents allow their children large amounts of computer time, but without affecting the volume of their home literacy practices, suggesting that these parents use the computer as a companion to book reading (as discussed previously).

There are also "high-computer-low-book parents" who typically are of below-average SES; these parents allowed more than 2 h per day on computers, but provided fewer than 20 paper-based books. This group of parents bifurcates to two subgroups, distinguished by the TV and tablet dosage they allow to their children.

One group had moderate use of TV and tablet, with the computer being the only dominant device at home (the "computer-only parents"). These parents come from the lowest SES in our sample, but they report average parental efficacy and they carry out an average number of home literacy practices. It is possible that their positive parenting efficacy (despite low SES) keeps these parents hopeful that their children can (or should) learn to use a computer early on to develop cognitive skills. They encourage their children to use computers more, while exercising control over their children's TV or tablet viewing hours. They engage in more home literacy practices with their children than average low-SES parents, perhaps making use of, or in parallel with, computer hours. It is also possible that these parents encourage the children's use of one device and limit children's use of other devices as a manifestation, or reinforcement, of their efficacy or competency, leading to purposeful and effective language and literacy practices with their children. It is noteworthy that the most impressive home literacy practice in the computer-only class is child-self-reading, which suggests that these parents assign high value to, and remain hopeful about, their children's education and pressure their children to learn, yet do so despite inadequate resources, knowledge, or simply books for reading and telling stories to their children. It is possible that, despite the limited number of books at home, parents in the computer-only class ask their children to read the available books repeatedly; it is also possible that they have their children read digital books on the computers.

On the contrary, the other subgroup of high-computer-low-book parents allowed a high amount of time with screen devices not only on computers but also on TV and tablets ("high-screen parents"). These parents had low parental efficacy and low frequency of home literacy practices. The uncontrolled screen hours on all devices could be the consequence, or a reinforcement, of these parents' lack of efficacy. It is possible that high-screen parents are anxious about the challenge of fulfilling their children's need to excel, and, possibly, they hope their children can learn from the media. It is also possible that these parents are resigned, avoid interaction with their children, and let screens babysit their children.

Lastly, there are "TV-tablet-parents," who come from below-average SES backgrounds and who had low parenting efficacy. None of the devices are dominant for their children, but relatively speaking, the TV and tablet are moderately popular (both used more than 1 h per day), even while the number of books and computer hours remained low. These parents engage infrequently in home literacy practices with their children. In fact, their profiles are similar to those of high-screen parents in SES, parenting efficacy, and home literacy practices. It is possible the device use is limited by what they own; it is also possible that these parents exert some control over the device use. But when they do allow device use, they give their children TV and tablets, not books or a computer. And there is no sign that they use TV and tablet to facilitate or promote home literacy practices. It is possible that TV and tablets are primarily used for entertainment and babysitting purposes.

5.3. Limitations and future work

Without fuller information about parental usage and motivation underlying device choices, our organization of parent profiles is somewhat speculative. We need to have a better understanding of the parents' own narratives to understand when, why, and how parents introduce different devices to their children. Future work should also collect child development measures—vocabulary, expressiveness, social emotional development—to evaluate if different device strategies have an impact on children's cognitive development either directly or via home literacy practices.

This study did not question whether screen technology is benign or harmful to children's development but does suggest that some parents at times give their children tablets out of their own parenting frustration. In other words, parents allow their children TV or tablet time rather than providing face-to-face parent involvement (compensatory screen viewing). As a result, parents are missing opportunities to teach, read, and interact with their children in more meaningful ways. Granted, it is fully possible that when parents can curb their anxiety or look for teachable moments, they can take advantage of tablet (and even TV) co-viewing, making it a catalyst for positive home literacy experiences (catalytic screen viewing), just as parents use computers (or books) with children at home. Indeed, previous studies have shown the effect of media use on young children's language development to be mediated or boosted by high-quality, parent-child co-viewing and interaction (Bracken & Fischel, 2008; Goussak, 2018; Liebeskind, Piotrowski, Lapierre, & Linebarger, 2014; Linebarger & Vaala, 2010; Nichols, 2018; Prendergast, 2015; Tabors, Roach, & Snow, 2001). Gillen and Kucirkova (2018) argued that there is great potential for screen technology to positively transform children's and parents' home lives once it can be used innovatively, imaginatively and multimodally. But innovative or

imaginative application of technology in education almost always requires parents to be aware and to be efficacious in learning, experimenting and practice. Thus, we suggest future educational-media interventions might include components designed to help parents manage their stress, build their parenting skills, and increase their sense of efficacy in order to reduce compensatory screen viewing. Similarly, intervention components to help parents acquire a skillset in catalytic screen viewing should be evaluated for their effectiveness in making screen time complementary to other elements in the home literacy environment.

Though readers should be cautious in generalizing the findings from this study, they raise intriguing and important questions for future research, one having to do with their applicability across cultural contexts, and the other with the emergence of screen devices that are marketed to young children.

The relationships reported here among parental efficacy, children's book and screen exposure, and home literacy practices are novel findings. There has been no directly comparable study conducted with any sample. Thus, the extent to which the pattern discovered and presented in this research is applicable to countries other than China remains to be demonstrated.

Interestingly, recently developed and marketed preschool "smart" toys, representing a projected global revenue estimated to reach $8.8 billion by 2020 (Statista, 2019), have incorporated screen devices and other new media technologies. For example, Amiibo connects physical figurines to Wii (Otero, 2014), Woobo inserts tablets in plush toys (Ng, 2017), and Hello Barbie Hologram places a Barbie doll in a hologram, which then functions similarly to Amazon Alexa (Carman, 2017). Such developments in smart toys have redefined screen devices. Nearly all of these new variations of screen devices make similar promises, namely, "[They] create a supportive environment in which AI can educate, entertain and provide companionship" (Peng, 2018). Although the purpose of these toys is not to replace parents, and their effects on parent-child interaction remain to be studied, the common thread of such products "is an appeal to parental anxiety about raising smart kids, occupying their time, tracking their whereabouts and making sure they're healthy and safe" (O'Brien, 2019). If parents use such high-tech devices strategically as tools to relieve their own anxiety and babysit their children, replicating their uses of television or tablets, it seems unlikely that "smart" futuristic toys will achieve their educational potential.

6. Conclusion

In 1977, Marie Winn (Winn, 1977) named television the "plug-in drug" that parents use to keep their children hooked and quiet "zombies, " occupying the time parents and their children might have spent together on more meaningful experiences. More than 40 years later, modern scholars have deemed the zombie metaphor a myth (e.g., Anderson, Fite, Petrovich, & Hirsch, 2006; Barr, Zack, Garcia, & Muentener, 2008; Courage & Howe, 2010; Schmidt, Pempek, Kirkorian, Lunk, & Anderson, 2008). Meanwhile, mini screens (tablets) have become completely wireless and now afford rich opportunities to make viewing more active and interactive. However, tablets still mimic television and tightly bind with TV use in modern Chinese families. When low-SES parents are anxious about their own parenting capability, they give their children tablet screens, which in turn shortens their storytelling time together and limits increases in reading time (this is better, however, than TVs, which actually *decrease* reading time). Alternatively, low-SES parents can also introduce their children to computers, which bring about strikingly contrasting effects from tablets in home literacy practices. Computer-use appears to be complementary, whereas TV and tablets are detrimental, to home literacy practices. Our study suggests that low-SES or inefficacious parents tend to seek help strategically from different screen devices, yet the specific choice of devices reflects the broader parenting goals, and its impact is reflected in the home literacy practices.

In our sample, only parents who felt efficacious about their parenting capabilities supplemented and enriched the learning environments they created by providing more paper-based picture books, thus generating opportunities to incorporate interactive book-reading. Parents with low efficacy bought fewer books and introduced more screen time to their children. Alongside previous studies that showed parents use screen devices to soothe their children (Kabali et al., 2015), we found partial evidence to suggest that parents give children screen devices to soothe their own anxiety stemming from feelings of educational inefficacy. More effort is needed to help parents manage their anxiety and to teach parents how to realize and exploit the educational values afforded by the advancing media technology.

Declaration of competing interest

The authors declare that they have no conflict of interest.

CRediT authorship contribution statement

Chen Chen: Methodology, Formal analysis, Writing - original draft, Visualization. **Si Chen:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - review & editing, Project administration, Funding acquisition. **Peizhi Wen:** Resources, Data curation. **Catherine E. Snow:** Conceptualization, Supervision, Writing - review & editing.

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Appendix

Parenting efficacy Scale	Item-test correlation
I find it difficult to give my child proper attention and response	0.55
I worry my child cannot grow up happily	0.69
I am anxious for not be ab1e to explain things clearly to my child	0.69
I worry that I cannot handle my child's emotional problems	0.73
I worry that I cannot be a good parent because of my financial stress	0.73
I am concerned about my competency as a parent	0.75
I am afraid that I cannot form a close relationship with my child	0.74
I am nervous when I discipline my child's behaviors	0.78
I am anxious that I cannot accompany my child because I am busy at work	0.70
I worry I cannot teach my child to develop good habits	0.75
I am uncertain about my ability in playing the role of a parent	0.93
I often get up set that I cannot spend time with my children because I need to work	0.68

(*continued on next page*)

(*continued*)

Parenting efficacy Scale	Item-test correlation
I worry that I cannot provide a warm and lovely environment to grow	0.77
I worry that I cannot handle my child's b ad habits	0.67
I feel stressed that educational expenses for my child are more than I can afford	0.60
I worry that I cannot take care of my child's health	0.75
I am frustrated that I cannot provide proper development opportunities	0.73
I worry that I cannot make proper communication or interaction with my child	0.76

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