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Children's Health, Parent-Child Activities, Using Digital Devices, and Social Competence: Serial Mediation

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Abstract

Background: Studies have pointed out the influence of different children's activities and prolonged use of digital products on their social development. However, whether the parent-child activities and using digital devices were serial mediators of the relationship between children's health and social development needs further verification. **Purpose:** This study explored how parent-child activities and children's use of digital devices influence the relationship between children's health and their social competence. **Method:** This study used data from *Kids in Taiwan: National Longitudinal Study of Child Development and Care*. A total sample of 2164 participants was used in this study. Serial mediation analyses were performed using model six of Hayes' PROCESS (2012). **Results:** This study found that parent-child activities and the use of digital devices can serially mediate the relationship between children's health and social competence. Children's health could directly improve their social competence, but it could also serially mediate social competence by increasing parent-child activities and reducing the use of digital devices. **Conclusion:** Childcare policy planners and parenting educators should not only call on parents to reduce the use of electronic products for their children, but also encourage parents to spend more time interacting with their children, so that children can learn social skills by interacting with others in their daily lives.

Keywords

Children's Health, Social Competence, Parent-Child Activities, Using Digital Devices, Preschooler

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1. Introduction

The purpose of this study was to understand the mediating effects of parent-child activities and use of digital devices on the relations between young children's health and social competence. Many studies have pointed out the influence of different children's activities and prolonged use of digital products on their social development. However, when it comes to the relationship between young children's health and social competence, the research objects were mostly aimed at children with physical and mental disabilities or chronic illnesses. Whether the relationship between children's health and social development is affected by parent-child activities or using digital devices, and what the relationship is between parent-child and digital using digital devices, needs further verification.

Social competence is important for an individual's ability to develop and form lasting relationships and participate and function in a community, especially in early childhood [1]. For children, social competence includes various important aspects, meaning individuals with cooperation can follow social norms, positively interact with others in daily life, and acquire the individual abilities required in society [2]. As with other kinds of development, social competence is cultivated from childhood [1]. When interacting with their peers, children with positive social skills can share and fit in with others and follow the rules. Those characteristics of social competence influence their future adaptation to the environment [3], social behavior [4], personality development [5], and emotion management [6].

Much evidence suggests activities (such as play) and sedentary behavior (such as using electric devices) in early childhood are important predictors of the social skill [7]. Through different activities, young children learn and practice important social skills with people [8]. Activities, such as interaction with people and play [9], are considered as the foundation on which the social skills of young children are built. Research found that parents involved in their children's activities positively created higher levels of social behavior in their children [10]. Even when parents take their children to visit relatives and friends or regularly allow their children to play at home with their peers, it can help those children develop social skills [10]. Unstructured play with different environments can provide young children with enhanced social skills from different situations [11].

Although some studies found use of digital devices creates positive influence on children socially if caregivers could control the children's media or discuss TV content with children [11], many researchers believed electric devices have negative effects on children's development. Studies had found that screen time in early childhood reduces opportunities to interact with others [12] and negatively impacts the development of social skills, which is especially important in early childhood [13].

The academic community has always been concerned about the development of children, especially how to provide a healthy environment for children to

grow up [14]. The health influence of three levels factors: the individual factors, such as long-term video game activity [15]; the family factors, such as parents' education and employment [16], marital disruption [17], and child abuse [18]; and the social and environmental factors, such as inequalities [19], policy [20], and nature environments [21] have been widely investigated to discover better ways to promote children's health. For most children, they can cope with daily life, but for some children with chronic illness, they and their families are under significant daily stress [22].

Children's health is not only related to their daily activity but also to their future achievement [19]. Children with chronic illness have higher rates of both emotional and behavioral problems compared to children without chronic conditions [23]. And their conditions may limit normative activities and peer relationships [24]. Although having some problems in their social skills, children with chronic illness can improve their social interaction skills through a family-centered way [25]. Jamison *et al.* [26] indicated that teaching social skills to young children with disabilities early on may help to develop a foundation of appropriate social behaviors. While it is clear from the above that a young child's health does affect his social abilities, these results are mostly for children with chronic diseases.

In addition, many studies believed that the sick young children use more electric devices [27], since they have rarely social activities [27]. Li *et al.* [28] had also found excessive screen time use was associated with health problems, such as overweight/obesity, and various health indicators in physical, behavioral, and psychosocial aspects. It cannot be denied that these health problems also seem to intensify computer use. Recently, a study discovered that parent-child activities and screen time in early childhood significantly predict behavioral problems in early adolescence, and children's development benefits are greatest if parents and caregivers can substitute parent-child playtime for children's screen time [29]. Mustafaoğlu *et al.* [7] also indicated that physical activity is negatively related to screening duration for children, and digital technology use is of no benefit to children's health. Skaug *et al.* [30] have argued that parental companionship was related to time use while watching television and playing tablet gaming [31]. Furthermore, related past research has shown that parents who had more interaction with their children will reduce the use of digital devices and thus promote better development [32]. Therefore, this study argues that parent-child activities play an important role in limiting the negative effect on the use of electric device, thereby affecting the relationship between children's health and their social competence.

To determine the effect of parent-child activities and using digital activities on the relationship between children's health and their social competence, other possible factors were treated as control variables. Girls exhibit more desirable social behavioral development than boys [33]. Mothers' education levels considerably affect preschool children's social competence, because when mothers

with high education levels tend to require their children to exhibit social behaviors and competence appropriate to social norms [34]. The social competence development of children with poor health status, such as interacting and sharing with peers with mental disabilities and autism, are significantly inferior to children with good health status [35]. Finally, preschool children with siblings can realize their social abilities in daily living, such as sharing [36]. Therefore, in this study, children's gender, mother's education level, children's health, and whether children have siblings were used as control variables.

2. Methods

2.1. Data and Sampling

This study explored these hypotheses through quantitative research, based on data from *Kids in Taiwan*: *National Longitudinal Study of Child Development and Care* (KIT). The construction of KIT aimed to establish a long-term database regarding the development of local children and focuses on the process and evolution of the health and various dimensions of children from birth to 8 years old in Taiwan, as well as the effects of families and preschool experience on the children's development [37]. The database project has passed the ethical examination of the Institution Review Board of National Taiwan University (No. 201408ES007) and National Taiwan Normal University (No. 201707HS003).

This study analyzed the first group of KIT data, which was limited to parents with children born from April 1, 2013, to March 31, 2014, and aged 36 months. The sampling was based on two phases of the stratified proportionate to size approach; the first sampling unit was town and city, and 358 towns and cities in Taiwan were classified into 19 geographic stratifications. The second sampling unit was parents, who were selected randomly. A total sample of this study was 2164 parents [37], but after excluding questionnaires with incomplete responses, the final sample size utilized for analysis is 2111.

2.2. Measures

Because the design of the database is precise, the related items in KIT met the requirements of this study. The operational definitions of the variables in this study were consistent with the content in KIT; therefore, the validity issue of the propriety of data [38] in the analysis of the secondary database was avoided.

2.2.1. Independent Variables

The independent variable, "Children's health", is mainly measured using the items in the "Current health condition of the child" in the database. Children's health was based on the item, "In your opinion, what is the current health condition of the child?" Four-point scores included 1 (The child has a very serious health issue), 2 (The child gets sick very often), 3 (The child's health condition is normal. He/she gets sick occasionally), and 4 (The child is very healthy). The higher the score, the healthier the child. The mean score of children's health is

3.604 (SD = 0.536).

2.2.2. Dependent Variable

The dependent variable, children's social competence, was measured by the sum of four items: "The child can cooperate with other children to accomplish the work"; "When playing with other children, the child takes turns to use the equipment and toys"; "The child likes to share his/her toys with other adults or children"; and "The child shares his/her things (e.g., toys or stationery) with other children." Scoring is from 1 (Never) to 5 (Always). The higher the score, the better the child's social competence. The scale of social competence had been developed by Chang [37] in order to assess children's social competence. In this study, Cronbach's alpha coefficient was found as $\alpha = 0.80$ for the total scale. And the average score of social competence is 3.561 (SD = 0.825).

2.2.3. Mediation Variable

Two mediation variables are parent-child activities and using digital devices. Parent-child activities was measured by the sum of "I take the child to visit families and friends or invite families and friends to visit our home.", "I take the child to visit or play outside (e.g., parks, markets, or public squares).", "I take the child to the bookstore or the library.", and "I participate in activities suitable for children with the child (e.g. a parent-child joint activity)." Scoring is from 1 (rarely) to 4 (very often); the higher the score, the more often the parents took their children out of the house to play. The average score of parent-child activity is 2.524 (SD = 0.707).

Using digital devices was measured by the sum of two items: "On average, how much time each day does the child spend on watching TV (including all kinds of recorded media, such as DVDs)?"; and "Other than TV, on average, how much time each day does the child spend on using mobile devices (e.g., a laptop, a tablet computer, or a smart phone)?" And a higher score indicates more frequent use of digital devices. The average time of using digital devices is about 2.7 hours per day.

2.2.4. Control Variables

To avoid the effects of other variables, this study had the following control variables. Baby's gender was based on the item, "The child's gender." Scoring is from 1 (*male*) to 2 (*female*). Mothers' education levels were examined with the item, and "51.4% (n = 1113) were boys and 48.6% (n = 1051) were girls. The education level of the child's mother," with higher scores indicating higher education levels; and the average year of education of the mothers was 14.38 years. Finally, whether the children had siblings was investigated by asking "Does this child have siblings?" The answers were (1) no and (2) yes. And we found 69.4% (n = 1500) of the children had siblings, and 30.6% (n = 662) had none.

3. Results

Before conducting the regression analysis, Pearson's correlation analysis was

performed to examine the correlation coefficients among the variables in order to prevent multicollinearity. The strongest correlation was observed between using digital devices and mother's education, with the correlation coefficient being lower than 0.8 (r = −0.276) (Table 1). Thus, we observed that there was no collinearity or multicollinearity [13]. To determine the serial-multiple mediation of parent-child activities and using digital devices in the relationship between children's health and social competence, the regression-based approach, PROCESS Model 6, as recommended by Hayes [39] was used. Obtained findings are presented in Figure 1.

Table 1. Descriptive statistics and pearson correlation coefficient values regarding study variables (N = 2164).

	Mean	SD	1	2	3	4	5	6	7
1) Social competence	3.561	0.825	1						
2) Children's health	3.604	0.536	0.105***	1					
3) Parent-child activities	2.524	0.707	0.263***	0.080***	1				
4) Using digital devices	2.723	1.841	−0.125***	−0.005	−0.150***	1			
5) Child's gender	-	-	0.080***	0.045*	−0.004	−0.052*	1		
6) Mother's edu.	14.377	2.482	0.082***	−0.049*	0.221***	−0.276***	0.034	1	
7) Siblings	-	-	−0.025	0.042	−0.064**	0.010	0.030	−0.027	1

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

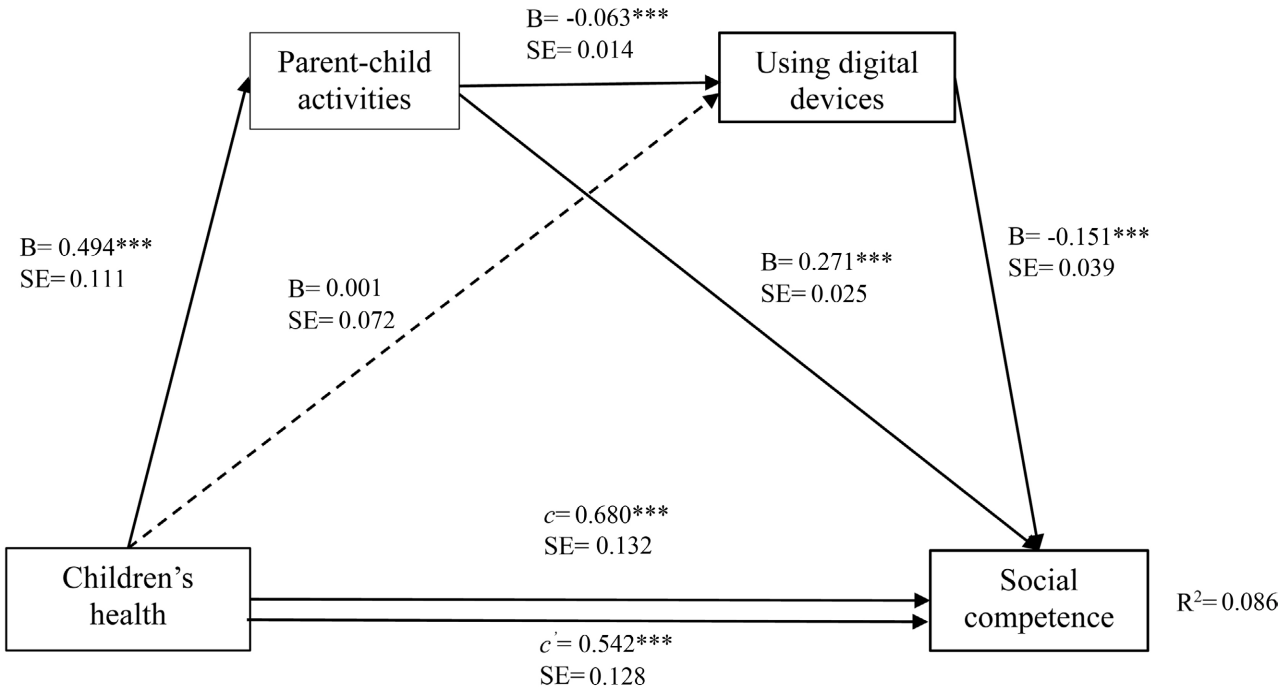

Figure 1. Serial-Multiple mediation of parent-child activities and using digital devices in the relationship between children's health and social competence with non-standardized beta values. ***p < 0.001.

As can be seen in Figure 1, total effect (c = 0.680, CI = 0.422 to 0.938, t = 5.172, $p < 0.001$) of children's health on social competence was at a significant level (Step 1). In addition, the direct effects of children's health on parent-child activities (effect = 0.494, CI = 0.276 to 0.711, t = 4.455, p < 0.001) was at a significant level, but children's health on using digital devices (B = 0.001, CI = −0.140 to 0.142, t = 0.017, p > 0.05) was not at significant levels. The direct effect of parent-child activities as the first mediating variable on the second mediating variable of using digital devices (B = −0.063, CI = −0.090 to −0.035, t = −4.448, p < 0.001) is on significant level (Step 2). A review of the direct effects of mediating variables on social competence, on the other hand, showed that the effects of parent-child activities (B = 0.271, CI = −0.221 to 0.320, t = 10.744, p < 0.001) and using digital devices (B = −0.152, CI = −0.228 to −0.076, t = −3.904, p < 0.001) were at significant levels (Step 3). When children's health and all other mediating variables were simultaneously entered into the equation (Step 4), the relationship between children's health and social competence, in relation to direct effect, was at significant level (c'= 0.542, CI = 0.291 to 0.793, t = 4.236, p < 0.001). Based on this result, the mediating variables were observed to partial mediate between children's health and social competence. In addition, the model overall was seen to be at a significant level (F (6-2104) = 32.915, p < 0.001) and explained 8.6% of the total variance in social competence.

The results of indirect effects and specific effects of children's health on social competence through parent-child activities and using digital devices are included in Table 2. As seen in Table 2, the total indirect effect (the difference between total and direct effects/c-c') of children's health through parent-child activities and using digital devices on social competence is statistically significant (effect = 0.005, CI = 0.002 to 0.009). Within the tested model, when considering the mediating variables separately and together in relation to the mediating indirect effects of children's health on social competence, single mediation of parent-child activities (effect = 0.134, CI = 0.076 to 0.201) was found statistically significant, but single mediation of using digital devices (effect = −0.000; CI = −0.023 to 0.024) was not found statistically significant.

Contrasting findings presented in pairs were included in this study in order to determine which model was stronger than other. Current research analysis results showed three contrasting pairs were obtained. Since the indirect effect of model 2 was not significant, we only compared model 1 with model 3. The results showed that the indirect effect of model 1 was significantly higher than model 3 (effect = 0.021; CI = 0.011 to −0.031), seen as in Table 2.

4. Discussion

The previous discussions regarding children's health and children's social competence have predominantly focused on the direct impact of various physical illnesses on children's social competence [23] [26]. However, this study proposes that the influence of children's health on social competence may occur through

Table 2. Serial mediation effects of parent-child activities and using digital devices on the relationship between children's health and social competence.

Model pathways	B	*SE*	*t*	p	*LL* 95% CI	*UL* 95% CI
Children's health → Parent-child activities	0.494	0.111	4.455	<0.001***	0.276	0.711
Children's health → Using digital devices	0.001	0.072	0.017	0.987	−0.140	0.142
Parent-child activities → Social Competence	0.271	0.025	10.744	<0.001***	0.221	0.320
Using digital devices → Social Competence	−0.152	0.039	−3.904	<0.001***	−0.228	−0.076
Parent-child activities → Using digital devices	−0.063	0.014	−4.448	<0.001***	−0.090	−0.035
	Effect	*SE*	*t*	p	*LL* 95% CI	*UL* 95% CI
Total Model Effect	0.680	0.132	5.172	<0.001***	0.422	0.938
Direct Effect	0.542	0.128	4.236	<0.001***	0.291	0.793
Total Indirect Effect	0.138	0.035			0.075	0.209
Children's health → Parent-child activities → Social Competence (model 1)	0.134	0.032			0.076	0.201
Children's health → Using digital devices → Social Competence (model 2)	−0.000	0.012			−0.023	0.024
Children's health → Parent-child activities → Using digital devices → Social Competence (model 3)	0.005	0.002			0.002	0.009
Contrasts						
Model 1 versus Model 2	0.022	0.006			0.011	0.033
Model 1 versus Model 3	0.021	0.005			0.011	0.031
Model 2 versus Model 3	−0.001	0.002			−0.005	0.003

Note. Models include controls for child's gender, mother's edu, and Siblings. ***pathway significant at $p < 0.001$; significant pathways are noted in bold (95% confidence interval does not cross zero). All pathways are unstandardized. Indirect effects were computed using 5000 bootstrap samples. Unstandardized indirect effects are shown outside parentheses. Standardized indirect effects are shown inside parentheses.

an indirect pathway. It is known from past research that a young child's health can negatively affect his social competence, especially a child with chronic illness [23], but the unhealthy effects can be reduced through child-parent interaction and supportive programs [26]. Through different activities, young children learn and practice important social skills with people [8] [9], which can improve the social competence of unhealthy children.

Although many studies believed that the sick young children use more digital devices because of the limitation of their physic and psychologic development

[27] [28], this study found no relationship between children's health and using digital devices. The effect of using digital devices is the second mediator of the model, that children's health could improve children's social competence by increasing parent-child activities to reduce the use of digital devices. From the concept of time pie, the use of digital products and parent-child activities are in competition with each other for children. The more parent-child activities, the less time children spend using electronic product [40]. However, when considering the impact of children's health on social competence, reducing the use of digital products requires increasing parent-child activities first, so as to help children's early childhood social behaviors.

5. Conclusions

The preschool stage is a critical period for the development of an individual's social abilities. If there is no proper training, the social development of children may be negatively affected, which will further affect future interpersonal interactions and social behaviors [1]. Past research showed that using digital devices have negative effects on children's social skill [13], since screen time in early childhood reduced opportunities to interact with others [12]. The findings of this study not only support the negative impact of digital products on children's social competence in the past, but further point out that reducing the use of digital devices is not enough. Promoting the social development of young children through parent-child activities is the key, and it is even more important for children who are not in good health.

Childcare policy planners and parenting educators should not only call on parents to reduce the use of electronic products for their children, but also encourage parents to spend more time interacting with their children, so that children can learn social skills by interacting with others in their daily lives.

6. Limitations

This study focuses on 36-month-old children as the research subjects and utilizes data from the KIT database to conduct a preliminary analysis of the factors that influence the development of social competence in Taiwanese children. As the development in early childhood has a significant impact on future outcomes, future research may compare the factors that influence the social competence development of preschool children of different ages to gain a more comprehensive understanding of relevant knowledge.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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