

**A Comprehensive Service Delivery Model for Preschoolers with Special Educational Needs:
Its Characteristics and Effectiveness**

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Abstract

Background: The compartmentalization between early intervention services and early childhood special education programs is a worldwide phenomenon, which results in the fragmentation of services for preschoolers with special education needs (SEN).

Aims: To address this fragmentation of services, an intervention program in Hong Kong adopted a comprehensive service delivery model with six characteristics: 1) multidisciplinary approach, 2) integration of services across different contexts, 3) multimodal intervention with direct and indirect services, 4) capacity building for systems, 5) inclusive environment, and 6) high program intensity.

Methods: The program evaluation was a quasi-experiment with a control group (n = 60) matched to the experimental group (n = 60).

Results: At the end of the school year, the experimental group made significant improvement in most measures including cognitive skills, receptive language skills, expressive language skills, gross-motor skills, fine-motor skills, and self-direction skills. School heads in the experimental group also agreed that the program had empowered their teachers and reinforced their school systems.

Conclusion: Despite its exploratory nature, the study has shed light on the future directions of services for preschoolers with SEN. The comprehensive service delivery model offers a response to the fragmentation of services and reveals the importance of integration of services across different contexts with multidisciplinary approach.

Keywords: preschoolers, special educational needs, comprehensive service delivery model

What this paper adds?

The compartmentalization in services for preschoolers with SEN is a common phenomenon around the world. The intervention program reported in this paper addresses this compartmentalization by adopting a comprehensive service delivery model. The model integrates services across the important ecological contexts for child development and includes both direct and indirect services. The evaluation study of this pioneering program, despite of its exploratory nature, has shown promising results. The preschoolers in the experimental group displayed improvement in six of the seven outcome measures at the end of the school year but the preschoolers in the control group did not. The benefits were also extended to the systems in which the children grew and developed. Their teachers had higher self-efficacy at the end of the school year and their school principals agreed that the program had reinforced their school systems and empowered their teachers in helping children with SEN. The enhancement of the school systems is important given that the prevalence of children with SEN is higher when the assessment is made according to teachers' perceptions of a child functioning in school contexts rather than standardized diagnostic testing for disability in clinical contexts. When teachers are empowered and school's capacity is enhanced, the children who are identified by teachers for special support but do not meet the traditional diagnostic criteria would also benefit. The program has shed light on the future directions of services for preschoolers with SEN and offered an alternative to the fragmentation of services.

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1. Introduction

Decades of research in neuroscience have shown that early childhood years, particularly from birth to five years, are critical in brain development (Center on the Developing Child, 2007). As children's earliest years lay the groundwork for lifelong development, the importance of effective early childhood education is well recognized. Its importance is even more profound for children who have or are at risk of developmental delays. High quality early childhood intervention may change their developmental trajectory and improve outcomes for them and their families (Hebbeler et al., 2007).

1.1. Importance of early childhood intervention

A meta-analysis (Camilli, Vargas, Ryan, & Barnett, 2010) reviewed 123 studies of early education interventions in the United States and found average effects of 0.23 standard deviations (SD) for cognitive development, 0.14 SD for school performance, and 0.16 SD for social-emotional development. These results were corroborated by those of another meta-analysis (Nores & Barnett, 2010) of 30 studies of early childhood interventions in 23 mostly developing countries. This international meta-analysis found average effects of 0.35 SD for cognitive development, 0.41 SD for school performance, 0.27 for behavior, and 0.23 for health. These convergent findings across developed and developing countries around the world provide strong support for the importance of early childhood intervention.

The value of early childhood intervention may be more evident when one looks into the cost/benefit analyses. The benefits include reducing economic burden to society through academic success and decreased need for special education in childhood, as well as increased earnings and less likelihood of reliance on welfare support in adulthood (Hebbeler, 2009, Reynolds, Temple, White, Ou, & Robertson, 2011). The Perry Preschool Project in Michigan

(Schweinhart, 2004), Abecedarian Project in North Carolina (Ramey, et al., 2000), and Chicago Parent Centers Project in Illinois (Reynolds et al., 2011) were three rigorously studied early childhood intervention programs in the United States. For every dollar invested in these programs, the return to society ranged from US\$2.5 to US\$16 (Mervis, 2011).

1.2. Early childhood intervention in Hong Kong

Despite the fact that early childhood intervention is important, it is not readily available to many preschoolers who have developmental delays and special educational needs (SEN). In 2015, Hong Kong had about 287,700 children between age two and six (Census and Statistics Department, 2016). Approximately 4.5% of these children (12,810) were diagnosed with a disability and thus entitled to rehabilitation services. Nevertheless, the Hong Kong Government could only offer 6,810 rehabilitation services places in 2015. Almost half of the preschoolers with SEN (6,000) had to be on a wait-list for the services and the average waiting time ranged from 13 to 19 months (Information Services Department, 2015). While waiting, most of the parents of these children had to enroll their children in regular preschools where little accommodation was provided.

In addition to the problem of limited access, early childhood intervention in Hong Kong also has difficulties in its service delivery model because preschool rehabilitation services are separate from preschool education. The former is for preschoolers with special needs and managed by the Labor and Welfare Bureau whereas the latter is for all preschoolers and managed by the Education Bureau. Harmonization of services is difficult because it requires close coordination between these two bureaus (Family Council, 2015). Even within the preschool rehabilitation services that are managed by the Labor and Welfare Bureau, compartmentalization is still a concern. For example, early education and training centers provide therapy, such as speech therapy, to children with SEN from birth to age two. The services are terminated once the children move on to inclusive preschool programs at the age of three. If the children move on to

regular preschool programs and do not receive other preschool rehabilitation services, the services at the early education and training centers may continue until the children reach age six but there is little communication between the centers and the regular preschool programs.

1.3. Compartmentalization in services

The compartmentalization in services for children with SEN is not unique to Hong Kong. In fact, it is a common phenomenon around the world. Zivian, Freeney, Rodger, and Watter (2010) distinguished early intervention services from early childhood special education programs. According to them, early intervention programs usually include the provision of occupational therapy, physiotherapy, speech therapy, and supportive services for the children and their families. In contrast, early childhood special education programs are classroom-based interventions in school settings. A review of the early childhood programs in the field does reveal such compartmentalization. The three most rigorously studied programs, Perry Preschool Project (Schweinhart, 2004), Abecedarian Project (Ramey, et al., 2000), and Chicago Parent Centers Project (Reynolds et al., 2011), were classroom-based intervention programs that did not include occupational therapy, physiotherapy, or speech therapy. On the other hand, the many early intervention programs outside school settings had no inclusive education component. For example, the Early Start Denver Model (Dawson et al., 2010) provided therapeutic services to children in clinical settings and did not involve an inclusive classroom. Apart from a few exceptions, such as Project DATA for Toddlers (Boulware, Schwartz, Sandall, & McBride, 2006), the compartmentalization of services seems to be the norm in the field. Interventions for preschoolers with SEN rarely involve comprehensive and integrated services that cover clinic-based, classroom-based, child-directed, systems-directed, and multimodal treatments.

There have been voices from the field calling for a multimodal approach that involves a partnership across school, family, and clinical contexts (e.g. Power et al., 2010). Ramey and Ramey (1998) pointed out that comprehensive services with multiple routes to enhancing

children's development had larger effects than services that were narrower in focus. Their findings are in agreement with ecological systems theory (Bronfenbrenner, 1977), which acknowledges that multiple systems contribute to a child's development. As it takes a village to raise a child, it is important to establish a shared mission, open communication, and close cooperation among all systems for the well-being of a child.

1.4. A comprehensive service delivery model

To address the inadequacy and fragmentation of services for preschoolers with SEN in Hong Kong, Heep Hong Society developed a comprehensive service delivery model and put that up for a two-year trial run with the funding of US\$1.28 million from a charity. Heep Hong Society is a nongovernment organization (NGO) that serves children of different abilities with inclusive preschool programs, early education and training centers, and special child care centers. Its professional team includes school psychologists, early child care workers, occupational therapists, physiotherapists, speech therapists, social workers, and preschool teachers. The comprehensive model developed by these professionals has six characteristics that are based on the principles of effective early intervention recommended by many researchers (Barnett, 2011; Odom & Wolery, 2003; Ramey & Ramey, 1998; Reynolds., Magnuson, & Ou, 2010; Smith et al., 2002).

1.4.1. Characteristic 1: Multidisciplinary approach

With its multidisciplinary team, Heep Hong Society provides occupational therapy, speech therapy, physiotherapy, and social/cognitive skills training to the children in its early education and training centers. This approach echoes the voice in the field for comprehensive services (Ramey & Ramey, 1998; Reynolds et al., 2010).

1.4.2. Characteristic 2: Integration of services across different contexts

The multidisciplinary team regularly visits the children's preschool and provides instructional consultation to their teachers. The intervention includes both center-based and

school-based services. The services are also extended to the family by teaching parents to train their children at home. The integration of services across center, school, and family is a response to the advocacy of Power et al. (2010) on partnership across ecological contexts.

1.4.3. Characteristic 3: Multimodal intervention with direct and indirect services

The current model includes both direct and indirect services. Besides direct training provided to children, instructional consultation to teachers and support to parents are also provided because school and family are two essential systems in which children grow and develop (Bronfenbrenner, 1977).

1.4.4. Characteristic 4: Capacity building for systems

By providing indirect services through teachers and parents, the intervention program aims at reinforcing both school and family systems. If schools and families can build up their capacity, all children in the systems will benefit (Smith et al., 2002). The beneficiaries will not be restricted to those with SEN.

1.4.5. Characteristic 5: Inclusive environment

Children with SEN learn best in more developmentally advanced settings (Odom & Wolery, 2003). It is important that children with SEN can interact with peers with typical development in an inclusive classroom. In the comprehensive service delivery model, children with SEN are all placed in regular preschools.

1.4.6. Characteristic 6: High program intensity

Past research has indicated that interventions that are more intensive produce larger positive effects than do interventions that are less intensive (Ramey & Ramey, 1998). In the current model, each child receives about 78 sessions of therapeutic training, such as speech therapy, during a school year. At the end of each session, parents are taught how to continue the training at home. They also receive counseling services from social workers on a monthly basis. In addition, they are invited to attend four to five parenting workshops during the school year.

The professionals from the team visit the preschools of the children on a monthly basis. Teachers are also invited to attend five to six staff development workshops during the school year.

1.5. Overview of the study

In face of the serious inadequacy of services and strong demand from parent advocacy groups, the Hong Kong Government intends to improve the early intervention for preschoolers with SEN (Family Council, 2015). The comprehensive service delivery model developed by Heep Hong Society may be considered as a pioneering model to which the policy makers can make reference for future development. The purpose of the current study is to evaluate the efficacy of this model. The evaluation study was a quasi-experiment with a control group matched to the experimental group in terms of age, gender, and SEN types.

2. Methods

2.1. Participants

The participants included 120 Chinese children in Hong Kong who were diagnosed with SEN, their parents, and 191 teachers of the 33 preschools in which they attended. Among these participants, 60 parent-child dyads and 142 teachers from 10 preschools were in the experimental condition. Another 60 parent-child dyads and 49 teachers from 23 preschools were in the control condition. The types of SEN among the children included global developmental delay (45%), autism spectrum disorder (27%), speech developmental delay (20%) and others, such as attention deficit and hyperactivity disorder (8%). As matching was adopted, there was no difference between the experimental and control groups in the prevalence of diagnoses.

To recruit preschools for the experimental group, 10 preschools located within the catchment areas of the early education and training centers of Heep Hong Society were approached by cold calls. They were approached not only because they were in the vicinity but also because they had at least 25% of their students coming from low-income families, which met the requirements set by the charity that funded the project. All these schools agreed to

receive the services and be involved in the evaluation study. With the assistance from the principals, invitation letters were sent to 60 parents and 142 teachers. All of them agreed to join. The response rates for the schools, parents, and teachers in the experimental group were 100%.

The participating preschools in the control condition were recruited by two approaches. The first approach employed the same recruitment method used in the experimental condition. The second approach contacted the preschools of the children with SEN who visited the parent resources centers of Heep Hong Society. With these two approaches, 45 preschools were contacted and 23 agreed to participate. Invitation letters were sent to 49 teachers of the 60 children with SEN in these 23 preschools and all of them agreed to join. The sample size of the teachers in control group was smaller than that in the experimental group because only the home-room teachers of the preschoolers in the control group were invited. In contrast, all the teachers in the 10 schools in experimental group were invited because all of them received consultation services and training from the pioneering program.

All the preschools were publicly-funded preschools for typically developing children with a teacher-student ratio around 1:10. The children in both conditions generally attended school three hours a day and five days a week. The control condition could be considered as “treatment as usual” because it is a general practice for Hong Kong parents to enroll their children with SEN in regular preschools with no accommodation when they cannot secure places in inclusive preschools. Compartmentalization of services prevails in these regular preschools because even when parents can secure some fragmented services for their children in out-of-school-hours, there is no communication between the service providers and the preschools.

The children in the two conditions were not significantly different in age ($M_{experimental} = 4.08, SD = .55; M_{control} = 4.05, SD = 0.67$), $t(118) = .274, p = .79$, Cohen’s $d = .05$. Neither were they significantly different in gender ratio, $\chi^2 = .05, df = 1, p = .83$. There were 47 boys and 13 girls in the experimental group and 46 boys and 14 girls in the control group. Most of the parents

who participated in this evaluation study were mothers. They made up 83.3% for the experimental group and 73.3% for the control group. There was no significant difference in whether the parents were mothers or not between the two conditions, $\chi^2 = 3.01$, $df = 3$, $p = .39$. Neither was there a significant difference in the age of the parents between the two conditions ($M_{experimental} = 37.02$, $SD = 6.56$; $M_{control} = 36.17$, $SD = 6.44$), $t(110) = .69$, $p = .49$, Cohen's $d = .13$. The parents were categorized into four groups according to their annual family income: (1) below US\$20,000; (2) between US\$20,000 and US\$ 40,000; (3) between US\$40,000 and US\$76,900; and (4) above US\$76,000. In the experimental condition, the percentages of the parents in Groups 1, 2, 3, and 4 were 28.8%, 39%, 23.7% and 8.5%, respectively. In the control condition, the percentages of parents in Groups 1, 2, 3 and 4 were 20.7%, 39.7%, 31%, and 8.6%, respectively. There was no significant difference in annual family income between the two conditions, $\chi^2 = 1.35$, $df = 3$, $p = .72$. In terms of the demographic background, the two conditions were very similar.

2.2. *Procedures*

Pretest and posttest data were collected at the beginning and the end of a school year, respectively. Data from the children were collected individually through assessments conducted by the professionals of the relevant assessment domain, e.g., language skills by speech therapists. The data from the parents and teachers were collected via a questionnaire given to them through the schools. Approval was granted by the appropriate Institutional Review Board and consent was received from all the participants.

2.3. *Intervention program*

2.3.1. *School-based services*

The support services in the experimental condition included both school-based support services and center-based therapeutic training services. School-based support services were the on-site support services provided by the specialists (including school psychologists, speech

therapists, occupational therapists, physiotherapists, and special child care workers) to the preschools. At the beginning of the school year, a multidisciplinary professional team from Heep Hong Society conducted initial meetings with the teachers to devise the Individual Education Plan (IEP) for each of the children in the experimental condition. Special child care workers visited the preschools on a monthly basis to provide on-site coaching for teachers on how to incorporate IEP training objectives in day-to-day classroom learning. They also demonstrated strategies and skills for teaching, behavioral management, and emotional regulation for children with various types of SEN. School psychologists and therapists visited the preschools quarterly to conduct classroom observations and curriculum consultation meetings with teachers to advise on IEP implementation. In addition, all teachers in the 10 schools were invited to attend six training workshops on strategies for identifying and teaching children with SEN. At the end of the school year, the multidisciplinary professional team conducted evaluation meetings with teachers to review the progress of the children, and the principals were asked to complete an end-of-the-school-year evaluation questionnaire regarding the support services they received.

2.3.2. Center-based services

The center-based therapeutic services refer to the training conducted by therapists and special child care workers in early education and training centers, utilizing facilities specially designed and equipped for sensory integrative therapy, physiotherapy and speech therapy. The training was either conducted individually or in small groups according to the children's needs. Within one academic year, all children in this condition each received around 21-22 sessions of speech therapy provided by speech therapists as well as 33-34 sessions of cognitive skills training and social skills training provided by special child care workers. Each session was about one to two hours long. Half of the children in the experimental condition were nominated by their teachers for 21-22 sessions of fine motor skills training provided by occupational therapists; the teachers' nominations were confirmed in a brief screening session by occupational therapists.

Thirty children, nominated by their teachers and briefly screened, also received 20-21 sessions of gross motor skills training provided by physiotherapists. It is noted that 14 children received both fine motor and gross motor training. Parents were invited to observe the training sessions. They would meet with the respective therapists and special child care workers after each training session and were given regular home training advice. In addition, social workers provided monthly one-on-one counseling/consultation to parents to promote positive parenting. Each parent in the experimental condition was invited to four to five parent training workshops on parenting and strategies for skills training at home.

2.4. *Measures*

2.4.1. *Cognitive skills*

The children's cognitive skills were measured by the Cognitive subtest of the Developmental Assessment Chart Revised (DAC-R) (Heep Hong Society, 2006), covering cognitive skills on six dimensions: causal relationship, spatial concept, object concept, color concept, shape concept, and early mathematics concept. Each item on every dimension was scored either as 1 for a correct answer/pass item or 0 for an incorrect answer/fail item. The raw score for each child on each dimension of cognitive skills was transformed into a standard score with reference to the scores of the current sample. The Cronbach's α of the six standard scores was .94 in the pretest and .90 in the posttest. These six standard scores were then averaged to form an index of cognitive skills. A positive score indicated a performance above the average in this sample whereas a negative score indicated a performance below the average in this sample.

2.4.2. *Language skills*

The children's language skills were measured by the Reynell Developmental Language Scales (RDLS) Cantonese (Hong Kong) Version (RDLS-C) (Hong Kong Society for Child Health and Development, 1987). It consists of two scales: Verbal Comprehension and Expressive Language. The Verbal Comprehension Scale can be considered a measure of receptive language

skills. It measures language understanding of nouns, verbs, prepositions, simple directions, and more complex directions. The Expressive Language Scale measures spoken language in the areas of syntax, vocabulary, and content. Standard score equivalents of raw scores by age were computed in both scales and were used to indicate the child's receptive and expressive language skills respectively. The higher score indicated better development of the language skills.

2.4.3. Gross-motor skills

The children's gross-motor skills were measured by the four subtests from the Peabody Developmental Motor Scales-Second Edition (PDMS-2) (Folio & Fewell, 2000). The four subtests measure a child's skills in Reflexes (8 test items, from birth to 11 months only), Stationary (30 items, all ages), Locomotion (89 items, all ages) and Object Manipulation (24 items, 12 months and older). A child was rated 2, 1, or 0 for each item, i.e., 2 for complete mastery, 1 for clear resemblance to the item mastery criteria but not fully meeting the criteria, and 0 for not attempting the item or the attempt not showing that the skill was emerging. The Gross-Motor Quotient (GMQ) is a composite of the results of the four subtests. With a mean of 100 and an SD of 15, the GMQ was used as an index of children's gross-motor skills. A higher GMQ indicated better development of gross-motor skills.

2.4.4. Fine-motor skills

The children's fine-motor skills were measured by the Hong Kong Preschool Fine-Motor Developmental Assessment (HK-PFMDA) (Heep Hong Society, 2009; Siu, Lai, Chiu, & Yip, 2011). The HK-PFMDA consists of 87 items measuring fine-motor skills including basic hand skills and pre-writing skills among children aged 0-6 years, sub-divided into 12 age groups. When comparing the total raw score to the normative data of the 12 age groups, a standard score can be obtained. A higher score indicated better development of the fine-motor skills.

2.4.5. Adaptive skills for school

These skills were measured by the School Living subscale with 24 items from the Adaptive Behavior Assessment System – Second Edition (ABAS-II) (Harrison & Oakland, 2003). The Teacher Form for Ages 0-5 of the Taiwan Chinese version was used (Lu & Chen, 2009). The teachers were asked to complete the 24 items that measured children’s adaptive skills needed for classroom learning and getting around the school (e.g. “Wipes up spills at school”) on a 4-point scale with 0 = “not able” and 4 = “always/almost always when needed.” A norm-referenced scaled score was used as an index of children’s adaptive skills for school, having a mean of 10 and a SD of 3. A higher scaled score indicated better adaptive skills for school.

2.4.6. *Self-direction skills*

These skills were measured by the Self-Direction Subscale with 25 items from the Adaptive Behavior Assessment System – Second Edition (ABAS-II) (Harrison & Oakland, 2003). The Parent/Primary Care-giver Form for Ages 0-5 of the Taiwan Chinese version was used (Lu & Chen, 2009). The parents were asked to complete the 25 items that measured how often their children displayed skills needed for independence (e.g., “Tries to do most of the things without the help from adults, such as dressing and eating”) on a 4-point scale with 0 = “not able” and 4 = “always/almost always when needed.” A norm-referenced scaled score was used as an index of children’s self-direction skills, having a mean of 10 and an SD of 3. A higher scaled score indicated that better self-direction skills.

2.4.7. *Parent self-efficacy*

This was measured by the eight items adapted from the Early Intervention Parenting Self-Efficacy Scale (Guimond, Wilcox, & Lamorey, 2008). Parents were asked to indicate how much they agreed that each item described their thoughts and feelings (e.g., “If my child is having problems, I would be able to think of some ways to help my child”). They were required to indicate their answers on a six-point scale with 1 = “strongly disagree” and 6 = “strongly agree.” The Cronbach’s α of the eight scores was .69 in the pretest and .79 in the posttest. The average of

the eight scores was used as an index of parent self-efficacy, a sense of being able to have the means to solve problems in raising children with SEN. A higher score indicated higher parent self-efficacy.

2.4.8. Teacher self-efficacy

This was measured by the eight questions from the Efficacy in Classroom Management Subscale of Teachers' Sense of Efficacy Scale (Tschannen-Morn & Woolfolk, 2001). Teachers were asked how much they could do certain things to manage their class, such as control disruptive behaviors in class. They were asked to indicate their answers on a 5-point scale with 1 = "not at all" and 5 = "a great deal." The Cronbach's α of the eight scores was .93 in the pretest and .92 in the posttest. The average of the eight scores was used as an index of teacher self-efficacy, a sense of being able to have the means to solve problems in teaching children with SEN. A higher score indicated higher teacher self-efficacy.

2.4.9. Enhancement of school capacity

The principals of the 10 preschools in the experimental group were asked to complete an end-of-the-school-year evaluation questionnaire after consulting their school staff. Four statements in the questionnaire measured their agreement that the intervention program had reinforced their school systems (e.g., developing school-based plans). They rated each statement on a 5-point scale, with 1 = "strongly disagree" and 5 = "strongly agree." The Cronbach's α of these four item scores was .76. The average rating of the four statements was used to indicate the principals' evaluation of the services in reinforcing their school systems in helping children with SEN. Another five statements measured their agreement that the intervention program had empowered their teachers (e.g., supporting classroom management). The Cronbach's α of these five item scores was .82. The average rating of the five statements was used to indicate the principals' evaluation of the services in empowering their teachers to help children with SEN.

2.5. Statistical analysis strategies

The data of each measure were first tested for normality and logarithmic transformation was performed to those that did not meet normality. The data about enhancement of school capacity were collected only from the principals of the 10 preschools that had been served by the program. Therefore, one-sample t tests were performed to examine whether the ratings on these measures were above mid-point of the scale. Other than these measures, all other measures had data from both experimental and control groups in the pretest and posttest. To examine whether the two groups were different in the pretest, independent t -tests were conducted. To examine the difference between the two groups in the posttest, *ANCOVA* were performed on the posttest scores of the two groups with the pretest scores as the covariate. Finally, to examine whether there was any difference between the pretest and posttest for each group, paired sample t -tests were conducted.

3. Results

Table 1 presents the means of pretest and posttest measures in the experimental and control groups. The skewness and kurtosis values of the data for all measures were in the range of ± 2 and ± 7 , respectively. Nevertheless the results of *Shapiro-Wilk's W* test for the data of cognitive skills, receptive language skills, and expressive skills were significant ($p < .05$), indicating non-normality. Therefore, the data of these three measures were transformed with logarithms before analyses were performed. The original sample size for both the experimental group and the control group was 30 for the measures of gross-motor skills and fine-motor skills; 60 for all other measures except teacher self-efficacy. The original sample size for the measure of teacher self-efficacy was 142 for the experimental group and 49 for the control group. As shown in Table 1, the attrition in the experimental group was minimal, being lower than that in the control group. Analyses were conducted to compare those who stayed and those who dropped out in the control group. Independent-samples t -tests and χ^2 tests indicated that these

two groups were not different for the demographic variables, including age and gender for the children; family income, age, and gender for the parents; all $p > .05$.

3.1. Cognitive skills

Independent t -test indicated that experimental group was not significantly different from the control group in the pretest, $t(115) = -.88, p = .39$, Cohen's $d = .15$. However, the results of *ANCOVA* indicated that the experimental group was significantly different from the control group after a year of intervention, $F(1,114) = 23.67, p < .001$, partial $\eta^2 = .17$, Cohen's $d = .27$. Paired sample t -tests also showed a significant increase from pretest to posttest in the experimental group, $t(59) = -3.70, p < .001$, Cohen's $d = -.33$, but a significant decrease in the control group, $t(56) = 3.50, p = .001$, Cohen's $d = .23$.

3.2. Receptive language skills

Independent t -test indicated that the experimental group was not significantly different from the control group in the pretest, $t(108) = .93, p = .35$, Cohen's $d = .18$. However, the results of *ANCOVA* indicated that the experimental group performed better than the control group after a year of intervention, $F(1,109) = 12.59, p < .001$, partial $\eta^2 = .11$, Cohen's $d = 0.14$. Paired sample t -tests also showed a significant improvement from pretest to posttest in the experimental group, $t(59) = -5.51, p < .001$, Cohen's $d = -.42$, but not in the control group, $t(49) = .18, p = .86$, Cohen's $d = .01$.

3.3. Expressive language skills

Independent t -test indicated that the experimental group was not significantly different from the control group in the pretest, $t(111) = .89, p = .38$, Cohen's $d = -.16$. However, the results of *ANCOVA* indicated that the experimental group performed significantly better than the control group, $F(1,107) = 10.73, p = .001$, $\eta^2 = .09$, Cohen's $d = 0.34$. Paired sample t -tests also showed a significant improvement from pretest to posttest in the experimental group, $t(59) = -$

8.09, $p < .001$, Cohen's $d = -.78$, but not in the control group, $t(49) = -1.10$, $p = .27$, Cohen's $d = -.14$.

3.4. *Gross-motor skills*

Independent t -test indicated that the experimental group was not significantly different from the control group in the pretest, $t(48) = .02$, $p = .99$, Cohen's $d = .004$. However, the results of ANCOVA indicated that the experimental group performed significantly better than the control group after a year of intervention, $F(1,47) = 38.82$, $p < .001$, partial $\eta^2 = .45$, Cohen's $d = 1.47$. Paired sample t -tests also showed a significant improvement from pretest to posttest in the experimental group, $t(29) = -10.09$, $p < .001$, Cohen's $d = -1.52$, but not in the control group, $t(19) = -.26$, $p = .80$, Cohen's $d = .06$.

3.5. *Fine-motor skills*

Independent t -test indicated that the experimental group was not significantly different from the control group in the pretest, $t(57) = -1.24$, $p = .22$, Cohen's $d = -.34$. However, the results of ANCOVA indicated that the experimental group performed significantly better than the control group after one year of intervention, $F(1,56) = 12.92$, $p = .001$, partial $\eta^2 = .19$, Cohen's $d = 0.42$. Paired sample t -tests also indicated a significant improvement from pretest to posttest in the experimental group, $t(29) = -7.66$, $p < .001$, Cohen's $d = -.95$, but not in the control group, $t(28) = -.69$, $p = .50$, Cohen's $d = -.11$.

3.6. *Adaptive skills for school*

Independent t -test indicated that the experimental group was not significantly different from the control group in the pretest, $t(109) = .58$, $p = .56$, Cohen's $d = -.11$. The results of ANCOVA also indicated that it was not significantly different from the control group in the posttest, $F(1,108) = .74$, $p = .39$, partial $\eta^2 = .007$, Cohen's $d = 0.05$. Paired sample t -tests did not show any significant improvement for both the control group, $t(50) = -.44$, $p = .66$, Cohen's $d = -.046$, and the experimental group, $t(59) = -1.78$, $p = .08$, Cohen's $d = -.21$.

3.7. *Self-direction skills*

Independent *t*-test indicated that the experimental group was not significantly different from the control group in the pretest, $t(110) = -1.53, p = .13$, Cohen's $d = .29$. The results of ANCOVA also showed that it was not significantly different from the control group in the posttest, $F(1,109) = 3.24, p = .08$, partial $\eta^2 < .029$, Cohen's $d = 0.45$. However, there was a significant increase in the score for the experimental group from pretest to posttest, $t(59) = -2.73, p = .008$, Cohen's $d = -.32$. In contrast, such an increase was not observed in the control group, $t(51) = -1.36, p = .18$, Cohen's $d = -.13$.

3.8. *Parent self-efficacy*

Independent *t*-test indicated that the experimental group was not significantly different from the control group in the pretest, $t(107) = -.26, p = .80$, Cohen's $d = .05$. The results of ANCOVA also showed that it was not significantly different from the control group in the posttest, $F(1,106) = 1.19, p = .28$, partial $\eta^2 = .01$, Cohen's $d = 0.21$. Paired sample *t*-tests showed a significant increase from pretest to posttest for both the control group, $t(48) = -2.09, p = .04$, Cohen's $d = -.26$, and the experimental group, $t(59) = -3.02, p = .004$, Cohen's $d = -.47$.

3.9. *Teachers self-efficacy*

Independent *t*-test indicated that the experimental group scored significantly lower than the control group in the pretest, $t(175) = -2.24, p = .03$, Cohen's $d = -.40$. However, the results of ANCOVA showed that it was not significantly different from the control group in the posttest, $F(1,174) = .01, p = .93$, partial $\eta^2 < .001$, Cohen's $d = -.06$. Paired sample *t*-tests showed a significant improvement from pretest to posttest in the experimental group, $t(138) = -4.5, p < .001$, Cohen's $d = -.62$, but not in the control group, $t(37) = -1.24, p = .23$, Cohen's $d = -.19$.

3.10. *Enhancement of school capacity*

On a scale of 5, the principals from the 10 schools in the experimental group gave an average rating of 4.30 (SD = .35) for the measure of reinforcement of school systems and 4.21

(SD = .53) for the measure of empowerment of teachers. They rated both measures high above the mid-point, indicating that they agreed that the intervention program had enhanced their school systems, $t(9) = 11.76, p < .001$, Cohen's $d = 3.71$, and empowered their teachers in helping children with SEN, $t(9) = 7.28, p < .001$, Cohen's $d = 2.28$.

4. Discussion

4.1. Outcomes for preschoolers

The results for the preschoolers' cognitive skills, receptive language skills, expressive language skills, gross-motor skills, and fine-motor skills share a similar pattern. Although the control and experimental groups were not significantly different in the pretest, the experimental group performed significantly better than the control group in the posttest. The paired sample t -tests indicated that the experimental group made significant improvements from pretest to posttest but the control group did not. The improvement was particularly impressive for expressive language skills, gross motor skills, and fine-motor skills. As revealed by the Cohen's d values, the preschoolers who had received the services made an improvement of .78 to 1.52 SD in these areas.¹ The findings of large effects in these areas are consistent with the claim of past researchers (Barnett, 2011; Ramey & Ramey, 1998) that direct therapeutic interventions result in larger and more enduring benefits than interventions that rely only on an indirect route (e.g., parent training) to change children's competencies.

Self-direction skills and adaptive skills for school were reported by parents and teachers, respectively. Parents in the experimental group reported significant improvement in their children's self-direction skills from pretest to posttest. In contrast, the same improvement was not reported by the parents in the control group. Almost all the outcome measures for

¹ Cohen (1988) suggested that $d=0.2$ be considered a small effect size, 0.5 represents a medium effect size and 0.8 a large effect size.

preschoolers indicated the efficacy of the intervention. The only exception was the measure of adaptive skills for school. The results showed no significant difference between the two groups for this measure in both pretest and posttest. Neither did the paired sample *t*-tests show any significant improvement for this measure from pretest to posttest in both groups. A possible explanation for this exception may lie in teachers' comparison of the target preschoolers with the other preschoolers in their classrooms. When teachers made the ratings, they might have made reference to the behaviors of preschoolers with typical development in their classrooms. As the preschoolers in both the experimental and control groups were children with SEN, the teachers might have rated them consistently low with reference to the norm.

The effect size of the preschoolers' outcomes ranged from 0.05 SD to 1.47 SD with an average of 0.45 SD. That means by the end of the school year, the preschoolers in the experimental group scored 0.45 SD higher than their counterparts in the control group across the outcomes. The effect size in the present study was higher than average program-level effect size of 0.27 SD found in the meta-analysis by Shager et al. (2013).

4.2. *Outcomes for parents, teachers, and schools*

Paired sample *t*-tests indicated that the parents in both control and experimental groups reported significantly higher self-efficacy in the posttest than in the pretest. However, there was no significant difference between the two groups in the posttest. The increase of parent self-efficacy in the control group might be an artifact due to attrition. All 60 parents in the experimental group stayed for the whole year between pretest and posttest but only 49 parents in the control group did so. Those who did not receive services but were willing to be engaged in the research project might be the resilient parents who were more open to social connection. The capability to stay connected to social and community networks is one of the characteristics of resilient families (Walsh, 2003). This might explain the rise of self-efficacy in this group of parents although they did not receive any services.

Paired sample *t*-tests indicated that the teachers in the experimental group reported significantly higher self-efficacy in the posttest than in the pretest. The same increase was not observed in the teachers in the control group. These results were corroborated by the ratings of the school principals in the end-of-the-school-year evaluation questionnaire. They agreed that the intervention program had reinforced their school systems and empowered their teachers in helping children with SEN.

4.3. *Contributions*

The current intervention program addresses the compartmentalization in services for preschoolers with SEN by adopting a comprehensive service delivery model. The model integrates services across the important ecological contexts for child development and includes both direct and indirect services. Its six characteristics are firmly based on the literature of good practices (e.g., Odom & Wolery, 2003; Reynolds et al., 2010; Smith et al., 2002).

The evaluation study of this pioneering program, despite of its exploratory nature, has shown promising results. The preschoolers in the experimental group displayed improvement in six out of the seven outcome measures at the end of the school year but the preschoolers in the control group did not. The benefits were also extended to the systems in which the children grew and developed. Their teachers had higher self-efficacy at the end of the school year and their school principals agreed that the program had reinforced their school systems and empowered their teachers in helping children with SEN. Lilvist and Granlund (2010) found that the prevalence rate of children with SEN could be as high as 17.3% by the teachers' assessment of children's functioning in school contexts but only 3.7% by standardized diagnostic testing. In Hong Kong, according to teachers' nomination, the prevalence rate of children with SEN is even higher. Although only 4.5% of Hong Kong preschoolers aged two to six were diagnosed as having a disability (Census and Statistics Department, 2016), 25% of Hong Kong first graders were identified by their teachers to be at risk for SEN (Information Services Department, 2013).

As the prevalence of children with SEN is higher according to teachers, it is important that the services are not only targeted at the children who have been diagnosed as having a disability through standardized testing. When teachers are empowered and school's capacity is enhanced, the children who are identified by teachers for special support but do not meet the traditional diagnostic criteria would also benefit.

The encouraging results of the current pioneering intervention program have prompted the Hong Kong Government to invest more in early intervention for preschoolers with SEN. This program heralded the Government's effort in launching a two-year pilot scheme with funding of US\$54 million for about 2,900 preschoolers in 450 preschools (Information Services Department, 2015). The Government invited 16 NGOs to provide these preschoolers with comprehensive services that were modeled after the current intervention program.

4.4. Limitations and future directions

Although this comprehensive service delivery model has many merits, it has some limitations. The preschoolers in the experimental group did not have significant improvement in adaptive skills for school as reported by teachers. There was also no significant difference between the experimental group and control group in self-direction skills as reported by parents at the end of the program. The nonsignificant results in these areas indicate a need to extend the improvement in specific skills (e.g. expressive language skills) to more broad and general skills. In addition, the feasibility of this comprehensive service delivery model depends on the availability of professionals. As this model requires a multidisciplinary approach, the availability of professionals in the various disciplines is crucial to the success of the model. Hong Kong has long been suffering from a shortage of rehabilitation personnel (Health & Welfare Bureau, 1999). This model cannot be fully implemented if the bottle-neck in the supply of relevant professionals continues. Training institutes need to increase the intake of students and prepare enough professionals for this new development.

The evaluation study of the current intervention program also has some obvious limitations. First, it was not a randomized control trial and therefore alternative explanations of some of the results cannot be excluded. As services were not offered to the control group, it was difficult to recruit participants for the control group and keep them involved throughout the whole year. Future studies might consider a waitlist control design if resources allow it. Second, the study only covered a period of one year. No data for the long-term outcomes were available. It would be worthwhile to follow the development of the participants for several years. Third, teachers in the experimental control group outnumbered those in the control group. Possible confounding effects may have been avoided if the two groups of teachers were similar in number. Lastly, multi-level analyses may be appropriate because the 120 preschoolers in the present study were nested within 33 preschools. However, some preschools in the control group only had one or two participants and thus made hierarchical linear modeling impractical. Future studies with bigger sample size are recommended to adopt multi-level analyses to control for school effects.

The comprehensive service delivery model is a promising approach to early intervention for children with SEN. The current evaluation study has provided preliminary evidence for its effectiveness. However, more studies, particularly of a longitudinal design, are required. We are looking forward to seeing more intervention programs adopting a comprehensive service delivery model and more evaluation studies examining their effectiveness.

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Table 1

The Means and Standard Deviation of the Measures in the Pretest and Posttest by Groups

	Pretest		Posttest	
	Control	Experimental	Control	Experimental
Cognitive skills	.13 ^a (.95) n=57	-.09 ^a (.76) n=60	-.12 (1.05) n=57	.11 (.51) n=60
Receptive language skills	-.79 ^{a,1} (1.61) n=50	-1.25 ^a (1.34) n=60	-.84 ¹ (1.41) n=50	-.61 (1.49) n=60
Expressive language skills	-1.02 ^{a,1} (1.7) n=50	-1.41 ^a (1.25) n=60	-.85 ¹ (1.32) n=50	-.40 (1.26) n=60
Gross-motor skills	82.1 ^{a,1} (6.79) n=20	82.13 ^a (6.86) n=30	81.65 ¹ (8.19) n=20	93.63 (8.06) n=30
Fine-motor skills	-1.77 ^{a,1} (1.19) n=29	-2.17 ^a (1.16) n=30	-1.60 ¹ (1.57) n=29	-.97 (1.40) n=30
Adaptive skills for school	6.63 ^{a,1} (2.36) n=51	6.35 ^{a,2} (2.64) n=60	6.75 ^{b,1} (2.65) n=51	6.88 ^{b,2} (2.48) n=60
Self-direction skills	7.27 ^{a,1} (2.20) n=52	7.93 ^a (2.36) n=60	7.5 ^{b,1} (2.57) n=52	8.70 ^b (2.42) n=60
Parent self-efficacy	4.04 ^a (.69) n=49	4.07 ^a (.54) n=60	4.22 ^b (.65) n=49	4.36 ^b (.68) n=60
Teacher self-efficacy	2.93 ¹ (.56) n=38	2.72 (.52) n=139	3.04 ^{a,1} (.56) n=38	3.01 ^a (.54) n=139

Note. Means in the same row do not share the same letter superscripts are significantly different across the two groups at .05 level. Means in the same row do not share the same numerical superscripts are significantly different between pretest and posttest at .05 level. Numbers in the parentheses are standard deviations.