

Effects of a family-centered workshop for children with developmental delays

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Abstract

This study investigated the effects of a short-term family-centered workshop for children with developmental delays.

This study was conducted in a rehabilitation outpatient clinic of a teaching hospital. We recruited 30 children with developmental delays and their parents as the study group and 57 age- and sex-matched children with typical development and their parents as the control group. The workshop was conducted for the children with developmental delays and their parents in the form of one 2-hour session per week for 6 weeks by health and education professionals by using a family-centered multidisciplinary approach. The Mandarin-Chinese Communicative Developmental Inventory and Peabody Developmental Motor Scales–Second Edition were used to assess the communication and motor skills of the children with developmental delays. The parent form of the Pediatric Outcomes Data Collection Instrument, Child Health Questionnaire, Pediatric Quality of Life (PedsQL) Inventory, and PedsQL Family Impact Module were administered to the parents of both groups.

On study commencement, no significant differences were noted in functional performance and family impact between the children with developmental delays and those without delays. The children with developmental delays had lower health and health-related quality of life (HRQOL) scores than the children with typical development. Following the workshop, the study group exhibited significant improvements in physical health (94.2 vs 80.2, effect size: 1.00, $P = .026$), global function (94.8 vs 78.7, effect size: 0.88, $P = .006$), impact of the child's health on parental HRQOL (85.0 vs 70.4, effect size: 0.81, $P = .043$), and parental HRQOL (81.3 vs 65.0, effect size: 0.81, $P = .015$). No significant differences were recorded in function, health, HRQOL, or family impact between the children with developmental delays and those with typical development after 6 weeks.

The multidisciplinary short-term family-centered workshop for children with developmental delays improved the children's physical health and global functional skills, and it reduced the impact of the child's health on parental HRQOL while also improving parental HRQOL.

Abbreviations: HRQOL = health-related quality of life, PedsQL = Pediatric Quality of Life, PODCI = Pediatric Outcomes Data Collection Instrument.

Keywords: children, developmental delays, function, health-related quality of life

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1. Introduction

Approximately 15% of infants and toddlers have developmental delays.^[1] Early developmental interventions can improve cognitive, motor, and behavioral outcomes, while minimizing the impact of disability on development.^[2,3] Family-centered early intervention services are known to have numerous benefits, including positive effects on parents' perception of efficacy, well-being, and satisfaction; providing anticipatory guidance to parents to foster their involvement in childcare interventions; and improving developmental and functional outcomes in children with developmental delays and special health needs.^[2,4–8]

The National Health Insurance program in Taiwan was implemented in 1995. Since 1997, the National Health Insurance program has funded early developmental interventions for children with suspected or confirmed developmental delays, disabilities, or chronic conditions.^[9] The Early Childhood Developmental Delay Rehabilitation Services were established in 2013 through collaboration among the Bureau of Health Promotion, Department of Education, and Child Welfare Bureau. These services provide children aged 0 to 6 years with suspected or confirmed developmental delays necessary health counseling, medical treatments, social welfare services, educational referrals, and placements. The number of Joint Assessment Centers for Child Development in Taiwan increased from 5 in 1997 to 45 in 2016, with an additional 75 hospitals providing

early intervention services. The number of children receiving early developmental screenings nationwide increased from 9421 in 2000 to 18,197 in 2013.^[10]

The preschool period is recognized as critical for the development of language, cognitive, motor, and social skills.^[11] Specifically, early communication is related to subsequent outcomes in special education.^[12] However, only 10% of potentially eligible children receive early intervention services^[1] because of various family- and practice-level barriers.^[13] Such barriers prevent young children with developmental delays from receiving appropriate services during this critical period and include failures to address the needs of children and their families,^[13] resource limitations such as therapist time^[14] and therapy dosage,^[15] and service provision (e.g., urban and rural disparities in specialization and access to therapy services).^[15] Ensuring an adequate number of therapy sessions is vital for parents of children requiring early developmental interventions.^[5] This has led to concerns that families require more traditional therapy sessions for their children than are currently being provided.^[5] However, conducting such sessions requires substantial manpower and is an economic burden. In Taiwan, children with delays in speech development must often wait for half a year before receiving treatment because of a severe shortage in speech language therapists. Therefore, in addition to traditional early developmental intervention programs, group-based approaches must be developed for improving function and health-related quality of life (HRQOL) in children with developmental delays based on children's condition, especially for children with delays in speech development.

We previously designed a workshop conducted by parents and professionals in health and education for children with developmental delays.^[16] The workshop emphasized the following aspects: participatory practice by families; bilateral interactions between professionals and families; training and education on strategies for improving children's communication, cognition, physical function, and behavior through play; sharing information and experiences; and shaping children's overall physical and learning environment.^[16,17] The short-term family-centered workshop demonstrated improvements in family function and parental satisfaction.^[16] However, we did not include any assessment tools for examining the effects of the workshop on children's functional performance or health. Therefore, the effects of the family-centered workshop for children with developmental delays remained uncertain.

In this study, we extended our prior findings by assessing the effects on children's functioning and health as well as the family impact of a prospective, family-centered workshop conducted by health and education professionals and parents for children with developmental delays. We proposed 3 hypotheses. First, children with developmental delays have lower functional performance and health status, and their conditions have a greater effect on family than the conditions of children with typical development. Second, participation by children with developmental delays in the workshop can improve functioning and health and reduce family impact. Third, children with typical development exhibit no increase or decrease in the outcome measures over 6 weeks.

2. Materials and methods

2.1. Design

This prospective study was conducted at Shin Kong Wu Ho-Su Memorial Hospital from August 2015 to April 2016. The

hospital is a teaching hospital with 862 beds and is located in northern Taiwan. Children with suspected developmental delays from Taipei City and New Taipei City located near the hospital are referred to the early intervention team at the hospital for developmental evaluation. The team members comprised a physiatrist, a psychiatrist, a pediatrician, an otolaryngologist, an ophthalmologist, a psychologist, a social worker, occupational therapists, speech therapists, and physical therapists. The early intervention team frequently administers visual acuity and hearing evaluations, the Chinese version of the Wechsler Intelligence Scale for Children–Third Edition or the Bayley Scales of Infant and Toddler Development–Third Edition (Bayley-III), Peabody Developmental Motor Scales, Preschool Language Evaluation Tool or Child Expression Evaluation Tool, and family structure and social support assessment. The Chinese version of the Wechsler Intelligence Scale for Children–Third Edition or Bayley-III is used to measure intelligence (which one is used depends on the child's age); the Peabody Developmental Motor Scales is used to measure gross and fine motor domains; and the Preschool Language Evaluation Tool or Child Expression Evaluation Tool is used to measure language performance (also depending on the child's age). In addition, genetic chromosomal analysis, brain magnetic resonance imaging, echocardiography, and electroencephalography are performed depending on the child's condition. Developmental delay is diagnosed when scores at least 2 standard deviations lower than mean scores on age-appropriate norm-referenced standardized developmental tests are obtained. The detailed developmental evaluation procedure has been reported in our previous studies.^[9,18] The scores obtained by the children in the present study to establish a diagnosis of developmental delay are presented in Table 1.

Table 1
Subscores of children used to establish diagnosis of developmental delay.

Variable (percentile rank)	DD (n=30)	Mean ± SD
Preschool Language Evaluation Tool (percentile rank)		
Comprehension		
Normal	14 (46.5)	46.7 ± 18.8
Borderline delayed	2 (7)	12.0 ± 2.8
Delayed	14 (46.5)	5.1 ± 2.3
Expression		
Normal	8 (27)	24.8 ± 13.3
Borderline delayed	3 (10)	11.0 ± 1.7
Delayed	19 (63)	6.1 ± 3.9
Peabody Developmental Motor Scales (percentile rank)		
Gross motor		
Normal	7 (23)	95.0 ± 3.9
Below average	12 (40)	84.5 ± 2.7
Delayed	11 (37)	72.5 ± 5.7
Fine motor		
Normal	13 (43)	96.3 ± 5.1
Below average	9 (30)	84.0 ± 2.6
Delayed	8 (27)	74.0 ± 6.6
Bayley III (composite score)		
Cognition		
Normal	10 (33.3)	107.0 ± 8.9
Borderline delayed	16 (53.3)	82.8 ± 8.2
Delayed	4 (13.3)	55.0 ± 0.0

Data are expressed as totals (%) except where otherwise indicated. DD = delayed development, SD = standard deviation.

2.2. Participants

The eligibility criteria for children in the study group were as follows: aged 18 to 36 months; first diagnosed developmental delay being a speech delay with or without delays in cognitive, fine motor, gross motor, or social and emotional functioning; on the waiting list for early intervention services and not receiving any such services; and availability of children and their parents to attend a 2-hour workshop session each week for 6 weeks. Eligible families were informed about the study at clinics by the treating physicians of their children. If parents were interested in the study, they were free to participate. At the same time, group age- and sex-matched children with typical development and their parents were recruited from 4 infant and young children community centers as the control group. The children in the control group were evaluated as having typical development based on their parents' reports regarding whether their children had identifiable developmental delays and on standard structured developmental screenings conducted by primary pediatric care providers. All parents provided written informed consent for themselves and their children for participation in the study. To detect an effect size of 0.77 at an alpha level of 0.05 and a power of 0.8, at least 28 participants must be included in a study group.^[16,19] According to

1 study, the potential median percentage of participants lost to follow-up is 6%.^[20] We therefore recruited 30 children with developmental delays and their parents for the study group, and 57 age- and sex-matched children with normal development and their parents as the control group.

This study was approved by the Institutional Review Board for the Protection of Human Subjects at Shin Kong Wu Ho-Su Memorial Hospital in accordance with the World Medical Association Declaration of Helsinki. The study was prospectively registered at ClinicalTrials.gov under the unique identifier NCT02523963 on August 13, 2015.

2.3. Intervention

The program for the workshop was designed by a psychiatrist, a child care and education teacher, a psychologist, a physical therapist, 2 speech therapists, and 2 occupational therapists. The psychiatrist was the main consultant for the parents and the main coordinator of the workshop. The workshop was structured in a small group containing 6 pairs of children with their parents. The workshop consisted of one 2-hour session conducted every week, with a total of 6 sessions over 6 weeks (Fig. 1).

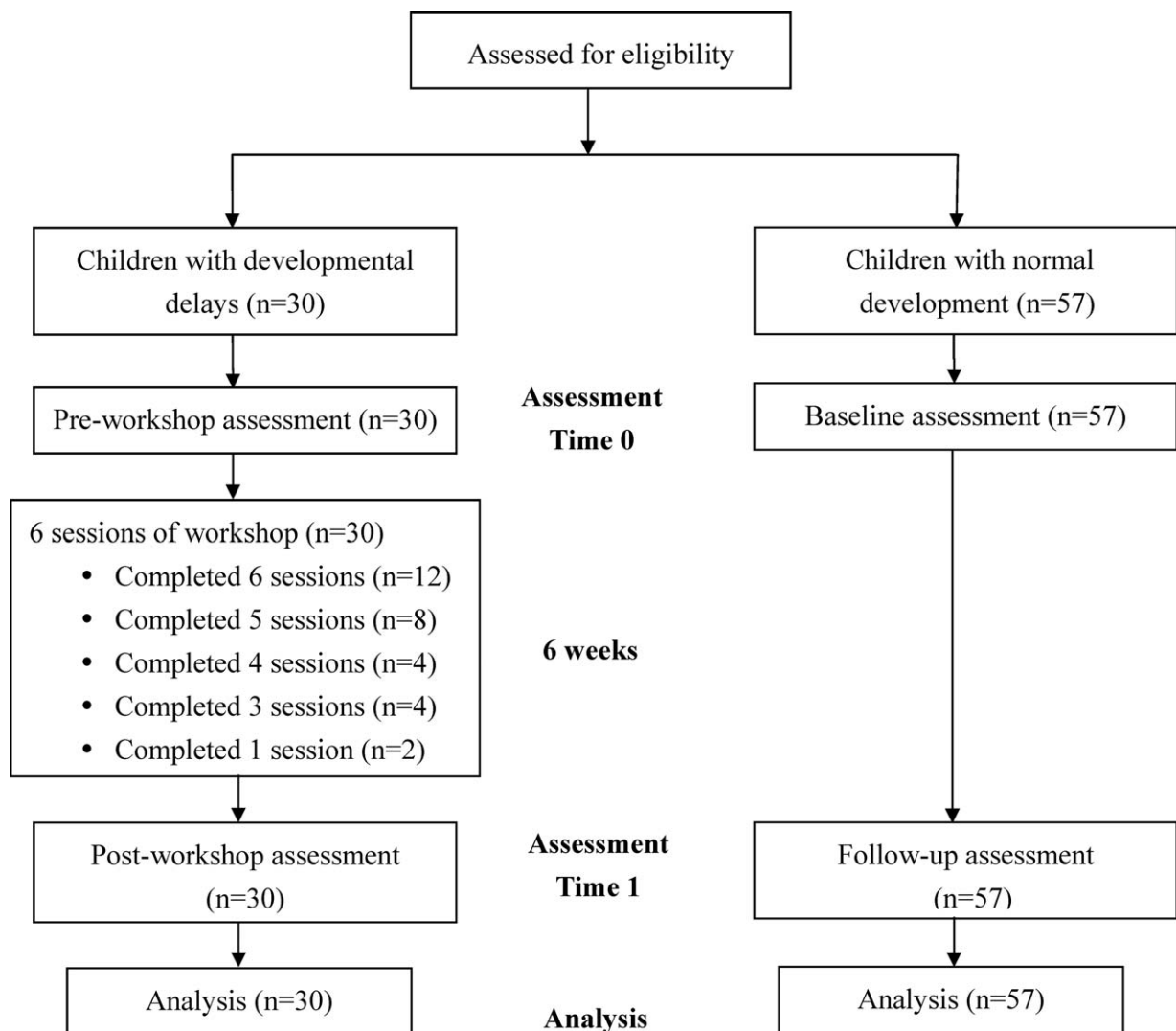


Figure 1. Trial profile.

In each session, the families interacted in the workshop with 3 professionals, namely a speech therapist, a child care and education teacher, and an occupational or physical therapist. The 3 professionals interacted with multiple families according to specific instructions. The families interacted with the same professionals across all 6 sessions. They provided individualized training on techniques and strategies to meet individual family needs for improving children's cognition, communication, physical function, and social interaction through play; emphasized parental engagement; nurtured parent-child and parent-educator-therapist interaction; and shared information and experiences with professionals and other parents. The detailed process was described in our previous study.^[16]

2.4. Outcome measures

After recruitment, outcome measures were assessed before participation in the workshop (T_0) and at the end of the 6-week workshop (T_1) in the study group and at baseline (T_0) and at a follow-up visit after 6 weeks (T_1) in the control group.

2.5. Communication and motor skills of children with developmental delays

The Mandarin-Chinese Communicative Development Inventory was employed for assessing the development of language and communication, such as expressive vocabulary, semantic function, sentence complexity, and word combination.^[18] It is designed for 16- to 36-month-old children and can be used to obtain scores for vocabulary production and syntactic complexity. Scores lower than 10% indicate a language developmental delay.^[18] It has high test-retest reliability ($r=0.81-0.97$) and interrater reliability ($r=0.73-0.95$).^[18]

The Peabody Developmental Motor Scales-Second Edition was used to measure motor development.^[21] It is a norm-referenced, standardized test composed of 6 subtests: reflexes, stationary, locomotion, object manipulation, grasping, and visual-motor integration. These tests provide gross motor and fine motor quotients. The scale has excellent test-retest reliability ($r=0.84-0.98$) and interrater reliability ($r=0.94-0.99$).^[22,23]

2.6. Functional performance, health, and HRQOL of children

The functional performance of children of both groups was measured using the parent report format of the Pediatric Outcomes Data Collection Instrument (PODCI).^[24] The PODCI contains 6 domains: upper extremity and physical function, transfer and basic mobility, sports/physical function, pain/comfort, happiness, and global functioning. The scores range from 0 to 100 and a higher score indicates higher functioning.^[24,25] The Chinese version of the PODCI has demonstrated high reliability (interrater reliability=0.97; intrarater reliability=0.83).^[26]

The parents' ratings of the health of children were determined using the Child Health Questionnaire Parental Form 28, which contains 28 items with 13 health scales.^[27] Well-being of a child (9 scales), impact of a child's health on parents' HRQOL (2 scales), and family function (2 scales) can be assessed using this scale.^[28] The Chinese version of the scale has demonstrated satisfactory reliability (interrater and intrarater reliability=0.9), validity, and feasibility.^[26] Scores are calculated from 0 to 100, with a higher score indicating a more favorable health status.

The pediatric HRQOL was measured using the Pediatric Quality of Life (PedsQL) Inventory Generic Core Scales parent proxy-report.^[29] A 5-point categorical response scale was used, and the scores were reversed and normalized to a range from 0 to 100, with 100 indicating the highest HRQOL. The PedsQL Inventory provides a physical health summary score, psychosocial health summary score, and total score. The Chinese version of the PedsQL Inventory has demonstrated satisfactory reliability (test-retest reliability=0.62-0.81), validity, and feasibility.^[27,30] The PedsQL physical health summary score was the primary outcome measurement.

2.7. Family impact

The PedsQL Family Impact Module^[29] was used to assess the impact of pediatric chronic health conditions on parents' HRQOL and family functioning. The module demonstrated satisfactory reliability ($r=0.79-0.98$).^[26,31] It contains 36 items and encompasses 8 dimensions: physical, emotional, social, cognitive functioning, communication, worry, daily activities, and family relationships. A parental quality of life summary score, family functioning summary score, and total score can be obtained using the module. The scores range from 0 to 100, with a higher score indicating lower family impact.

2.8. Statistical analysis

Statistical analyses were performed using SAS version 9.2. A chi-square test and *t* test were employed to compare data differences between the study and control groups according to demographic and baseline variables. No intervention was conducted for the control group. A paired *t* test was used to compare changes in outcome measure scores in each group. A simple *t* test was used for comparison of scores between the 2 independent groups at a follow-up visit after 6 weeks. The sample size was greater than 30; thus, according to the central limit theorem, the sample means were approximately normally distributed. The use of the *t* test (which requires a normality assumption) was therefore valid for this study. The results were expressed as the mean \pm standard deviation. The minimal and maximal values were also obtained for all measures to enable readers to determine whether a ceiling effect existed within the measures used for normal participants. Estimates of the effect size were reported. The following interpretation for the magnitude of effect size was chosen: 0 to 0.1=no effect; 0.2 to 0.4=a small effect; 0.5 to 0.7=an intermediate effect; and ≥ 0.8 =a large effect.^[32] The level of significance was set at 0.05.

3. Results

Among the 30 children with developmental delays, 25 had unspecified developmental delays, 2 had autism spectrum disorder, 1 had attention deficit-hyperactivity disorder, 1 had cerebral palsy, and 1 had Down syndrome. Of these children, 100% had speech and language developmental delays, 76.6% had social or emotional and gross motor delays, 53% had fine motor delays, 23.3% had cognition delays, and 90% had global developmental delays (Table 2).

The mean age of the children was 29.9 months (range=18-35 months). Of the 30 children, 18 were boys and 12 were girls. No statistically significant differences were observed in demographic data between the 2 groups. All the participants underwent preintervention and postintervention evaluations. Among the

Table 2
Demographics of participants.

Variable	DD (n=30)	TD (n=57)
Children		
Child's age, mean ± SD, mo	29.9 ± 5.5	27 ± 5.7
Child's sex		
Male	18 (60)	30 (53)
Female	12 (40)	27 (47)
Delayed development		
Gross motor	23 (76.7)	–
Fine motor	16 (53.3)	–
Speech-language	30 (100)	–
Cognition	7 (23.3)	–
Social emotion	23 (76.6)	–
Multiple domains	27 (90)	–
Diagnosis		
Unspecified developmental delays	25 (83.3)	–
Autism spectrum disorder	2 (6.7)	–
Attention deficit hyperactivity disorder	1 (3.3)	–
Cerebral palsy	1 (3.3)	–
Down syndrome	1 (3.3)	–
Parents		
Parent age, mean ± SD, y		
Father	40.1 ± 2.9	36.3 ± 2.9
Mother	37.3 ± 4.7	33.8 ± 3.6

Data are expressed as totals (%) except where otherwise indicated. DD = delayed development, SD = standard deviation, TD = typical development.

30 participants in the study group, 12 participants completed all 6 sessions of the intervention. The primary reasons for absence from the intervention sessions were sickness of the child and parents requiring personal time. No adverse events were reported during the intervention.

Table 3 lists the results from parental assessment of the children's functional performance, health, HRQOL, and family impact before intervention in both groups. Children's functional performance scores, measured using the PODCI, did not differ between the 2 groups. However, compared with the children with typical development, those with developmental delays had significantly lower baseline scores for physical health (80.2 vs 90.3, $P = .048$), psychosocial health (74.5 vs 88.4, $P = .039$), and impact of child's health on parent's HRQOL (70.4 vs 86.2, $P = .011$).

Table 4 lists changes in the communication and motor skills scores of children with developmental delays alongside scores of other outcome measures for both groups, including between-group differences in participating children and their parents. Children in the study group exhibited significant improvement in their physical health (94.2 vs 80.2, effect size: 1.00, $P = .026$), global function (94.8 vs 78.7, effect size: 0.88, $P = .006$), impact of the child's health on the parent's HRQOL (85.0 vs 70.4, effect size: 0.81, $P = .043$), and parental HRQOL (81.3 vs 65.0, effect size: 0.81, $P = .015$) after 6 weeks of intervention (changes between T_1 and T_0). However, after 6 weeks of the workshop, no significant differences were noted in communication and motor skills or the majority of outcome measure subscales of functional performance (except for global function) in the children with developmental delays. The children and parents in the control group showed no significant changes in outcome measure scores after the 6-week period (changes between T_1 and T_0). The children and parents in the both groups had no significant difference in outcome measures after 6 weeks (T_1).

Table 3
Scores for the participating children and their parents before intervention.

Variable	DD (n=30)	TD (n=57)	P-value
Children			
Communication: MCDI			
Vocabulary production	7.5 ± 2.1	–	–
Syntactic complexity	8.0 ± 2.5	–	–
Motor: PDMS-II			
Gross motor	82.1 ± 17.2	–	–
Fine motor	75.6 ± 19.4	–	–
Functional performance: PODCI			
Upper extremity and physical function	79.5 ± 18.6	85.3 ± 13.9	.085
Transfer and basic mobility	80.8 ± 15.8	86.4 ± 13.6	.123
Sports and physical function	70.2 ± 18.2	73.1 ± 19.2	.553
Pain/comfort	75.6 ± 16.5	77.8 ± 20.5	.376
Happiness	86.4 ± 19.2	90.2 ± 22.3	.462
Global function	78.7 ± 20.1	79.7 ± 20.3	.981
Health: CHQ-PF28			
Well-being of child	70.8 ± 23.6	76.9 ± 19.5	.060
Impact of child's health on parent's HRQOL	70.4 ± 20.4	86.2 ± 19.7	.011*
Impact on family	74.5 ± 22.1	81.7 ± 18.3	.128
HRQOL: PedsQL			
Physical	80.2 ± 10.4	90.3 ± 10.4	.048*
Psychosocial	74.5 ± 15.6	88.4 ± 11.1	.039*
Total score	74.9 ± 11.7	84.4 ± 16.8	.051
Parents			
Family impact: PedsQL-family impact module			
Parental HRQOL summary	65.0 ± 23.9	74.6 ± 19.8	.068
Family functional summary	60.8 ± 26.7	66.5 ± 24.7	.198
Total impact score	62.9 ± 24.5	70.5 ± 22.4	.057

Data are expressed as mean ± standard deviation. * $P < .05$. PedsQL, Pediatric Quality of Life Inventory–Generic Core Scales; PedsQL-Family Impact Module, Pediatric Quality of Life Inventory Family Impact Module. CHQ-PF28 = Child Health Questionnaire–Parental Form 28, DD = delayed development, HRQOL = health-related quality of life, MCDI = Mandarin-Chinese Communicative Development Inventory, PDMS-II = Peabody Developmental Motor Scales, PedsQL = Pediatric Quality of Life, PODCI = Pediatric Outcomes Data Collection Instrument, TD = typical development.

4. Discussion

We investigated the effects of a 6-week family-centered workshop conducted by members of a rehabilitation team, a child care and education teacher, and parents on children with developmental delays. The present study provided novel insights regarding the workshop's effects on children with developmental delays beyond the findings of our previous research. Although the children with developmental delays had lower physical and psychosocial health and a greater impact on parent's HRQOL than the children with typical development, the groups were not significantly different on the majority of outcome measure subscales prior to intervention, especially for functional performance. The present study further demonstrated that the designed workshop improved physical health and global function in children with developmental delays; moreover, the workshop improved their parental HRQOL and family impact. After 6 weeks of the workshop, no significant difference was noted in functional performance, health, HRQOL, and family impact between the children with developmental delays and those with typical development.

The fact that no difference was found in functional performance between the 2 groups after 6 weeks of the workshop is unsurprising because the scores of functional performance,

Table 4**Score changes for the participating children and their parents after intervention.**

Variables	DD				TD				T ₁		
	T ₀	T ₁	Cohen d	P-value	T ₀	T ₁	Cohen d	P-value	DD	TD	P-value
Children											
Communication: MCDI											
Vocabulary production	7.5±2.1 (5.3–9.7)	11.4±5.7 (5.6–17.3)	0.91 [†]	.057	–	–	–	–	11.4±5.7	–	–
Syntactic complexity	8.0±2.5 (5.4–10.6)	6.9±2.6 (4.2–9.6)	–0.43	.958	–	–	–	–	6.9±2.6	–	–
Motor: PDMS-II											
Gross motor	82.1±17.2 (63.5–99.5)	85.0±14.8 (70.1–100)	0.18	.081	–	–	–	–	85.0±14.8	–	–
Fine motor	75.6±19.4 (56.1–95.3)	63.4±20.1 (43.2–83.7)	–0.62	.224	–	–	–	–	63.4±20.1	–	–
Functional performance: PODCI											
Upper extremity and physical function	79.5±18.6 (59.6–98.2)	92.2±6.70 (62.7–100)	0.91 [†]	.055	85.3±13.9 (55.5–100)	89.2±10.5 (69.1–100)	0.32 [†]	.445	92.2±6.7	89.2±10.5	.892
Transfer and basic mobility	80.8±15.8 (61.7–98.1)	88.6±19.7 (60.9–100)	0.44 [†]	.561	86.4±13.6 (61.3–100)	88.5±11.4 (59.8–100)	0.17	.585	88.6±19.7	88.5±11.4	.995
Sports and physical function	70.2±18.2 (50.2–90.0)	76.7±20.4 (56.1–97.1)	0.34 [†]	.522	73.1±19.2 (51.9–93.1)	74.5±18.3 (49.3–95.1)	0.07	.749	76.7±20.4	74.5±18.3	.223
Pain/comfort	75.6±16.5 (55.0–92.8)	77.9±21.6 (50.8–99.6)	0.12	.869	77.8±20.5 (55.3–98.6)	78.4±19.4 (57.1–98.2)	0.03	.993	77.9±21.6	78.4±19.4	.598
Happiness	86.4±19.2 (65.2–100)	93.1±18.5 (57.0–100)	0.36 [†]	.563	90.2±22.3 (57.0–100)	93.3±6.70 (64.1–100)	0.19	.765	93.1±18.5	93.3±6.70	.906
Global function	78.7±20.1 (52.3–99.2)	94.8±16.5 (70.5–100)	0.88 [†]	.006*	79.7±20.3 (57.1–100)	84.8±15.2 (60.9–100)	0.28 [†]	.615	94.8±16.5	84.8±15.2	.068
Health: CHQ-PF28											
Well-being of Child	70.8±23.6 (46.1–95.5)	79.0±22.6 (50.3–100)	0.35 [†]	.181	76.9±19.5 (52.4–100)	78.4±21.7 (50.9–100)	0.07	.867	79.0±22.6	78.4±21.7	.522
Impact of child's health on parent's HRQOL	70.4±20.4 (45.2–96.5)	85.0±15.4 (42.8–100)	0.81 [†]	.043*	86.2±19.7 (56.5–100)	85.4±14.3 (69.4–99.7)	–0.05	.975	85.0±15.4	85.4±14.3	.983
Impact on family	74.5±22.1 (50.5–96.8)	81.9±17.7 (57.2–100)	0.37 [†]	.324	81.7±18.3 (62.5–100)	87.5±12.3 (72.6–100)	0.37 [†]	.742	81.9±23.7	87.5±12.3	.056
HRQOL: PedsQL											
Physical	80.2±10.4 (60.1–91.9)	94.2±16.8 (67.2–100)	1.00 [†]	.026*	90.3±10.4 (65.8–100)	94.2±5.70 (62.3–100)	0.47 [†]	.335	94.2±16.8	94.2±5.70	.885
Psychosocial	74.5±15.6 (57.9–92.1)	83.4±18.6 (64.5–100)	0.52 [†]	.054	88.4±11.1 (61.3–100)	86.7±13.2 (69.3–100)	–0.14	.852	83.4±18.6	86.7±13.2	.759
Total score	74.9±11.7 (62.5–88.0)	83.7±17.1 (65.7–100)	0.60 [†]	.059	84.4±16.8 (60.9–100)	85.0±14.8 (67.5–100)	0.04	.988	83.7±17.1	85.0±14.8	.477
Parents											
Family impact: PedsQL family impact module											
Parental HRQOL summary	65.0±23.9 (39.5–89.2)	81.3±15.2 (55.7–96.8)	0.81 [†]	.015*	74.6±19.8 (52.1–94.5)	82.7±17.4 (61.5–100)	0.43 [†]	.428	81.3±25.2	82.7±17.4	.651
Family functional summary	60.8±26.7 (33.5–90.5)	71.7±21.0 (49.5–95.3)	0.45 [†]	.061	66.5±24.7 (41.0–91.8)	70.9±19.2 (47.5–91.5)	0.20 [†]	.793	71.7±21.0	70.9±19.2	.368
Total impact score	62.9±24.5 (37.5–88.4)	76.5±23.5 (52.0–100)	0.57 [†]	.057	70.5±22.4 (47.5–93.0)	72.5±23.1 (46.5–96.5)	0.09	.912	76.5±23.5	72.5±23.1	.219

Data are expressed as mean ± standard deviation; range (min–max). T₀, baseline; T₁, after intervention. **P* < .05. PedsQL, Pediatric Quality of Life Inventory—Generic Core Scales; PedsQL-Family Impact Module, Pediatric Quality of Life Inventory Family Impact Module. CHQ-PF28 = Child Health Questionnaire—Parental Form 28, DD = delayed development, HRQOL = health-related quality of life, MCDI = Mandarin-Chinese Communicative Development Inventory, PDMS-II = Peabody Developmental Motor Scales—Second Edition, PedsQL = Pediatric Quality of Life, PODCI = Pediatric Outcomes Data Collection Instrument, TD = typical development.

[†] Cohen *d* ≥ 0.2.

measured by the PODCI, did not differ between the 2 groups at baseline. Therefore, our results did not fully support our first hypothesis. We selected the PODCI for functional performance assessment because it measures the ability to perform or participate in age-appropriate activities along with levels of pain or comfort, general happiness, satisfaction with care, expectation for treatment, and upper and lower extremity function.^[33] However, the existing ceiling effects and gaps in the PODCI itself, use of the pediatric version for reporting by parents (which lacks objective functional performance measurements), and the fact that most of the children (83%) with developmental delays had unspecified delays may have affected the results.^[34] In future, further objective functional performance measures should be conducted.

The increasing prevalence of long-term disorders is a considerable burden on health care systems worldwide.^[35]

Developing a strategy for providing comprehensive, personalized, coordinated multidisciplinary care is thus crucial.^[36] The brain is essential for learning skills and shaping future knowledge, especially in the first few years of life.^[4,37] One study reported that timely early intervention can improve quality of life and functional outcomes in young children at risk of developmental delays.^[4] The United States has focused on providing early developmental intervention to infants and young children with confirmed developmental delays or at risk of developmental delays from birth to 3 years of age. In Taiwan, 38.8% of children diagnosed with developmental delays were younger than 3 years in 2013, and the ratio continues to increase.^[38] The present study demonstrated that a family-centered workshop for children younger than 3 years with developmental delays had positive outcomes for the children's physical health and global function as well as parental HRQOL

and the impact of the child's health on parental HRQOL. This result supported our second hypothesis that a multidisciplinary family-centered workshop for children with developmental delays improved their function and health and reduced their family impact. However, we did not conduct long-term follow-up with the children. Therefore, further studies investigating the long-term effects of family-centered workshops on children with developmental delays are warranted.

Family-centered interventions can improve healthcare outcomes for the families of children with special healthcare needs.^[6] Group-based interventions have provided positive outcomes with respect to parental psychological distress and satisfaction.^[16,17] Family workshops, such as those for educating the families of children with food allergies,^[39] changing dietary and physical activity habits in low-income families,^[40] supporting children with autism and other disabilities,^[17] and integrating pediatric mental health care,^[41] have provided knowledge, comfort, and satisfaction for many families. To our knowledge, we are the first to design a family-centered workshop conducted by parents alongside health and education professionals for children younger than 3 years with developmental delays.^[16] The family-centered workshop provides training strategies for increasing children's physical function and social behavior through play and emphasizing active parental participation in children's daily activities; moreover, it provides guidance to parents regarding children's disabilities and a forum in which to share their experiences with others.^[16] In addition to enhancing family function and satisfaction as demonstrated by our previous study, we observed that participation in the workshop improved children's physical health and global skills, and it also improved parents' HRQOL and the family impact.

No significant change was noted in the function, health, or family impact of children with typical development over the 6-week period. This result supported our third hypothesis. However, children with typical development might have a different developmental timeline compared with developmentally delayed children. As a result, 6 weeks may not be sufficiently long to witness a change in children with typical development, even in the absence of an intervention. In addition, the lack of an intervention in the control group meant that we were unable to isolate workshop effects.

We also found no significant difference in functional performance, health, HRQOL, parental HRQOL, or family impact after the 6-week family-centered workshop between the children with developmental delays and those with typical development. This indicates that we can actively integrate multidisciplinary and family-centered workshops into early intervention services for children with developmental delays. However, because of a lack of children with developmental delays as controls in the present study, we cannot rule out the possibility that the effects were influenced by the time factor, social aspects of parents participating in the workshops, bias when providing questionnaire responses after engaging with the research, or changes related to other interventions and activities that the families engaged in during that time. To control for these and other factors, comparison of an intervention group of children with developmental delays to a control group of without-intervention children with developmental delays should be conducted.

5. Limitations

This study had several limitations. First, the present study focused on how much change might occur in the presence of intervention.

Therefore, the most appropriate comparison would be children with similar developmental delays who did not receive intervention through a randomized controlled trial. However, because of ethical considerations, children diagnosed with developmental delays should receive traditional early intervention programs as soon as possible. In addition, the aim of the present study was to explore the effects of the family-centered workshop on the function and health of children with developmental delays rather than comparing traditional interventions to our newly designed workshop. Therefore, we recruited children without developmental delays as controls. In the future, we should compare the intervention group of children with developmental delays to a control group of children with developmental delays. Second, because of child sickness and parents requiring personal time, only 40% of the participants attended all of the workshop sessions. The results were therefore limited by attendance and dosage issues (6 families completed ≤ 3 sessions), which may have biased the results. However, because the participation rate was low, we also cannot exclude the possibility that our results underestimated the positive effects of the workshop. Third, although we used reliable, valid, patient-centered measurements for comparison of the 2 groups, the methodology of the study was limited by the use of parent-reported outcomes (an intervention with high parental involvement). The results in the measures over this short period, although statistically significant, were marginal. This raises the possibility that the parents either shifted perspective or engaged their children in activities they had not previously attempted, subsequently finding that their children were, in fact, capable. Although we successfully educated parents on how to participate and engage in their children's activities of daily living, further objective measures for assessment of functional performance in children should be performed. Fourth, no confirmation of typical development was made other than the parental report in the control group. Fifth, the generic category of developmental delay covered much heterogeneity and subcategories with direct relevance to specifics of approach and outcome. We recruited children with speech delays from clinics for early developmental intervention, and the outcome measures were relatively limited. We did not analyze other potential factors or heterogeneity in the presentations, and we conducted insufficient etiological work-up. Therefore, we should not generalize the results to children with specific disorders, because the diagnoses of the children with developmental disorders in the present study varied. Nevertheless, the results are representative of children assessed and treated in clinical settings. Sixth, because multiple *t* tests were performed, the probability of type-1 error increased. Last, we did not conduct long-term follow-up with the children. Therefore, this study does not provide data on the long-term effects of the workshop.

6. Conclusions

Our findings show that children with developmental delays had lower physical and psychosocial health and greater effect on parental HRQOL than children with typical development at baseline. The short-term family-centered workshop conducted by interprofession collaboration between health and education professionals improved the physical health and global function of the children with developmental delays as well as parental HRQOL and family impact. After the 6-week workshop for children with developmental delays, no significant differences we noted in functional performance or family impact between the study and control groups. However, the study and control groups

were also not significantly different on the majority of outcome measure subscales prior to intervention. Therefore, caution should be taken when generalizing the results from this study, which focused on children with speech delays, to all children with developmental delays.

Author contributions

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