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A Chinese version of the Young Children's Participation and Environment Measure: Psychometric evaluation in a Hong Kong sample

Abstract

Purpose: To investigate the psychometric properties of a Chinese-translated version of the Young Children's Participation and Environment Measure.

Materials and methods: The Young Children's Participation and Environment Measure was translated into Chinese using cultural adaptation by adding/replacing with activities relevant to Chinese culture. Parents of 53 children aged 2–5 years with developmental disabilities and of 50 typical developing children completed the questionnaires. Internal consistency, test-retest reliability, known-group validity, and discriminant validity were examined using Cronbach's alpha, intraclass correlation coefficient, Mann–Whitney *U* tests, and Spearman's rank correlation coefficients respectively.

Results: Internal consistency was acceptable for most scales (α = 0.42–0.89). Test-retest reliability of the summary scores was moderate to high for all scales (intraclass correlation coefficient = 0.65−0.90). Known-group validity was supported by demonstrating significant differences by disability status in all community participation scales, two daycare/preschool participation scales, and one home participation scale. Low or negative correlations between the scores of some scales and children's cognition (ρ = 0.27–0.32; -0.36–-0.35) and parental stress (ρ = -0.42–-0.31) supported discriminant validity.

Conclusion: This study provided psychometric evidence supporting the use of the Young Children's Participation and Environment Measure to assess Chinese children's participation and environmental support.

Keywords: Participation; Chinese children; Young Children's Participation and Environment Measure; YC-PEM; Psychometrics.

Introduction

Participation refers to the nature and extent of an individual's involvement in life situations according to the International Classification of Functioning, Disability, and Health [1]. Participation offers individuals opportunities to learn, express oneself, interact with others, gain news skills, and develop a sense of purpose [2,3]. Successful participation in everyday activities is important for children during the first six years of life, as it facilitates children's development of fundamental skills [4] and helps families sustain daily routines [5]. Promoting participation is recognized as the primary outcome in pediatric rehabilitation and early intervention services that are provided to families who have a child with a disability [6].

Developmental disabilities (DD) are a heterogeneous group of impairments in functioning attributed to physical and/or cognitive deficiencies that begin in early childhood [7]. The incidence of DD among children aged 0–5 years in developed countries is estimated at 5–10% [8]. Young children with DD are reported to participate less in activities, compared with their typically developing peers [9-11]. Timely access to suitable interventions that promote participation becomes crucial for these children with DD.

In Hong Kong, as high as 15.1% of children aged under six years, who had been referred to screening at Child Assessment Centers, are diagnosed to have DD [12]. The local Rehabilitation Program Plan proposed by the Labour and Welfare Bureau [13] has established a vision of empowering children with disabilities to achieve full participation in school, the community, and society, in compliance with the United Nations Convention on the Rights of Persons with Disabilities [14]. A range of services is available to young children with DD [15], with many tending to focus on fostering successful learning experiences for children's future inclusion in mainstream schools. Furthermore, owing to the lack of suitable participation measures, the participation of young children with DD has not been studied widely in the Chinese context [16,17]. As such, the effectiveness of early intervention and rehabilitation services in helping these children achieve full participation in daily life is

unknown.

Measures that assess the participation of young children with DD are needed for their participation to be studied and for the effectiveness of existing preschool rehabilitation services in promoting participation to be evaluated. According to recent systematic reviews [18,19], many children's participation measures have been developed. To the best of our knowledge, none except for two measures have been translated to Chinese and validated in children aged younger than six years. One is the School Function Assessment-Chinese version [20], whereas the other is the Chinese version of the Assessment of Preschool Children's Participation [21]. However, children's participation obtained from the two measures is limited to a specific domain of life activities (i.e., preschool and recreation, respectively). The two measures do not assess environmental impact, which has been found to relate inextricably to the degree of children's participation [22,23].

The Young Children's Participation and Environment Measure (YC-PEM) [24] is one of recently developed measures that can assess participation and environmental factors at the same time. The YC-PEM captures participation in a comprehensive range of home, daycare/preschool, and community activities among children aged younger than six years. It also includes the assessment of environmental factors that support or hinder children's participation in each setting of the home, daycare/preschool, and community. This combination of participation and environmental aspects in one assessment allows the direct investigation of the environmental impact on children's participation within and across settings. The YC-PEM is designed to be completed by parents, and it can be used with typically developing children and children with all types of disabilities, including DD. The YC-PEM has been demonstrated to have acceptable psychometric properties for use with children living in North America [24,25]. Specifically, the participation scales have acceptable internal consistency (Cronbach's α coefficients = 0.68–0.96) and test-retest reliability (intraclass correlation coefficients [ICCs] = 0.31–0.93), where the environment

scales have demonstrated excellent internal consistency (Cronbach's α = 0.92–0.96) and test-retest reliability (ICCs = 0.91–0.94). Most of the participation and environment scales differentiate between children with and without disabilities across all the settings. The participation and environment scales are associated with functional performance and environmental barrier scores to a small and moderate degree, respectively. To date, the YC-PEM has been reported to be useful in clinical and research settings [9,26,27] and has been translated to different languages in several countries [28-31].

The present study aimed to examine the psychometric properties of a translated Chinese version of the YC-PEM, including reliability (internal consistency and test-retest reliability) and validity (known-group and discriminant validity), in young children with and without DD in Hong Kong. Two specific research questions were addressed:

(1) Does the YC-PEM Chinese version demonstrate acceptable internal consistency and test-retest reliability for assessing children's participation and environmental factors?

(2) Does the YC-PEM Chinese version demonstrate group differences between children with and without DD as well as low or negative correlations with the measures assessing different constructs (i.e., children's cognitive function and parental stress)?

We hypothesized that the YC-PEM Chinese version would demonstrate similar internal consistency and test-retest reliability to the original version [24]. Further, we hypothesized that most of the participation and environment scales would be able to differentiate between children with and without DD across the home, daycare/preschool, and community settings [24]. Based on existing evidence [32-34], we also hypothesized that specific participation scales (e.g., frequency) would have low associations with the scores of children's cognitive function, and that most of the participation and environment scales would have negative associations with the parental stress scores.

Methods

Participants

Young children with DD were recruited from five early education training centers through convenience sampling between December 2017 and June 2018. The inclusion criteria were that (1) the target child was diagnosed with DD by Child Assessment Centers or by pediatricians in hospitals; (2) the target child was aged 2–5 years; and (3) the participating parent could read Chinese. The target age range was chosen for this study because children begin nursery schooling at the age of two years in Hong Kong, and, if diagnosed with disabilities, they are eligible for preschool rehabilitation services. Children who had physical impairments or serious illnesses (e.g., total blindness and total hearing loss) were excluded from the study.

Children with typical development were recruited from one local nursery school and through online advertisement among various parent groups. A convenience and snowballing sampling method was used. Children and their parents needed to fulfill the above inclusion criteria except for the first one and, additionally, that the children were born full-term, with birth weight of ≥2500 grams, and without any known sensorimotor deficits, major diseases, or body impairments, according to the parents' reports.

Ethical approval for the study was granted by the ethical review committee at The Hong Kong Polytechnic University (Reference Number: HSEARS20170811002). Written consent was obtained from the parents.

Instruments

The YC-PEM [24] includes 28 items that assess young children's participation in broad types of activities at home (13 items), at daycare/preschool (3 items), and in the community (12 items). It also has 46 items on the environmental impact on participation at home (13 items), at daycare/preschool (16 items), and in the community (17 items). For each

participation item, parents report how often their child participates in this type of activity (0 = never to 7 = once or more each day), how involved the child is while participating (1 = not very involved to 5 = very involved), and if the parents want their child's participation to change (yes or no; if yes, the parents can identify the kind(s) of change desired). For each environmental setting, parents are asked to evaluate the impact of types of environmental features and resources regarding the child's participation in that setting. Three-point scales are used to assess the level of the parents' perceived impact of environmental features (1 = usually makes harder to 3 = no impact/usually helps) and resources (1 = usually no to 3 = not needed/usually yes) on participation, respectively.

Altogether, four types of summary scores can be produced for each of the three settings in the YC-PEM: three from the participation scales (frequency, involvement, and desire for change) and one from the combined environment scales (environmental support). The score calculation is detailed in Khetani et al. [24]. As mentioned earlier, the YC-PEM original version has demonstrated good psychometric properties [24,25]. Further, the original YC-PEM is designed as a questionnaire that can be completed either on paper or in a web-based format. The paper form was used in the current study.

The Hong Kong Comprehensive Assessment Scales for Preschool Children (HKCAS-P) [35] is a comprehensive measure that assesses the development of preschool children aged 3–6 years, in eight domains, namely, cognition (40 items), social cognition (29 items), language (68 items), literacy (42 items), numeracy (5 items), visual perception (41 items), fine motor skills (11 items), and gross motor skills (15 items). In this study, the 40-item cognition subscale was used to reduce the assessment burden on young children with DD and to examine the discriminant validity of the YC-PEM. Also, children who were younger than 3 years were not evaluated owing to the age applicability of the cognition subscale. In this cognition subscale, each item is scored as 1 when the child gives a correct answer or passes the item and 0 when the child gives an incorrect answer or fails the item. Raw scores were

used for analysis, and higher scores indicated higher cognitive function. The HKCAS-P cognition subscale has excellent internal consistency (Kuder-Richardson 20 coefficient = 0.93), known-group validity, and unidimensionality confirmed by Rasch analysis [35].

The Parental Stress Scale (PSS) [36] is a parent-reported questionnaire that evaluates the perceived levels of parenting stress associated with raising children. The PSS consists of 18 items that are rated on a six-point scale (1 = strongly disagree to 6 = strongly agree). In the Chinese version [37], one item (i.e., there is little or nothing I wouldn't do for my child[ren] if it was necessary) was excluded owing to the low item-total correlation. Thus, a total score summed from the remaining 17 items was used in the current study, with higher scores indicating higher level of parental stress. The PSS Chinese version has been shown to have good internal consistency (Cronbach's $\alpha = 0.89$), known-group validity, concurrent validity with the Parenting Stress Index, and internal construct validity confirmed by factor and Rasch analyses [37,38].

A demographic questionnaire was designed to obtain information on the children's sex, age, types of disabilities, and birth history, as well as about respondents' relationship with the children, age, educational level, and monthly family income.

Procedure

Translation procedure of the YC-PEM

Prior to this study, we approached the YC-PEM original author (2016 email from M. Khetani to me; unreferenced) and obtained her permission to translate the YC-PEM through CanChild Centre for Childhood Disability Research. The YC-PEM was then translated to Chinese following translation guidelines provided by the original authors' team and other researchers [39,40]. The procedure included the following: (1) forward translation to the target language; (2) experts' review of the translated version; (3) testing of the translated version through cognitive interviews with target participants; (4) backward translation to the

original language; and (5) final review by the research team. The number and types of the revisions are summarized as below and in Table 1.

First, the YC-PEM was translated from English to Chinese, separately, by two bilingual translators who were native Chinese speakers and had backgrounds in occupational therapy and medical laboratory science, respectively. The two forward translation versions were synthesized by the research team. At this step, a total of 14 revisions were made across the instructions, participation scales, and environment scales. Most revisions were done to ensure the semantic equivalence between Chinese and English, and to remove culturally irrelevant examples or replace with examples relevant and common to Hong Kong culture. These revisions were further consulted with and approved by a team coordinator of the YC-PEM, to form one unified translated version.

Second, the unified translated version was reviewed by 10 local experts (including seven occupational therapists, one educational psychologist, one clinical psychologist, and one physiotherapist). These experts each had more than seven years of experience in working with children. Each expert received a hard-copy survey composed of 98 questions. In these questions, the original English and translated Chinese descriptions of the instructions and items were presented together for review. The experts were asked to rate the appropriateness of the Chinese translation, in terms of word choice and cultural relevance, on a four-point scale (1 = very inappropriate to 4 = very appropriate). The experts were also invited to provide additional written comments on the inappropriate phrasing and content in each question. The results of the expert review revealed high levels of appropriateness among the instructions and items (the mean rating = 3.48 with a standard deviation [SD] of 0.27; range = 2.80–3.90). The experts' written comments contributed 86 revisions mostly in refining semantic equivalence between the original and translated versions.

Third, cognitive interviews were implemented with 18 parents of children aged 0–5 years (6 children with DD and 12 children with typical development; 10 boys and 8 girls).

The parents were divided into five groups according to their child's age: two parents in the age group of 0–1 years, three in the age group of 1–2 years, three in the age group of 2–3 years, six in the age group of 3–4 years, and three in the age group of 4–5 years. They were all mothers and most completed secondary education (94.4%). These parents completed the Chinese version independently and then were interviewed on the clarity of instructions, cultural appropriateness of the item and example descriptions, and suitability of response formats, using a think-aloud cognitive method [41]. Misleading/unclear wording and cultural irrelevance as identified by the parents guided 73 revisions, 32 of which were semantic modifications and 38, removal (or addition) of culturally irrelevant (or relevant) examples in the YC-PEM items.

Fourth, the Chinese version was translated to English by a native speaker who was fluent in Chinese and had a nursing background. The backward translation was conducted to examine possible conceptual and/or semantic discrepancies in equivalence between the original English and translated Chinese versions. Several rounds of discussions by the research team led to slight modifications on the wording of one instruction and three items.

Last, the backward translation and pre-final Chinese versions were sent to the same YC-PEM team coordinator for review. The coordinator raised several issues on inconsistency in wording or semantic meaning, and identified that one added example after the parents' cognitive interviews did not fit the conceptual coverage of that item. Thus, a total of eight revisions were made to maintain the wording/semantic consistency and remove the conceptually inappropriate example, leading to the final Chinese version of the YC-PEM for field testing.

Field testing procedure of the YC-PEM

Research packets (including the YC-PEM, PSS, and demographic questionnaire with research information sheet and consent form) were sent by post to parents who were willing

to participate in this research. The parents were asked to return the signed consent form and completed questionnaires through the pre-paid envelope included in the packet. Two weeks after the receipt of the completed questionnaires from the parents, the YC-PEM was sent to all parents again to examine the test-retest reliability. Additionally, children aged 3–5 years were evaluated by a Master of Educational and Child Psychology student who was trained by the second author (CL), using the HKCAS-P cognition subscale. The cognitive assessments were administered in an assessment room located at the university, and lasted 10–15 minutes per child.

Data Analysis

Internal consistency of the items of the participation and environment scales was examined by Cronbach's α coefficients. Cronbach's α values of ≥0.80 are considered excellent, whereas the values of 0.70–0.79 are deemed acceptable [42]. ICCs were computed to examine the test-retest reliability. Values ≥0.75 indicate high reliability, whereas values in the range of 0.40−0.74 represent moderate reliability [42]. We also calculated the minimal detectable change (MDC), considered the smallest difference between repeated assessments that are detectable and beyond random error [43]. The computation of MDC was based on the following formula: $1.96 \times \sqrt{2} \times$ standard error of measure (SEM), where SEM = SD $\times \sqrt{1 - \text{ICC}}$.

For the known-group validity, Mann–Whitney *U* tests were performed to investigate the differences in the participation and environment scales between young children with and without DD. Non-parametric tests were used because the data of the present study were non-normally distributed after screening by visual inspection and normality statistics. Effect sizes (*r*) were calculated to examine the magnitude of the differences. An *r* value of >0.50 is considered large; 0.30–0.49, medium; and 0.10–0.29, small [44].

For the discriminant validity, Spearman's rank correlation coefficients were used to estimate the relation between the YC-PEM participation and environment scores as well as the scores of the HKCAS-P cognition subscale and the PSS. A correlation coefficient of ≥0.75 is considered high; 0.50−0.74, moderate; and ≤0.49, low [45].

In addition, floor and ceiling effects of the YC-PEM participation and environment scales across each of the three settings were examined using 15% as a threshold [46]. Statistical Package for the Social Sciences Version 20.0 (SPSS Inc., Chicago, USA) was used for all analyses. The level of significance was set at $p < 0.05$ for all analyses.

Results

A total of 119 parents of young children with and without DD were registered initially for research participation, and 103 (96.5% completion rate) returned the completed questionnaires. Of these parents, 75 (71.8%) completed the YC-PEM questionnaire twice within one month (an average interval of 18.9 days and SD = 4.9 days). Additionally, 72 (69.9%) of the children aged 3–5 years were evaluated with the HKCAS-P cognition subscale. Thus, three samples were used in the psychometric analysis of this study (see Table 2). Specifically, the total sample including the 103 parents of the children with and without DD who were aged 2–5 years was used to examine the internal consistency, known-group validity, and discriminant validity of the YC-PEM by correlating with the PSS. The retest sample including the 75 parents who completed the YC-PEM twice from the total sample was used to examine the test-retest reliability. The cognitive assessment sample including the 72 parents from the total sample and their children who were aged 3–5 years was used to examine the discriminant validity of the YC-PEM by correlating with the HKCAS-P cognition subscale.

Among these samples, most respondents were mothers (87.5–92.0%), who were in their thirties (63.9–66.3%), who had at least a senior high school diploma (94.4–97.3%), and who

had monthly family incomes (59.8–65.3%) of more than the median of 25,000 Hong Kong dollars [47]. No statistical differences (p <0.05) were found in the type of respondents and their age, educational level, and family income between the total and the other two samples. The children's mean age was 4.7 years (SD = 1.1) in the total sample, similar to those in the retest sample (mean = 4.7 years; SD = 1.0) and the cognitive assessment sample (mean = 4.9 years; SD = 0.8). There were slightly more children who were male (54.2–60.0%), with no statistical difference among all the three samples (p <0.05). In the total sample, there were 53 (51.5%) children with DD, and this proportion did not differ significantly from those in the retest and cognitive assessment samples (p <0.05). The children's clinical disability was reported by the parents (Table 3), and 61.0–65.1% of them had more than one diagnosis/impairment. The majority of these children had speech/language impairment (63.4–69.8%), followed by developmental delay (65.9–69.8%) and autism spectrum disorder (32.6–34.1%).

Internal Consistency

The participation scales (except two frequency scales in the daycare/preschool and community settings) and environmental support scales demonstrated acceptable internal consistency, with Cronbach's α coefficients between 0.42 and 0.89, across all three settings (Table 4).

Test-retest Reliability

All participation and environment scales demonstrated moderate to high test-retest reliability estimates (ICCs = 0.65–0.90, Table 4) across the three settings. MDC ranged from 0.6 to 1.7 for frequency of participation, 0.6 to 0.9 for participation involvement, 22.2 to 36.9 for desired change, and 11.4 to 13.2 for environmental support.

Known-group Validity

Significant differences were found between children with and without DD for the participation frequency scales in all but the home settings and for the participation involvement scales in all the three settings (Table 5). Generally, the children with DD participated in daycare/preschool and community activities less frequently compared with the typically developing children. Their participation involvement in all types of home, daycare/preschool, and community activities was also lower, compared with the typically developing children. Additionally, the parents of children with DD reported significantly more desired change in their child's participation, but only in the community setting. No significant effects of disability were observed across all the environment scales (Table 5). The effect sizes were small to medium (0.20–0.36) for the participation scales that exhibited significant differences between the children with and without DD.

Discriminant Validity

Correlations between the scores of the YC-PEM and HKCAS-P cognition subscale as well as PSS are shown in Table 6. The frequency of children's participation in daycare/preschool and community activities was found to correlate positively, to a small degree (0.27–0.32, p <0.05), with the cognition scores. The parents' desired change in their child's home and community participation also demonstrated low associations with the children's cognition scores (-0.36–-0.35, p <0.01), although the associations were negatively oriented. No significant correlations were observed between the cognition scores and the involvement of children's participation in any one of the home, daycare/preschool, and community settings.

Similarly, low and negative correlations between the YC-PEM's involvement scales and PSS scores (-0.34–-0.42, p <0.01) were found in all settings. A negatively low correlation between the frequency of children's participation in home activities and PSS scores (-0.32,

p<0.01) was also observed. Further, the parents' perceived environmental support for their child's participation in home and community activities correlated negatively and low with the PSS scores (-0.31–-0.32, p <0.01). No significant correlations were found between the parents' desire-for-change scales and PSS scores.

Floor and Ceiling effects

No floor effects (0%) were found in any participation and environment scales in the home, daycare/preschool, and community settings. However, the YC-PEM revealed ceiling effects in the desire-for-change scales across all the settings (home, 42.9%; daycare/preschool. 85.3%; community, 35.9%) as well as the involvement (23.5%) and environment scales (16.1%) in the daycare/preschool setting. No ceiling effects were observed in the remaining scales (0.9–12.6%), especially the participation frequency scales in all settings (0–3.9%).

Discussion

To enable the use of the YC-PEM in Chinese children with DD, this study examined the psychometric properties of a translated Chinese version that was adapted to Hong Kong culture after several rounds of revisions. Overall, the proposed Chinese version of the YC-PEM was found to demonstrate acceptable internal consistency (except for two participation frequency scales) and moderate to high test-retest reliability. Significant differences between children with and without DD were also found in two of the three participation frequency scales, all the participation involvement scales, and one desire-for-change scale in the community setting, but not in all the environment support scales. Additionally, two participation scales (frequency and desire for change) exhibited low and positive associations with the cognition scores. Almost all of the participation scales (except for desire for change) and environment scales exhibited low and negative associations with the parental stress scores. These results provide preliminary evidence of the reliability

and validity of the YC-PEM Chinese version.

The results of the reliability analyses showed that the current YC-PEM Chinese version had low internal consistency in the frequency scales of participation in daycare/preschool and community activities. This finding is similar to previous results of the original version [24]. According to Coster and colleagues [48], a high internal consistency is not expected for the frequency of children's participation owing to many influencing factors. For example, the low internal consistency for the daycare/preschool section could be due to the inclusion of only three items, low variability on the field trip item, and heterogeneity in the programs across daycares/preschools. Our data for the current study were collected across multiple seasons and, thus, a seasonal effect might have occurred, such as an increased likelihood that children attended some school and community activities (e.g., field trips and physical activities) more often in summer, compared with winter. These factors could have possibly resulted in the low intercorrelations between the participation frequency items, which, in turn, affected the internal consistency.

Most of the participation and environment scales of the YC-PEM Chinese version showed high test-retest reliability, in accordance with the original version [24]. Exceptions to this included the participation frequency and environmental support scales in the daycare/preschool setting, with just the moderate test-retest reliability. These exceptions could be resulted from the fact that some parents might not obtain a complete and accurate picture about daycare/preschool activities and environment features/resources, especially if they had fewer chances to observe their child's participation or communicate with teachers. The temporal stability of the parent-reported frequency of their child's daycare/preschool participation and environmental support might be reduced accordingly. Despite this, the study results support the use of the YC-PEM Chinese version to capture young children's participation and environmental support in home and community activities over time. Additionally, the MDC values that were determined in this study could provide a reference

for the minimal magnitude of change that is not attributable to measurement error, and have implications for use in future intervention studies to determine whether the change of participation outcome in each individual is real and beyond measurement error.

Similar to the original version [24], the YC-PEM Chinese version detected differences in the levels of participation involvement between children with and without DD for all three settings. Evidence of the disability group differences was also revealed in two participation frequency scales (daycare/preschool and community) as well as one desire-for-change scale (community). However, our study did not identify any group differences in the parents' perceived environmental support across all settings. This finding is unexpected and contradicts previous findings on the YC-PEM. Particularly, we found that the parents of children with DD perceived higher levels of environmental support (median = 89.7–91.7), compared with the North American (median = 66.6–70.8) [24], Singaporean (mean = 73.8–77.2) [49], and Swedish parents (mean = 71.4–78.9) [30]. Although many early intervention and rehabilitation services are available in Hong Kong [15], we speculated that the high perceived environmental support could be over-estimated by parents who were influenced by Chinese culture. Academic performance is highly valued for children in Chinese societies [50], and Hong Kong parents usually put more focus on improving their child's abilities (e.g., fine motor, cognitive, and communicative skills), especially when the child has a disability and is still developing. By comparison, the environmental barriers to children's participation could be overlooked and perceived as less important factors. This may help explain why the YC-PEM Chinese version did not detect disability differences in all the environmental support scales.

We found that children's participation frequency had low associations with their cognitive function in the expected direction, providing discriminant validity evidence for the YC-PEM Chinese version. This finding makes sense, as cognition is categorized to mental functions in the body functions component that is different from the concept of participation

in the International Classification of Functioning, Disability, and Health [1]. Furthermore, no significant associations were found between the cognitive function and participation involvement scales across all three settings. Participation involvement is a construct encapsulating the in-the-moment experience while children take part in activities [51] and could be related more to the level of children's motivation, enjoyment, or persistence, and not cognitive function.

The discriminant validity of the YC-PEM Chinese version was also supported by the significant and negative associations between the scores of parental stress and participation involvement and environmental support for most of the three settings. In previous reports, parental stress has been linked with participation enjoyment in children [33] and environmental resources [34]; consistently, their relation was inverse, reflecting dissimilar constructs. That is, children whose parents with higher perceived parenting stress are likely to enjoy less during participation and have fewer environmental resources supporting their participation. Possible explanations are that parents with higher stress may provide more assistance so as to reduce the levels of their child's involvement, and that they may be less confident of finding or arranging environmental supports suitable for their child's participation. In addition, we did not find correlations between the parents' parenting stress and desire for change across all three settings. This finding also adds to the evidence for the discriminant validity of the YC-PEM Chinese version.

It is intriguing to note that the YC-PEM Chinese version exhibited ceiling effects in the desire-for-change scales across the home, daycare/preschool, and community settings. Cultural factors might have contributed to the ceiling effects displayed in this Hong Kong sample. In Hong Kong, parents are influenced largely by Chinese culture in which they always hope their child to succeed and have a bright future. The parents may thus want to see as many improvements as possible in their child's participation in any types of activities [52]. Especially, a large proportion (i.e., 85.3%) of the parents in this study expressed their desire

for change in the child's participation in all three daycare/preschool activities (i.e., group learning, socializing with friends, and field trips and events), although ceiling effects were also observed in the participation involvement and environment scales of this setting. The finding echoes the aforementioned notion that, in Chinese societies, parents have high value on their child's academic performance [50]. Therefore, Hong Kong parents may not be satisfied with their child's involvement and environmental supports for existing daycare/preschool participation and still want him/her to participate more often or in a broader variety of education-related activities, in order to pave the foundation for their child's future academic pursuit.

Study Limitations

This study has several limitations. First, a convenience sample of children and their parents was included, and they may not be representative of the Hong Kong population. Second, the original YC-PEM is developed for children aged 0–5 years, but we validated the Chinese version using children aged 2–5 years. Thus, our results cannot be generalized to children aged 0–2 years. Third, the HKCAS-P cognition subscale is applicable to 3- to 6-year-old children; meanwhile, children younger than 3 years were not evaluated but excluded from the discriminant validity testing. This indicates limited generalizability of such discriminant validity evidence of the YC-PEM Chinese version in the study to all children aged 2–5 years.

Conclusion

The YC-PEM, which includes participation and environment scales across the home, daycare/preschool, and community settings, was translated to Chinese and adapted to Hong Kong culture. Evidence for the internal consistency and test-retest reliability was provided for most of the YC-PEM scales. Adequate validity of the participation scales was also

established through known-group comparison and correlations with children's cognition and parental stress scores, despite limited support for known-group validity of the environment scales. These findings provide preliminary psychometric evidence for the application of the Chinese version of the YC-PEM to assess young children's participation patterns and identification of environmental barriers that warrant intervention in Hong Kong.

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Declaration of Interest Statement

The authors report no declaration of interest.

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Table 1. Number and types of revisions made to the Chinese version of the YC-PEM during translation

Sections	Translation process				
	Forward translation	Experts' review	Cognitive interview	Backward translation	Final review
Instructions	3	28	21	1	5
Home setting					
Participation	1	14	8	0	0
Environment	2	8	6	1	0
Daycare/preschool setting					
Participation	0	5	6	1	1
Environment	1	13	12	1	1
Community setting					
Participation	6	13	14	0	0
Environment	1	5	6	0	1
Total number of revisions	**14**	**86**	**73**	**4**	**8**
Types of revisions					
Semantic equivalence†	4	74	32	3	7
Item equivalence‡	8	7	38	0	1
Operational equivalence¶	2	5	3	1	0

† indicates that the revision was made to maintain equivalent wording/semantic meaning between Chinese and English.

‡ indicates that the revision was made to facilitate the adaptability of the items to Hong Kong culture.

¶ indicates that the revision was made to facilitate the suitability of the instructions, format, and response options in Hong Kong culture.

Table 2. Demographic characteristics of participants

Characteristics	Total sample n (%)	Retest sample n (%)	Cognitive assessment sample n (%)
Total number	103	75	72
Respondent			
Mother	93 (90.3)	69 (92.0)	63 (87.5)
Father	9 (8.7)	5 (6.7)	8 (11.1)
Guardian/Carer	1 (1.0)	1 (1.3)	1 (1.4)
Respondent age (year)[†]			
29 and younger	7 (6.9)	2 (2.7)	4 (5.6)
30−39	67 (66.3)	49 (65.3)	46 (63.9)
40 and older	27 (26.7)	23 (30.7)	22 (30.1)
Respondent education[‡]			
Junior high school	4 (3.9)	2 (2.7)	2 (5.6)
Senior high school	35 (34.0)	20 (26.7)	24 (33.3)
Diploma/associate degree	7 (6.8)	7 (9.3)	6 (8.3)
Undergraduate	39 (37.9)	32 (42.7)	25 (34.7)
Postgraduate	16 (15.5)	12 (16.0)	11 (15.3)
Monthly family income (HKD)			
< 10,000	3 (2.9)	0 (0)	2 (2.8)
10,000–19,999	19 (18.4)	11 (14.7)	13 (18.1)
20,000–29,999	19 (18.4)	15 (20.0)	14 (19.4)
30,000–39,999	17 (16.5)	13 (17.3)	13 (18.1)
40,000–49,999	11 (10.7)	9 (12.0)	9 (12.5)
≥50,000	34 (33.0)	27 (36.0)	21 (29.2)
Child gender			
Male	61 (59.2)	45 (60.0)	39 (54.2)
Female	42 (40.8)	30 (40.0)	33 (45.8)
Child age (year)			
2–3	14 (13.6)	9 (12.0)	0 (0)
3–4	14 (13.6)	11 (14.7)	12 (16.7)
4–5	26 (25.2)	21 (28.0)	21 (29.2)
5–6	49 (47.6)	34 (45.3)	39 (54.2)
Child's disability			
Non-disability	50 (48.5)	34 (45.3)	29 (40.3)
Disability	53 (51.5)	41 (54.7)	43 (59.7)

[†] Missing data: two in the total and cognitive assessment samples, and one in the retest sample.

[‡] Two missing data were in all the three samples.

Abbreviation: HKD, Hong Kong dollars.

Table 3. Disability/diagnostic information of children

Type of disability/diagnosis[†]	Total sample n (%)	Retest sample n (%)	Cognitive assessment sample n (%)
Total number of children with DD	53	41	43
Speech/language impairment	35 (66.0)	26 (63.4)	30 (69.8)
Developmental delay	35 (66.0)	27 (65.9)	30 (69.8)
Autism spectrum disorder	18 (34.0)	14 (34.1)	14 (32.6)
Down syndrome	2 (3.8)	2 (4.9)	1 (2.3)
ADHD	5 (9.4)	3 (7.3)	3 (7.0)
Dyslexia	3 (5.7)	1 (2.4)	3 (7.0)
Learning disability	1 (1.9)	1 (2.4)	1 (2.3)
Hearing impairment	2 (3.8)	2 (4.9)	2 (4.7)
Visual impairment	2 (3.8)	2 (4.9)	1 (2.3)

[†] Parents can report multiple disabilities/diagnoses for their child.

Abbreviations: DD, developmental disabilities; ADHD, Attention Deficit Hyperactivity Disorder.

Table 4. Internal consistency and test-retest reliability of the YC-PEM Chinese version

	Internal consistency		Test-retest reliability		
Settings	Number	α	Number	ICC (95% CI)	MDC
Home					
Frequency	101	0.70	74	0.90 (0.84–0.93)	0.6
Involvement	57	0.73	74	0.81 (0.71–0.88)	0.6
Desire for change	94	0.75	71	0.76 (0.61–0.85)	22.2
Environmental support	98	0.77	75	0.81 (0.70–0.88)	11.8
Daycare/preschool					
Frequency	102	0.42	73	0.71 (0.53–0.82)	1.5
Involvement	94	0.74	73	0.83 (0.73–0.89)	0.9
Desire for change	102	0.89	73	0.77 (0.63–0.85)	36.9
Environmental support	98	0.70	73	0.65 (0.44–0.78)	11.4
Community					
Frequency	103	0.64	75	0.89 (0.83–0.93)	0.7
Involvement	19	0.77	75	0.84 (0.75–0.90)	0.7
Desire for change	91	0.78	68	0.82 (0.71–0.89)	22.3
Environmental support	101	0.83	75	0.78 (0.65–0.87)	13.2

Abbreviations: ICC, intraclass correlation coefficient; CI, confidence interval; MDC, minimal detectable change.

Table 5. Comparisons of participation and environment scales of the YC-PEM Chinese version between young children with and without DD

Settings	Children with DD (n = 53)	Children without DD (n = 50)	*U*	*r*
Home				
Frequency	5.0 (4.6–5.6)	5.3 (4.8–5.8)	1.68	0.17
Involvement	3.8 (3.5–4.4)	4.1 (3.8–4.5)	2.15*	0.21
Desire for change	100.0 (80.8–100.0)	92.3 (73.1–100.0)	1.69	0.17
Environmental support	89.7 (79.5–94.9)	87.7 (84.0–94.9)	0.48	0.05
Daycare/preschool				
Frequency	5.0 (4.3–5.7)	5.3 (4.7–6.0)	2.38*	0.23
Involvement	3.7 (3.0–4.3)	4.3 (4.0–5.0)	3.70**	0.36
Desire for change	100.0 (100.0–100.0)	100.0 (100.0–100.0)	0.58	0.06
Environmental support	91.7 (88.0–97.3)	94.8 (89.6–100.0)	1.33	0.13
Community				
Frequency	3.0 (2.5–3.5)	3.3 (2.8–3.8)	1.97*	0.20
Involvement	3.9 (3.2–4.4)	4.1 (3.8–4.5)	2.38*	0.23
Desire for change	90.9 (77.3–100.0)	81.8 (72.7–100.0)	2.24*	0.22
Environmental support	90.2 (80.4–96.1)	86.3 (78.4–96.1)	0.63	0.06

Note: Values were median (interquartile range), and Mann-Whitney U test was used for statistical analysis.

Abbreviations: DD, developmental disabilities.

* $p < 0.05$

** $p < 0.01$

Table 6. Spearman's rank correlations between the scores of the HKCAS-P cognition subscale, PSS, and YC-PEM Chinese version in home, daycare/preschool, and community settings

	HKCAS-P cognition subscale		PSS	
Settings	Number	ρ	Number	ρ
Home				
Frequency	72	0.15	103	-0.32**
Involvement	70	0.09	101	-0.42**
Desire for change	68	-0.36**	98	0.08
Environmental support	72	0.05	103	-0.32**
Daycare/preschool				
Frequency	72	0.32**	102	-0.06
Involvement	72	0.23	102	-0.40**
Desire for change	72	-0.11	102	0.09
Environmental support	72	0.06	100	-0.15
Community				
Frequency	72	0.27*	103	-0.12
Involvement	71	0.12	102	-0.34**
Desire for change	67	-0.35**	98	-0.07
Environmental support	72	-0.04	103	-0.31**

Abbreviations: HKCAS-P, Hong Kong Comprehensive Assessment Scales for Preschool Children; PSS, Parental Stress Scale.

* p <0.05

** p <0.01