



Family Relations

Research

Psychometric Evaluation of the Father Involvement Scale Among Chinese Fathers of Children with Developmental Disabilities

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Psychometric Evaluation of the Father Involvement Scale Among Chinese Fathers of Children with Developmental Disabilities

3

Abstract

Objective: To translate, culturally adapt, and evaluate the structural validity, reliability, and construct validity of the Father Involvement Scale for Chinese fathers of children with special needs (FIS-CFCSN) among Hong Kong fathers of children with developmental disabilities (DD).

Background: Father involvement contributes uniquely to child development, yet validated tools for assessing paternal engagement among fathers of children with DD in non-Western contexts remain limited.

Method: Biological fathers (N = 437; child age 2-12 years) were recruited through schools, NGOs, and community organizations in Hong Kong. The adaptation followed a five-stage mixed-methods process: qualitative exploration, forward-back translation, expert review, item revision, and quantitative validation. The sample was randomly split for exploratory (n = 218) and confirmatory (n = 219) factor analysis.

Results: Exploratory factor analysis supported a four-factor solution: Educational and Rehabilitation Support (ERS), Independence Training (IT), Emotional and Social Engagement (ESE), and Physical Care (PC). Confirmatory factor analysis showed acceptable fit ($\chi^2/df = 1.77$; CFI = .92; TLI = .91; RMSEA = .059; SRMR = .066). Internal consistency and composite reliability were strong ($\alpha = .85-.92$; $\omega = .86-.93$), and AVE values met or approached .50.

Conclusion: The 25-item FIS-CFCSN provides initial structural validity evidence as a DD-specific measure of paternal involvement for Chinese populations. Its four-factor structure reflects culturally grounded paternal caregiving and disability-specific caregiving demands in Hong Kong.

Implications: The FIS-CFCSN supports domain-specific profiling of father involvement in intake assessment, outcome monitoring, and father-inclusive intervention planning. Future studies should examine predictive validity, test-retest reliability, and measurement invariance.

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Keywords: father involvement, developmental disabilities, scale validation, Chinese fathers, psychometric validation, Hong Kong

1 Introduction

2 Fathers occupy a central but historically underexamined position in the landscape of
3 child development research. Research on parenting has historically focused on mothers, with
4 father involvement receiving sustained empirical attention only in recent decades. This
5 imbalance is consequential: paternal involvement makes independent contributions to
6 children's cognitive development, language acquisition, behavioral self-regulation, and
7 socioemotional competence that cannot be accounted for by maternal behavior alone
8 (Cabrera et al., 2014; Lamb & Lewis, 2010; Pruett et al., 2017). These effects persist from
9 infancy into adolescence and are evident across diverse family structures, suggesting that
10 fathers represent a meaningful and distinct component of the family system rather than a
11 secondary or redundant influence on child outcomes.

12 Theoretical work has clarified what father involvement entails and why its measurement
13 is consequential. Lamb et al. (1987) distinguished three behavioral components of paternal
14 engagement: engagement (direct interaction with the child), accessibility (availability to the
15 child without direct interaction), and responsibility (accountability for the child's care,
16 including planning and coordination), a framework that organized much of the subsequent
17 empirical literature. Pleck (2010) extended this model by differentiating the quantity of
18 paternal involvement from its quality. In Pleck's revised conceptualization, father
19 involvement comprises four dimensions: positive engagement characteristics (warmth,

1 sensitivity, and cognitive stimulation during direct interaction), availability to the child,
2 responsibility for caregiving and planning, and process involvement (indirect contributions to
3 the family context, including financial provision and co-parental support). Critically, Pleck
4 argued that these dimensions are not interchangeable and that any adequate measurement
5 framework must capture their distinct contributions. This has direct implications for cross-
6 cultural measurement: if the behavioral expression and psychological organization of these
7 dimensions vary across cultural contexts, as growing evidence suggests, then instruments
8 developed in one cultural setting cannot be assumed to measure the same constructs when
9 applied in another.

10 This issue is especially pressing in the context of families raising children with
11 developmental disabilities (DD). Fathers in these families contribute in ways that extend well
12 beyond general paternal involvement: they coordinate therapeutic appointments, implement
13 rehabilitation exercises at home, navigate educational systems on behalf of their children, and
14 manage the emotional and logistical demands of disability-related caregiving (Flippin &
15 Crais, 2011; Langley, 2025; Lo, 2025). Active paternal involvement in DD contexts has been
16 associated with reduced maternal stress, improved child adaptive functioning, and greater
17 consistency in therapeutic follow-through (Bagner, 2013; Flippin & Crais, 2011). Despite
18 these documented contributions, intervention research in DD contexts has largely been
19 designed for and evaluated with mothers; fathers are recruited at lower rates, drop out more

1 frequently, and receive less tailored support (McBride et al., 2005). Advancing both research
2 and practice in this area requires valid measures of father involvement that are suited to DD-
3 specific caregiving demands and to the populations in which they are used.

4 Validated measurement tools for assessing paternal involvement in DD contexts are
5 scarce outside Western samples. The two most widely used instruments in this area are the
6 Inventory of Father Involvement (IFI; Hawkins et al., 2002) and the Father Involvement
7 Scale (FIS; Bragieli & Kaniok, 2011), both developed in Western samples. The IFI has
8 subsequently been adapted for use in several non-Western populations, including Chinese-
9 speaking contexts (Chuang & Fagan, 2021), but it was designed for fathers in the general
10 population and does not include disability-specific domains such as rehabilitation
11 coordination or therapeutic support. The FIS, by contrast, was developed explicitly for fathers
12 of children with disabilities, encompassing five subscales (Interest in the Child's Life, Care,
13 Education and Upbringing, Rehabilitation, and Active Help in Achieving Independence) that
14 map directly onto the caregiving demands characteristic of DD families. It is for this reason
15 that the FIS, rather than more general fathering instruments, was selected as the basis for the
16 present adaptation. A recent scoping review by Eubank et al. (2025) found that validated
17 instruments for assessing paternal involvement among fathers of children with DD in East
18 and Southeast Asia are effectively absent from the literature, identifying cultural adaptation
19 and psychometric validation as a priority for the field.

1 Using instruments without establishing cross-cultural measurement equivalence carries
2 real methodological costs. Measurement non-equivalence, the condition in which a scale's
3 items or factor structure function differently across cultural groups, produces biased estimates
4 of latent construct means and covariances, which in turn distorts conclusions about the
5 predictors and consequences of paternal involvement and compromises the interpretation of
6 intervention outcomes (Vandenberg & Lance, 2000). Prior cross-cultural applications of the
7 FIS illustrate this concern directly. Ko et al. (2022) found a four-factor solution among South
8 Korean fathers of children with disabilities, with the Education and Rehabilitation subscales
9 collapsing into a single factor. Semešiová et al. (2024) reported divergent structures across
10 European samples. Langley (2025) documented further structural variability in samples of
11 fathers of children with intellectual and developmental disabilities. These findings indicate
12 that the FIS factor structure is context-sensitive rather than universal, and that confirmatory
13 analyses assuming the original five-factor structure would be inappropriate without first
14 establishing whether that structure holds in the target population.

15 In Hong Kong, the cultural context of fathering differs from both Western and other East
16 Asian societies studied to date in ways that are directly relevant to how paternal involvement
17 is organized and expressed. Fatherhood in Hong Kong is embedded in Confucian traditions
18 that assign fathers primary responsibility for jiao, the moral cultivation, intellectual
19 development, and social formation of the child (Li, 2013; Shek, 2007). Within this

1 framework, fathers are expected to function as providers, moral guides, and educators; direct
2 physical caregiving and emotional expressiveness are more commonly associated with the
3 maternal role. These normative expectations have two implications for measurement. First,
4 the behavioral content of paternal involvement in Hong Kong may differ from Western
5 norms, with fathers more behaviorally active in educational and rehabilitative domains and
6 less expressive in affective domains, a pattern that Western-developed scales may capture
7 inadequately or misattribute. Second, the psychological organization of fathering behaviors
8 may differ: domains that appear conceptually distinct in Western instruments may be
9 experienced as a unified form of responsibility by Chinese fathers, and vice versa. Fathers of
10 children with DD in Hong Kong face additional challenges that further shape their
11 engagement, including the intersection of disability stigma with Confucian ideals of family
12 harmony and academic achievement, experiences of shame and social isolation, and pressure
13 to resolve the tension between provider roles and intensive caregiving demands (Chan &
14 Lam, 2018; Lo, 2025; Lo et al., 2025; Mak & Kwok, 2010).

15 These considerations motivate the present study, which aimed to translate, culturally
16 adapt, and examine the psychometric properties of a Chinese version of the FIS for use
17 among Hong Kong fathers of children with DD. The adaptation followed a multi-stage
18 process including qualitative construct exploration, forward-back translation, expert content
19 review, and item revision; these procedures are described in the Method section. The

1 psychometric evaluation focused on two questions: What factor structure best represents
2 paternal involvement as assessed by the Chinese-adapted FIS in this sample, and does that
3 structure replicate in an independent subsample? We approached the first question with
4 exploratory factor analysis (EFA), given consistent evidence that the FIS factor structure
5 varies across cultural contexts and that imposing the original five-factor model without prior
6 exploration would risk misspecifying the measurement model for this population. The second
7 question was addressed with confirmatory factor analysis (CFA) in a randomly split holdout
8 subsample.

9 *The Present Study*

10 Drawing on Pleck's (2010) conceptualization of father involvement as a
11 multidimensional construct whose specific dimensions may vary in behavioral expression and
12 psychological organization across cultural and family contexts, and on the qualitative work
13 conducted during the adaptation phase, we anticipated that the Chinese-adapted FIS would
14 yield a multifactor solution in which educational and rehabilitative caregiving domains would
15 coalesce into a single dimension, consistent with the Confucian integration of these
16 responsibilities under a unified conception of paternal developmental duty (Li, 2013; Shek,
17 2007), and that relational and emotional engagement would similarly consolidate into a
18 coherent factor reflecting the integrated expression of paternal warmth in Chinese family life.
19 These anticipated patterns reflect theoretically grounded expectations rather than confirmed

1 hypotheses, and the EFA was conducted to test them empirically rather than to confirm them
2 by design.

3 The study pursued two primary aims: (a) to translate, culturally adapt, and establish
4 content validity for a Chinese version of the FIS through a five-stage process including
5 qualitative construct exploration, forward-back translation, expert review, and item revision;
6 and (b) to evaluate the structural validity, reliability, and construct validity of the resulting
7 structure through EFA and CFA in independently drawn subsamples. Consistent with current
8 standards for psychometric evaluation (AERA et al., 2014; ITC, 2017), we treat the present
9 study as providing initial evidence for the structural validity of the adapted instrument rather
10 than constituting a definitive validation. Additional sources of validity evidence, including
11 predictive validity, test-retest reliability, and measurement invariance across subgroups, are
12 identified as priorities for future research.

13 **Method**

14 ***Participants***

15 Participants were 437 biological fathers residing in Hong Kong, each with at least one
16 child between the ages of 2 and 12 years ($M_{child} = 7.30$, $SD = 0.14$) diagnosed with or
17 suspected of having a developmental disability. Fathers were recruited between November
18 2022 and March 2023 through mainstream schools providing inclusive education, special
19 schools, NGOs providing rehabilitation and support services for children with special needs

1 and their caregivers, designated parent and relative resource centres, and self-help groups and
 2 community organizations. Of 470 total responses initially collected, 33 were excluded
 3 because the child exceeded the age eligibility criterion, yielding a final analytic sample of
 4 437 fathers. Demographic characteristics of both the full sample and the two randomly split
 5 subsamples are presented in Table 1.

6 Fathers ranged in age from 18 to 64 years. The majority were married (90.8%),
 7 employed full-time (82%), and had a secondary education or lower (43.7%). The sample was
 8 predominantly composed of fathers whose child carried a single DD diagnosis (83.5%), with
 9 ASD (22.0%) and ADHD (21.7%) being the most common diagnoses; the remaining 50.8%
 10 presented with comorbid or multiple disability profiles. All participants self-identified as
 11 ethnically Chinese. Inclusion criteria were as follows: (a) self-identified as the biological
 12 father of a child with a diagnosed or suspected DD; (b) the child was aged 2 to 12 years; (c)
 13 the father reported at least biweekly face-to-face or virtual contact with the child in the past
 14 six months; and (d) the father was able to read Chinese and provide informed consent.

15 Children's disabilities were classified according to categories established by the Census and
 16 Statistics Department of Hong Kong SAR (2021), encompassing Specific Learning
 17 Difficulties (SpLD), Intellectual Disability (ID), Autism Spectrum Disorder (ASD),
 18 Attention-Deficit/Hyperactivity Disorder (ADHD), Speech and Language Impairments (SLI),
 19 and physical, sensory, and developmental disabilities. Biological fathers were targeted

specifically because this population carries distinct normative role expectations and experiential challenges, including internalized stigma, role renegotiation, and provider-caregiver conflict, that have been documented in qualitative research with Hong Kong Chinese fathers and that may not generalize to non-biological or co-resident but non-biological fathers (Lo, 2025; Lo et al., 2025). The 2 to 12 year age range was chosen because this developmental window encompasses the critical early intervention period through primary school entry, the phase during which paternal decisions about therapeutic participation, educational support, and structured independence training carry the greatest developmental consequence (McBride et al., 2005).

[Table 1 about here]

Procedure

The present study followed best-practice guidelines for scale adaptation and validation (Cabrera-Nguyen, 2010) and adopted a mixed-methods scale development and validation analysis (MSDVA) framework (Zhou, 2019). The validation process comprised five sequential steps: (1) qualitative exploration of the construct; (2) translation and cultural adaptation of scale items; (3) expert review and content validation; (4) administration of the finalized scale to the target population; and (5) quantitative analyses including exploratory and confirmatory factor analyses to assess the factor structure, internal consistency, and construct validity of the FIS-CFCSN.

1 For Step 1, semi-structured individual interviews were conducted with 31 biological
 2 fathers of children with DD via Zoom between February and September 2022, using maximal
 3 variation sampling to ensure diversity across paternal age, education, child diagnosis, and
 4 service context. Inductive thematic analysis (Braun & Clarke, 2006) identified three
 5 caregiving domains not adequately represented in the original FIS: digital technology
 6 engagement, adventure and exploration play, and peer relationship support. These findings
 7 informed the addition of three new items and the revision of two existing items in Step 2.

8 For Step 2, the original Polish FIS was translated into Traditional Chinese through a
 9 forward-back translation procedure, with discrepancies reviewed by the research team to
 10 preserve conceptual equivalence across versions. Three new items were added (FI41 to FI43),
 11 and two existing items were reworded to reflect caregiving practices typical in Hong Kong
 12 DD contexts, producing a 43-item adaptation pool.

13 For Step 3, the 43-item pool was reviewed by an expert panel comprising a specialist in
 14 children with special needs and their caregivers, service operators with direct experience in
 15 DD family support, and a representative of the target population. Each item was rated for
 16 relevance on a four-point scale, and content validity indices were calculated at the item and
 17 scale levels following Lynn (1986) and Polit and Beck (2006). Items with I-CVI values
 18 below .78 were revised or removed.

19 For Step 4, fathers accessed the finalized scale via a secure online survey (Qualtrics)

1 through a unique URL between November 2022 and March 2023, or requested a paper
 2 version if preferred. Informed consent was obtained electronically or in writing before
 3 participation. All participants were assured of the voluntary nature of the study, the
 4 confidentiality of their responses, and their right to withdraw at any time without penalty.
 5 Participants received a coupon as a token of appreciation.

6 Step 5 analyses are described in the Statistical Analysis section below.

7 **Measures**

8 **Father Involvement Scale.** The Father Involvement Scale assesses fathers' perceived
 9 engagement with their child with disabilities (Bragiel & Kaniok, 2011). This original scale
 10 contained 40 items organized into five subscales: interest in the child's life (e.g., "*I talk to my*
 11 *child about his/her interests*"), care (e.g., "*I prepare meals and participate in feeding my*
 12 *child*"), education/upbringing (e.g., "*I teach my child how to deal with difficult situations*"),
 13 rehabilitation (e.g., "*I consult rehabilitation exercises for my child with physicians and*
 14 *specialists*"), and active help in achieving independence (e.g., "*I teach my child how to*
 15 *translocate from place to place and how to use means of public transport*"). Items are rated
 16 from 1 (never) to 5 (always), and scores are summed (possible range = 40 to 200), with
 17 higher scores indicating greater father involvement. Internal consistency of the five original
 18 subscales in the full sample was satisfactory (Cronbach's $\alpha = .84$ to $.91$), providing
 19 preliminary support for the coherence of the Chinese translation prior to structural analysis.

As described in the *Procedure* section, three new items were added to the 43-item adaptation pool: FI41 (“*I participate in adventure and exploration activities with my child*”), FI42 (“*I teach my child how to use the internet and electronic devices*”), and FI43 (“*I assist my child in making friends*”). Two existing items were also reworded: FI4 was revised to remove reference to theater attendance, which is uncommon among Hong Kong fathers, in favor of outdoor recreational and sports activities; FI15 was revised to specify occupational therapy and speech-language therapy, which are central to DD support in this context.

Demographic Questionnaire. Participants completed a researcher-developed demographic questionnaire assessing paternal age, education level, employment status, marital status, child age and diagnosis, number of children, and weekly caregiving hours. These variables were used for descriptive statistics and for verifying equivalence between the two randomly assigned subsamples.

Statistical Analysis

Data were analyzed following best-practice recommendations for psychometric validation (Cabrera-Nguyen, 2010). The total sample of 437 was randomly split into two subsamples: approximately half ($n = 218$) for exploratory factor analysis (EFA) and half ($n = 219$) for confirmatory factor analysis (CFA). Randomization was performed in R using a fixed seed to ensure reproducibility. Chi-square tests and independent-samples t-tests confirmed no significant differences between the two subsamples on paternal age, education

level, marital status, employment status, or child diagnosis (all $p > .05$), supporting the equivalence of the two subsamples prior to analysis. All analyses were conducted in RStudio (Version 2025.05.1) using R 4.5.1 (R Core Team, 2025).

EFA was conducted using principal-axis factoring (fa function with fm= "pa" in R), which estimates common variance only and is robust to nonnormality (Fabrigar et al., 1999; Revelle, 2022). Oblimin rotation was applied to permit factor intercorrelations, consistent with the theoretical expectation that dimensions of father involvement are related (Pleck, 2010). The number of factors to retain was determined by convergence across three criteria: the Kaiser criterion (eigenvalues > 1), the scree plot inflection point, and parallel analysis (observed eigenvalues exceeding the 95th percentile of 1,000 random-data eigenvalues; Horn, 1965). Items were removed iteratively based on three a priori criteria (Costello & Osborne, 2005): communality below .25; primary factor loading below .40; and cross-loading, defined as a primary-secondary loading difference of less than .20 when the secondary loading exceeded .32 (Tabachnick & Fidell, 2019). One item was removed at a time, with the EFA rerun after each removal.

Following EFA, CFA was subsequently conducted on the second half of the dataset ($n = 219$), employing robust maximum likelihood (MLR) estimation to account for data nonnormality and full-information maximum likelihood (FIML) to handle missing data effectively without imputation. The CFA specified a first-order model with four correlated

1 factors consistent with the EFA structure. Model fit was assessed using standard indices,
 2 accepting CFI and TLI values $\geq .90$, RMSEA $\leq .08$, and SRMR $\leq .08$ as indicative of
 3 acceptable fit. Modification indices above 10 were examined, with residual covariances
 4 added only if theoretically justified, avoiding overfitting. Items retained in the CFA model
 5 demonstrated standardized factor loadings of at least .40, with a preference for loadings
 6 above .50, ensuring robust representation of the latent constructs.

7 Internal consistency was assessed using Cronbach's α and McDonald's ω ; ω is reported
 8 alongside α because it does not assume tau-equivalence and provides a less biased reliability
 9 estimate when factor loadings vary (McDonald, 1999). Composite reliability (CR) and
 10 average variance extracted (AVE) were computed to assess construct-level reliability and
 11 convergent validity, with AVE values at or above .50 taken as evidence of convergent
 12 validity (Fornell & Larcker, 1981). Discriminant validity was assessed using the Fornell-
 13 Larcker criterion, requiring each factor's AVE to exceed its highest squared intercorrelation
 14 with any other factor.

15 Results

16 *Item Analysis and Exploratory Factor Analysis*

17 Item analysis was conducted by calculating the critical ratio (CR) and item-total
 18 correlations for all 43 items in the exploratory subsample. The CR compared mean scores
 19 between the upper 27% and lower 27% of total scorers; items with CR values below 3 were

1removed. Item-total correlations above .30 were required for retention. All 43 items met both
2criteria.

3 Data suitability for EFA was then assessed via inter-item correlations, the Kaiser-Meyer-
4Olkin (KMO) measure, and Bartlett's test of sphericity. No item pair exceeded the
5redundancy threshold of $|r| > .90$. The overall KMO index was .95, with individual item
6values ranging from .89 to .97, all above the recommended minimum of .50 (Kaiser, 1974).
7Bartlett's test of sphericity was significant, $\chi^2(903) = 7240.42, p < .001$, confirming the
8matrix was factorable.

The Kaiser criterion, scree plot, and parallel analysis all converged on a four-factor solution. Items were removed one at a time under three sequential criteria: 6 items were removed for low factor loadings below .40 (FI2, FI3, FI14, FI22, FI33, FI36), and 12 items were removed for cross-loading with a primary-secondary difference of less than .20 (FI1, FI8, FI9, FI18, FI19, FI23, FI24, FI27, FI31, FI37, FI41, FI43), yielding a final 25-item pool. Factor 1 accounted for 21% of the variance, Factor 2 for 17%, Factor 3 for 14%, and Factor 4 for 10%; the four factors together accounted for 62% of the total variance. Factor loadings and communalities are presented in Table 2.

17 [Table 2 about here]

18 *Factor Interpretation Based on EFA*

19 The four-factor solution yielded a theoretically coherent structure that partially maps

1 onto the original five-factor FIS while reflecting the caregiving context of Hong Kong
 2 Chinese fathers. Factor 1, Educational and Rehabilitation Support (ERS; loadings .46 to .86),
 3 consolidates the original education and rehabilitation subscales into a single dimension. The
 4 highest loadings fell on professional consultation (.85) and seeking specialized equipment
 5 (.78), consistent with prior evidence that Chinese fathers invest heavily in coordinating
 6 therapeutic and educational resources as a primary expression of paternal responsibility (Li,
 7 2013; Shek, 2007). This convergence replicates the pattern observed by Ko et al. (2022)
 8 among South Korean fathers and is consistent with Confucian conceptions of paternal duty as
 9 centered on the child's development and training.

10 Factor 2, Independence Training (IT; loadings .48 to .93), corresponds closely to the
 11 original active help in achieving independence subscale and incorporates FI42, the newly
 12 added item on digital technology use. The inclusion of this item within an independence-
 13 building factor reflects the practical integration of digital literacy into structured life-skill
 14 training among Hong Kong families.

15 Factor 3, Emotional and Social Engagement (ESE; loadings .51 to .88), draws from the
 16 original interest in child's life and portions of the care subscales. Items loading on this factor
 17 span recreational involvement, emotional expression, and values transmission, suggesting
 18 that Hong Kong Chinese fathers organize these behaviors as a single relational domain rather
 19 than as distinct categories.

Factor 4, Physical Care (PC; loadings .43 to .79), corresponds directly to the original care subscale and covers basic daily caregiving tasks. Its structural stability across cultural contexts is consistent with findings from prior cross-cultural FIS applications (Eubank & Leidy, 2025).

Confirmatory Factor Analysis

CFA was conducted on the confirmatory subsample ($n = 219$) to test the four-factor structure identified in the EFA. A first-order model with four correlated latent variables was specified using the lavaan package in R (Rosseel, 2012): ERS (8 items), IT (7 items), ESE (6 items), and PC (4 items). All standardized factor loadings were statistically significant ($p < .001$) and ranged from .65 to .85, indicating adequate to strong item-factor relationships. Inter-factor correlations ranged from .44 to .75, reflecting moderate to strong associations among the four dimensions (See Appendix Table A). Model fit was acceptable: $\chi^2(269) = 475.92, p < .001; \chi^2/df = 1.77; CFI = .92; TLI = .91; RMSEA = .059; SRMR = .066$ (See Appendix Table B). All indices met the pre-specified acceptance criteria, and the overall pattern of loadings and fit confirmed the factorial validity of the 25-item, four-factor FIS-CFCSN (Table 3).

[Table 3 about here]

Reliability and Validity

Internal consistency, composite reliability, and convergent and discriminant validity are reported in Table 4. All four factors showed strong internal consistency ($\alpha = .85-.92$; $\omega = .86-.93$) and CR values above the .70 threshold (CR = .83-.94). AVE values ranged from .49-.58. Three factors met the .50 convergent validity criterion (Fornell & Larcker, 1981); the ESE factor's AVE of .49 fell marginally below this threshold but was accompanied by standardized loadings all exceeding .67 and a CR of .86, which together support acceptable convergent validity for this factor (Fornell & Larcker, 1981). Discriminant validity was evaluated using the Fornell-Larcker criterion, which requires each factor's AVE to exceed the squared correlation between that factor and every other factor in the model. The highest squared inter-factor correlation in the sample was .56 (between ERS and PC; $r = .745$, $r^2 = .555$), which was exceeded by both factors' AVEs (.58 and .53, respectively). All remaining factor pairs yielded squared inter-factor correlations below their respective AVEs, supporting the discriminant validity of all four dimensions.

[Table 4 about here]

Discussion

The present study translated, culturally adapted, and examined the structural validity of the short version of the Father Involvement Scale (Bragiel & Kaniok, 2011) among Hong Kong Chinese fathers raising children with developmental disabilities. EFA and CFA supported a four-factor structure comprising Educational and Rehabilitation Support (ERS),

1 Independence Training (IT), Emotional and Social Engagement (ESE), and Physical Care
 2 (PC). This structure differs from the original five-factor model, and the nature of those
 3 differences is interpretable in terms of the cultural and caregiving context of the sample.

4 ***Factor Structure and Cultural Context***

5 The consolidation of the original education and rehabilitation subscales into a single
 6 ERS factor is consistent with evidence that Chinese fathers, operating within a Confucian
 7 framework that assigns paternal responsibility primarily to the moral cultivation and
 8 developmental advancement of the child (jiao; Li, 2013; Shek, 2007), may not distinguish
 9 educational from rehabilitative engagement as functionally separate domains. Within this
 10 normative orientation, coordinating therapy appointments, consulting rehabilitation
 11 specialists, and supporting academic progress may be experienced as expressions of a single
 12 paternal duty rather than as distinct behavioral categories. A parallel pattern was reported by
 13 Ko et al. (2022), who found that Education and Rehabilitation subscales collapsed into a
 14 single factor among South Korean fathers of children with disabilities, suggesting this
 15 convergence may reflect broader East Asian cultural organization of paternal caregiving
 16 rather than a feature specific to Hong Kong.

17 IT emerged as a distinct factor, covering structured teaching of daily living skills,
 18 financial management, use of public transport, and digital technology use. Its separation from
 19 ERS is interpretable within Confucian accounts of fathering that assign particular salience to

1 structured, goal-directed guidance toward self-sufficiency (Li, 2013; Shek, 2007). This
 2 pattern contrasts with the original Polish FIS, in which independence-related activities were
 3 treated as one component of a broader caregiving role (Bragiel & Kaniok, 2011), and
 4 suggests that in the Hong Kong DD context, structured independence training carries
 5 sufficient salience to warrant its own dimension. The inclusion of FI42 (digital technology
 6 use) within this factor, rather than as a standalone item, reflects the practical integration of
 7 technology as a life skill within daily parenting routines.

8 ESE, comprising recreational involvement, emotional expression, and values
 9 transmission, draws from the original interest in child's life and portions of the care subscales.
 10 The consolidation of these behaviors into a single factor is consistent with accounts of
 11 relational engagement in Chinese families, where emotional expression and shared activity
 12 may be organized as an integrated form of paternal warmth rather than as separate behavioral
 13 dimensions (Cabrera et al., 2018; Li et al., 2024). It should be noted that this interpretation is
 14 provisional; the factor structure identifies how items cluster statistically, and cultural
 15 accounts provide a plausible interpretive frame rather than a confirmed explanation. PC,
 16 covering daily caregiving tasks, replicated the structure of the original care subscale and is
 17 consistent with prior cross-cultural FIS applications (Eubank & Leidy, 2025), suggesting this
 18 dimension is relatively stable across national contexts.

19 ***Implications for Theory and Practice***

1 These findings extend Pleck's (2010) multidimensional framework by showing that the
2 specific organization of paternal involvement dimensions varies across cultural settings. The
3 ERS and IT factors in particular suggest that instruments developed in Western samples may
4 inadequately capture the degree to which educational, rehabilitative, and independence-
5 building activities are salient and structurally distinct components of fathering in DD families
6 in Hong Kong. The high endorsement of both direct and indirect involvement across the
7 sample suggests that fathers of children with DD in this context are actively engaged across
8 multiple domains, including some, such as rehabilitation coordination, that have historically
9 been treated as peripheral to paternal roles (Flippin & Crais, 2011).

10 Practically, the FIS-CFCSN provides researchers and practitioners with a
11 psychometrically evaluated, DD-specific tool for assessing paternal involvement in Chinese-
12 speaking populations, where previously no such measure existed (Eubank et al., 2025). The
13 four-subscale structure enables differential profiling rather than a single total score. ERS
14 scores can identify fathers who are disengaged from their child's therapeutic and educational
15 ecosystem, a domain associated with better rehabilitation outcomes when fathers are actively
16 involved (Flippin & Crais, 2011), and can guide referrals to rehabilitation literacy
17 programmes or family-centred service coordination. IT scores are directly relevant to
18 occupational therapy planning: low IT engagement may indicate fathers who would benefit
19 from structured coaching in teaching daily living and independence skills. ESE scores can

1 flag fathers with limited recreational or emotional engagement, informing group-based
2 programmes that use play and shared activity as the medium for building father-child
3 relationships. PC scores provide a lens on basic caregiving equity relevant to co-parenting
4 assessments and maternal caregiver burden reviews. Across all four domains, the scale
5 provides a practical tool for intake and outcome monitoring in father-inclusive programmes
6 in Hong Kong's early intervention and special education settings.

7 ***Limitations and Future Directions***

8 Several limitations should be noted. First, the sample was cross-sectional, which
9 precludes conclusions about how paternal involvement changes over time or in response to
10 intervention. Longitudinal designs would clarify developmental trajectories of involvement as
11 children age and their disability-related needs shift. Second, all data were self-reported,
12 which introduces the possibility of social desirability bias, particularly for domains such as
13 emotional expression that carry normative weight in Chinese cultural contexts. Future studies
14 could incorporate partner-report or observational data to strengthen construct validity. Third,
15 the sample was drawn from Hong Kong and consisted entirely of self-identified ethnic
16 Chinese fathers; generalizability to fathers in Mainland China, Taiwan, or Chinese diaspora
17 communities cannot be assumed, and replication in those populations is a priority. Fourth, the
18 sample was predominantly married and full-time employed, which may also limit the
19 generalizability of the findings to fathers with different marital, employment, residency, or

1 caregiving circumstances. Future studies should recruit more diverse father samples to
2 examine whether the four-factor structure remains stable across different family and
3 socioeconomic contexts. Fifth, the present study provides initial structural validity evidence
4 only; predictive validity, test-retest reliability, and measurement invariance across subgroups
5 defined by child diagnosis, income level, and disability severity remain to be established
6 before the FIS-CFCSN is recommended for high-stakes assessment purposes.

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Table 1
Descriptive statistics of respondents (N = 437)

Variables	Frequency (%)/ Mean (SD)
Age of Father	
18-29	11 (2.5%)
30-39	145 (33.2%)
40-49	214 (49.0%)
50-59	56 (12.8%)
60-65	11 (2.5%)
Marriage status	
Married	397 (90.8%)
Unmarried Non-cohabitant couples	4 (0.9%)
Unmarried cohabitant couples	6 (1.4%)
Separated or Divorce	28 (6.4%)
Others	2 (0.5%)
Family Income (HKD)	
<\$10,000 per month	17 (3.9%)
\$10,000 - \$19999 per month	94 (21.5%)
\$20,000 - \$29,999 per month	91 (20.8%)
\$30,000 - \$39,999 per month	78 (17.8%)
\$ More than \$29,999 per month	148 (34%)
Unknown	9 (2%)
Education level	
Secondary or below	191 (43.7%)
Tertiary level	71 (16.2%)
Bachelor or above	175 (40.1%)
Work status	
Employed (Full-time)	359 (82%)
Employed (Part-time)	36 (8%)
Family caregiver	18 (3.5%)
Unemployed	13 (3%)
Others	11 (2.5%)
Number of children	
1	205 (46.9%)
2	198 (45.3%)
3 or more	34 (7.8%)
Number of children with special needs	
1	365 (83.5%)

2	65 (14.9%)
3 or more	7 (1.6%)
Sex of children with special needs (Female)	103 (24%)
Age of children with special needs	7.30 (0.14)
Types of special needs of children (1 or more)	
AD/HD	95 (21.7%)
ASD	96 (22.0%)
SpLD	6 (1.4%)
ID	7 (1.6%)
Other type	11 (2.5%)
More than one type of special needs in development and learning disabilities	138 (31.6%)
More than one type of special needs in both physical, sensory, mental health, and/or development and learning disabilities	84 (19.2%)

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Table 2
EFA results for the Four-Factor Solution of the FIS-CFCSN (n = 218)

Item	Factor 1	Factor 2	Factor 3	Factor 4	h ²	u ²	Communalities
FI7	0.46				0.66	0.34	1.03
FI15	0.61				0.77	0.23	1.03
FI25	0.85				0.48	0.52	1.00
FI26	0.73				0.55	0.45	1.68
FI28	0.83				0.61	0.39	1.05
FI29	0.86				0.70	0.30	1.13
FI30	0.74				0.50	0.50	2.21
FI32	0.50				0.54	0.46	1.04
FI20		0.48			0.58	0.42	1.19
FI34		0.56			0.47	0.53	1.82
FI35		0.60			0.62	0.38	1.67
FI38		0.71			0.37	0.63	1.28
FI39		0.88			0.59	0.41	1.08
FI40		0.93			0.74	0.26	1.06
FI42		0.64			0.66	0.34	1.12
FI4			0.79		0.72	0.28	1.02
FI5			0.88		0.81	0.19	1.02
FI6			0.71		0.61	0.39	1.04
FI12			0.51		0.54	0.46	1.74
FI17			0.58		0.62	0.38	1.44
FI21			0.67		0.56	0.44	1.34
FI10				0.77	0.72	0.28	1.13
FI11				0.79	0.71	0.29	1.02
FI13				0.68	0.80	0.20	1.01
FI16				0.43	0.56	0.44	1.18
Eigenvalue	5.13	4.25	3.54	2.58			
Contribution rate	0.21	0.17	0.14	0.10			
Cumulative contribution rate	0.21	0.38	0.52	0.62			

Note. Factor loadings from principal-axis factoring with oblimin rotation.
Loadings < .40 suppressed.

Table 3
CFA results for the Four-Factor Solution of the FIS-CFCSN (n = 219)

Item	ERS	IT	ESE	PC
7. I keep in touch with school or institution which my child attends.	0.65			
15. I will take my children for physical, speech, occupational, and other forms of rehabilitation therapy.	0.69			
25. I participate in the rehabilitation of my child.	0.79			
26. I rehabilitate my child on vacation.	0.78			
28. I participate in courses associated with rehabilitation of disabled children.	0.84			
29. I consult rehabilitation exercises for my child with physicians and specialists.	0.85			
30. I rehabilitate my child using the latest methods.	0.78			
32. I seek for equipment and people required for rehabilitation of my child.	0.78			
20. I teach my child how to accept his/her disability.		0.65		
34. I teach my child how to do housework, wash, prepare meals, do shopping, mail letters, etc.		0.71		
35. I teach my child how to translocate from place to place and how to use means of public transport.		0.71		
38. I teach my child how to use his/her free time.		0.80		
39. I teach my child how to deal with money.		0.76		
40. I teach my child how to use telephone and how to, with its help, deal with various matters.		0.73		
42. I will teach my children how to use the internet and electronic devices		0.69		
4. I will play, go for walks, engage in sports, and participate in recreational activities with my children during leisure time.			0.70	
5. I show my love to my child by telling him/her this, hugging him/her, being with him/her.			0.74	
6. I encourage my child to participate in his/her rehabilitation.			0.67	
12. I take my child for a walk.			0.74	
17. I teach my child values in which I believe and experience which I gained by myself.			0.68	
21. I praise my child if he/she deserves it.			0.68	
10. I prepare meals and participate in feeding my child.				0.75
11. I participate in dressing my child.				0.77
13. I give medicines to my child.				0.66
16. I help my child with maintenance of tidiness and order in his/her room.				0.74

Note. Educational and Rehabilitation Support (ERS); Independence Training (IT); Emotional and Social Engagement (ESE); Physical Care (PC)

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Table 4
Internal Consistency, Composite Reliability, and AVE

Factor	α	ω	CR	AVE
ERS	0.92	0.93	0.94	0.58
IT	0.89	0.90	0.88	0.52
ESE	0.87	0.88	0.86	0.49 ¹
PC	0.85	0.86	0.83	0.53

Note. AVE for ESE is marginally below 0.50, but standardized loadings exceed 0.60, supporting acceptable convergent validity in context.

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1 **Psychometric Evaluation of the Father Involvement Scale Among Chinese Fathers of**
2 **Children with Developmental Disabilities**

3

4 **Abstract**

5 **Objective:** To translate, culturally adapt, and evaluate the structural validity, reliability, and
6 construct validity of the Father Involvement Scale for Chinese fathers of children with special
7 needs (FIS-CFCSN) among Hong Kong fathers of children with developmental disabilities
8 (DD).

9 **Background:** Father involvement contributes uniquely to child development, yet validated
10 tools for assessing paternal engagement among fathers of children with DD in non-Western
11 contexts remain limited.

12 **Method:** Biological fathers (N = 437; child age 2-12 years) were recruited through schools,
13 NGOs, and community organizations in Hong Kong. The adaptation followed a five-stage
14 mixed-methods process: qualitative exploration, forward-back translation, expert review,
15 item revision, and quantitative validation. The sample was randomly split for exploratory (n =
16 218) and confirmatory (n = 219) factor analysis.

17 **Results:** Exploratory factor analysis supported a four-factor solution: Educational and
18 Rehabilitation Support (ERS), Independence Training (IT), Emotional and Social
19 Engagement (ESE), and Physical Care (PC). Confirmatory factor analysis showed acceptable
20 fit ($\chi^2/df = 1.77$; CFI = .92; TLI = .91; RMSEA = .059; SRMR = .066). Internal consistency
21 and composite reliability were strong ($\alpha = .85-.92$; $\omega = .86-.93$), and AVE values met or
22 approached .50.

23 **Conclusion:** The 25-item FIS-CFCSN provides initial structural validity evidence as a DD-
24 specific measure of paternal involvement for Chinese populations. Its four-factor structure
25 reflects culturally grounded paternal caregiving and disability-specific caregiving demands in
26 Hong Kong.

27 **Implications:** The FIS-CFCSN supports domain-specific profiling of father involvement in
28 intake assessment, outcome monitoring, and father-inclusive intervention planning. Future
29 studies should examine predictive validity, test-retest reliability, and measurement invariance.

30

31 **Keywords:** father involvement, developmental disabilities, scale validation, Chinese fathers,
32 psychometric validation, Hong Kong

1 Introduction

2 Fathers occupy a central but historically underexamined position in the landscape of
 3 child development research. Research on parenting has historically focused on mothers, with
 4 father involvement receiving sustained empirical attention only in recent decades. This
 5 imbalance is consequential: paternal involvement makes independent contributions to
 6 children's cognitive development, language acquisition, behavioral self-regulation, and
 7 socioemotional competence that cannot be accounted for by maternal behavior alone
 8 (Cabrera et al., 2014; Lamb & Lewis, 2010; Pruett et al., 2017). These effects persist from
 9 infancy into adolescence and are evident across diverse family structures, suggesting that
 10 fathers represent a meaningful and distinct component of the family system rather than a
 11 secondary or redundant influence on child outcomes.

12 Theoretical work has clarified what father involvement entails and why its measurement
 13 is consequential. Lamb et al. (1987) distinguished three behavioral components of paternal
 14 engagement: engagement (direct interaction with the child), accessibility (availability to the
 15 child without direct interaction), and responsibility (accountability for the child's care,
 16 including planning and coordination), a framework that organized much of the subsequent
 17 empirical literature. Pleck (2010) extended this model by differentiating the quantity of
 18 paternal involvement from its quality. In Pleck's revised conceptualization, father
 19 involvement comprises four dimensions: positive engagement characteristics (warmth,

1 sensitivity, and cognitive stimulation during direct interaction), availability to the child,
 2 responsibility for caregiving and planning, and process involvement (indirect contributions to
 3 the family context, including financial provision and co-parental support). Critically, Pleck
 4 argued that these dimensions are not interchangeable and that any adequate measurement
 5 framework must capture their distinct contributions. This has direct implications for cross-
 6 cultural measurement: if the behavioral expression and psychological organization of these
 7 dimensions vary across cultural contexts, as growing evidence suggests, then instruments
 8 developed in one cultural setting cannot be assumed to measure the same constructs when
 9 applied in another.

10 This issue is especially pressing in the context of families raising children with
 11 developmental disabilities (DD). Fathers in these families contribute in ways that extend well
 12 beyond general paternal involvement: they coordinate therapeutic appointments, implement
 13 rehabilitation exercises at home, navigate educational systems on behalf of their children, and
 14 manage the emotional and logistical demands of disability-related caregiving (Flippin &
 15 Crais, 2011; Langley, 2025; Lo, 2025). Active paternal involvement in DD contexts has been
 16 associated with reduced maternal stress, improved child adaptive functioning, and greater
 17 consistency in therapeutic follow-through (Bagner, 2013; Flippin & Crais, 2011). Despite
 18 these documented contributions, intervention research in DD contexts has largely been
 19 designed for and evaluated with mothers; fathers are recruited at lower rates, drop out more

frequently, and receive less tailored support (McBride et al., 2005). Advancing both research and practice in this area requires valid measures of father involvement that are suited to DD-specific caregiving demands and to the populations in which they are used.

Validated measurement tools for assessing paternal involvement in DD contexts are scarce outside Western samples. The two most widely used instruments in this area are the Inventory of Father Involvement (IFI; Hawkins et al., 2002) and the Father Involvement Scale (FIS; Bragiel & Kaniok, 2011), both developed in Western samples. The IFI has subsequently been adapted for use in several non-Western populations, including Chinese-speaking contexts (Chuang & Fagan, 2021), but it was designed for fathers in the general population and does not include disability-specific domains such as rehabilitation coordination or therapeutic support. The FIS, by contrast, was developed explicitly for fathers of children with disabilities, encompassing five subscales (Interest in the Child's Life, Care, Education and Upbringing, Rehabilitation, and Active Help in Achieving Independence) that map directly onto the caregiving demands characteristic of DD families. It is for this reason that the FIS, rather than more general fathering instruments, was selected as the basis for the present adaptation. A recent scoping review by Eubank et al. (2025) found that validated instruments for assessing paternal involvement among fathers of children with DD in East and Southeast Asia are effectively absent from the literature, identifying cultural adaptation and psychometric validation as a priority for the field.

1 Using instruments without establishing cross-cultural measurement equivalence carries
2 real methodological costs. Measurement non-equivalence, the condition in which a scale's
3 items or factor structure function differently across cultural groups, produces biased estimates
4 of latent construct means and covariances, which in turn distorts conclusions about the
5 predictors and consequences of paternal involvement and compromises the interpretation of
6 intervention outcomes (Vandenberg & Lance, 2000). Prior cross-cultural applications of the
7 FIS illustrate this concern directly. Ko et al. (2022) found a four-factor solution among South
8 Korean fathers of children with disabilities, with the Education and Rehabilitation subscales
9 collapsing into a single factor. Semešiová et al. (2024) reported divergent structures across
10 European samples. Langley (2025) documented further structural variability in samples of
11 fathers of children with intellectual and developmental disabilities. These findings indicate
12 that the FIS factor structure is context-sensitive rather than universal, and that confirmatory
13 analyses assuming the original five-factor structure would be inappropriate without first
14 establishing whether that structure holds in the target population.

15 In Hong Kong, the cultural context of fathering differs from both Western and other East
16 Asian societies studied to date in ways that are directly relevant to how paternal involvement
17 is organized and expressed. Fatherhood in Hong Kong is embedded in Confucian traditions
18 that assign fathers primary responsibility for jiao, the moral cultivation, intellectual
19 development, and social formation of the child (Li, 2013; Shek, 2007). Within this

1 framework, fathers are expected to function as providers, moral guides, and educators; direct
 2 physical caregiving and emotional expressiveness are more commonly associated with the
 3 maternal role. These normative expectations have two implications for measurement. First,
 4 the behavioral content of paternal involvement in Hong Kong may differ from Western
 5 norms, with fathers more behaviorally active in educational and rehabilitative domains and
 6 less expressive in affective domains, a pattern that Western-developed scales may capture
 7 inadequately or misattribute. Second, the psychological organization of fathering behaviors
 8 may differ: domains that appear conceptually distinct in Western instruments may be
 9 experienced as a unified form of responsibility by Chinese fathers, and vice versa. Fathers of
 10 children with DD in Hong Kong face additional challenges that further shape their
 11 engagement, including the intersection of disability stigma with Confucian ideals of family
 12 harmony and academic achievement, experiences of shame and social isolation, and pressure
 13 to resolve the tension between provider roles and intensive caregiving demands (Chan &
 14 Lam, 2018; Lo, 2025; Lo et al., 2025; Mak & Kwok, 2010).

15 These considerations motivate the present study, which aimed to translate, culturally
 16 adapt, and examine the psychometric properties of a Chinese version of the FIS for use
 17 among Hong Kong fathers of children with DD. The adaptation followed a multi-stage
 18 process including qualitative construct exploration, forward-back translation, expert content
 19 review, and item revision; these procedures are described in the Method section. The

1 psychometric evaluation focused on two questions: What factor structure best represents
 2 paternal involvement as assessed by the Chinese-adapted FIS in this sample, and does that
 3 structure replicate in an independent subsample? We approached the first question with
 4 exploratory factor analysis (EFA), given consistent evidence that the FIS factor structure
 5 varies across cultural contexts and that imposing the original five-factor model without prior
 6 exploration would risk misspecifying the measurement model for this population. The second
 7 question was addressed with confirmatory factor analysis (CFA) in a randomly split holdout
 8 subsample.

9 *The Present Study*

10 Drawing on Pleck's (2010) conceptualization of father involvement as a
 11 multidimensional construct whose specific dimensions may vary in behavioral expression and
 12 psychological organization across cultural and family contexts, and on the qualitative work
 13 conducted during the adaptation phase, we anticipated that the Chinese-adapted FIS would
 14 yield a multifactor solution in which educational and rehabilitative caregiving domains would
 15 coalesce into a single dimension, consistent with the Confucian integration of these
 16 responsibilities under a unified conception of paternal developmental duty (Li, 2013; Shek,
 17 2007), and that relational and emotional engagement would similarly consolidate into a
 18 coherent factor reflecting the integrated expression of paternal warmth in Chinese family life.
 19 These anticipated patterns reflect theoretically grounded expectations rather than confirmed

hypotheses, and the EFA was conducted to test them empirically rather than to confirm them by design.

The study pursued two primary aims: (a) to translate, culturally adapt, and establish content validity for a Chinese version of the FIS through a five-stage process including qualitative construct exploration, forward-back translation, expert review, and item revision; and (b) to evaluate the structural validity, reliability, and construct validity of the resulting structure through EFA and CFA in independently drawn subsamples. Consistent with current standards for psychometric evaluation (AERA et al., 2014; ITC, 2017), we treat the present study as providing initial evidence for the structural validity of the adapted instrument rather than constituting a definitive validation. Additional sources of validity evidence, including predictive validity, test-retest reliability, and measurement invariance across subgroups, are identified as priorities for future research.

Method

Participants

Participants were 437 biological fathers residing in Hong Kong, each with at least one child between the ages of 2 and 12 years ($M_{child} = 7.30$, $SD = 0.14$) diagnosed with or suspected of having a developmental disability. Fathers were recruited between November 2022 and March 2023 through mainstream schools providing inclusive education, special schools, NGOs providing rehabilitation and support services for children with special needs

1 and their caregivers, designated parent and relative resource centres, and self-help groups and
 2 community organizations. Of 470 total responses initially collected, 33 were excluded
 3 because the child exceeded the age eligibility criterion, yielding a final analytic sample of
 4 437 fathers. Demographic characteristics of both the full sample and the two randomly split
 5 subsamples are presented in Table 1.

6 Fathers ranged in age from 18 to 64 years. The majority were married (90.8%),
 7 employed full-time (82%), and had a secondary education or lower (43.7%). The sample was
 8 predominantly composed of fathers whose child carried a single DD diagnosis (83.5%), with
 9 ASD (22.0%) and ADHD (21.7%) being the most common diagnoses; the remaining 50.8%
 10 presented with comorbid or multiple disability profiles. All participants self-identified as
 11 ethnically Chinese. Inclusion criteria were as follows: (a) self-identified as the biological
 12 father of a child with a diagnosed or suspected DD; (b) the child was aged 2 to 12 years; (c)
 13 the father reported at least biweekly face-to-face or virtual contact with the child in the past
 14 six months; and (d) the father was able to read Chinese and provide informed consent.
 15 Children's disabilities were classified according to categories established by the Census and
 16 Statistics Department of Hong Kong SAR (2021), encompassing Specific Learning
 17 Difficulties (SpLD), Intellectual Disability (ID), Autism Spectrum Disorder (ASD),
 18 Attention-Deficit/Hyperactivity Disorder (ADHD), Speech and Language Impairments (SLI),
 19 and physical, sensory, and developmental disabilities. Biological fathers were targeted

specifically because this population carries distinct normative role expectations and experiential challenges, including internalized stigma, role renegotiation, and provider-caregiver conflict, that have been documented in qualitative research with Hong Kong Chinese fathers and that may not generalize to non-biological or co-resident but non-biological fathers (Lo, 2025; Lo et al., 2025). The 2 to 12 year age range was chosen because this developmental window encompasses the critical early intervention period through primary school entry, the phase during which paternal decisions about therapeutic participation, educational support, and structured independence training carry the greatest developmental consequence (McBride et al., 2005).

[Table 1 about here]

Procedure

The present study followed best-practice guidelines for scale adaptation and validation (Cabrera-Nguyen, 2010) and adopted a mixed-methods scale development and validation analysis (MSDVA) framework (Zhou, 2019). The validation process comprised five sequential steps: (1) qualitative exploration of the construct; (2) translation and cultural adaptation of scale items; (3) expert review and content validation; (4) administration of the finalized scale to the target population; and (5) quantitative analyses including exploratory and confirmatory factor analyses to assess the factor structure, internal consistency, and construct validity of the FIS-CFCSN.

1 For Step 1, semi-structured individual interviews were conducted with 31 biological
 2 fathers of children with DD via Zoom between February and September 2022, using maximal
 3 variation sampling to ensure diversity across paternal age, education, child diagnosis, and
 4 service context. Inductive thematic analysis (Braun & Clarke, 2006) identified three
 5 caregiving domains not adequately represented in the original FIS: digital technology
 6 engagement, adventure and exploration play, and peer relationship support. These findings
 7 informed the addition of three new items and the revision of two existing items in Step 2.

8 For Step 2, the original Polish FIS was translated into Traditional Chinese through a
 9 forward-back translation procedure, with discrepancies reviewed by the research team to
 10 preserve conceptual equivalence across versions. Three new items were added (FI41 to FI43),
 11 and two existing items were reworded to reflect caregiving practices typical in Hong Kong
 12 DD contexts, producing a 43-item adaptation pool.

13 For Step 3, the 43-item pool was reviewed by an expert panel comprising a specialist in
 14 children with special needs and their caregivers, service operators with direct experience in
 15 DD family support, and a representative of the target population. Each item was rated for
 16 relevance on a four-point scale, and content validity indices were calculated at the item and
 17 scale levels following Lynn (1986) and Polit and Beck (2006). Items with I-CVI values
 18 below .78 were revised or removed.

19 For Step 4, fathers accessed the finalized scale via a secure online survey (Qualtrics)

1 through a unique URL between November 2022 and March 2023, or requested a paper
 2 version if preferred. Informed consent was obtained electronically or in writing before
 3 participation. All participants were assured of the voluntary nature of the study, the
 4 confidentiality of their responses, and their right to withdraw at any time without penalty.
 5 Participants received a coupon as a token of appreciation.

6 Step 5 analyses are described in the Statistical Analysis section below.

7 **Measures**

8 **Father Involvement Scale.** The Father Involvement Scale assesses fathers' perceived
 9 engagement with their child with disabilities (Bragiel & Kaniok, 2011). This original scale
 10 contained 40 items organized into five subscales: interest in the child's life (e.g., *"I talk to my*
 11 *child about his/her interests"*), care (e.g., *"I prepare meals and participate in feeding my*
 12 *child"*), education/upbringing (e.g., *"I teach my child how to deal with difficult situations"*),
 13 rehabilitation (e.g., *"I consult rehabilitation exercises for my child with physicians and*
 14 *specialists"*), and active help in achieving independence (e.g., *"I teach my child how to*
 15 *translocate from place to place and how to use means of public transport"*). Items are rated
 16 from 1 (never) to 5 (always), and scores are summed (possible range = 40 to 200), with
 17 higher scores indicating greater father involvement. Internal consistency of the five original
 18 subscales in the full sample was satisfactory (Cronbach's $\alpha = .84$ to $.91$), providing
 19 preliminary support for the coherence of the Chinese translation prior to structural analysis.

1 As described in the *Procedure* section, three new items were added to the 43-item adaptation
 2 pool: FI41 (“*I participate in adventure and exploration activities with my child*”), FI42 (“*I*
 3 *teach my child how to use the internet and electronic devices*”), and FI43 (“*I assist my child*
 4 *in making friends*”). Two existing items were also reworded: FI4 was revised to remove
 5 reference to theater attendance, which is uncommon among Hong Kong fathers, in favor of
 6 outdoor recreational and sports activities; FI15 was revised to specify occupational therapy
 7 and speech-language therapy, which are central to DD support in this context.

8 **Demographic Questionnaire.** Participants completed a researcher-developed
 9 demographic questionnaire assessing paternal age, education level, employment status,
 10 marital status, child age and diagnosis, number of children, and weekly caregiving hours.
 11 These variables were used for descriptive statistics and for verifying equivalence between the
 12 two randomly assigned subsamples.

13 *Statistical Analysis*

14 Data were analyzed following best-practice recommendations for psychometric
 15 validation (Cabrera-Nguyen, 2010). The total sample of 437 was randomly split into two
 16 subsamples: approximately half ($n = 218$) for exploratory factor analysis (EFA) and half ($n =$
 17 219) for confirmatory factor analysis (CFA). Randomization was performed in R using a
 18 fixed seed to ensure reproducibility. Chi-square tests and independent-samples t-tests
 19 confirmed no significant differences between the two subsamples on paternal age, education

level, marital status, employment status, or child diagnosis (all $p > .05$), supporting the equivalence of the two subsamples prior to analysis. All analyses were conducted in RStudio (Version 2025.05.1) using R 4.5.1 (R Core Team, 2025).

EFA was conducted using principal-axis factoring (fa function with fm= "pa" in R), which estimates common variance only and is robust to nonnormality (Fabrigar et al., 1999; Revelle, 2022). Oblimin rotation was applied to permit factor intercorrelations, consistent with the theoretical expectation that dimensions of father involvement are related (Pleck, 2010). The number of factors to retain was determined by convergence across three criteria: the Kaiser criterion (eigenvalues > 1), the scree plot inflection point, and parallel analysis (observed eigenvalues exceeding the 95th percentile of 1,000 random-data eigenvalues; Horn, 1965). Items were removed iteratively based on three a priori criteria (Costello & Osborne, 2005): communality below .25; primary factor loading below .40; and cross-loading, defined as a primary-secondary loading difference of less than .20 when the secondary loading exceeded .32 (Tabachnick & Fidell, 2019). One item was removed at a time, with the EFA rerun after each removal.

Following EFA, CFA was subsequently conducted on the second half of the dataset ($n = 7219$), employing robust maximum likelihood (MLR) estimation to account for data nonnormality and full-information maximum likelihood (FIML) to handle missing data effectively without imputation. The CFA specified a first-order model with four correlated

1 factors consistent with the EFA structure. Model fit was assessed using standard indices,
 2 accepting CFI and TLI values $\geq .90$, RMSEA $\leq .08$, and SRMR $\leq .08$ as indicative of
 3 acceptable fit. Modification indices above 10 were examined, with residual covariances
 4 added only if theoretically justified, avoiding overfitting. Items retained in the CFA model
 5 demonstrated standardized factor loadings of at least .40, with a preference for loadings
 6 above .50, ensuring robust representation of the latent constructs.

7 Internal consistency was assessed using Cronbach's α and McDonald's ω ; ω is reported
 8 alongside α because it does not assume tau-equivalence and provides a less biased reliability
 9 estimate when factor loadings vary (McDonald, 1999). Composite reliability (CR) and
 10 average variance extracted (AVE) were computed to assess construct-level reliability and
 11 convergent validity, with AVE values at or above .50 taken as evidence of convergent
 12 validity (Fornell & Larcker, 1981). Discriminant validity was assessed using the Fornell-
 13 Larcker criterion, requiring each factor's AVE to exceed its highest squared intercorrelation
 14 with any other factor.

15 Results

16 *Item Analysis and Exploratory Factor Analysis*

17 Item analysis was conducted by calculating the critical ratio (CR) and item-total
 18 correlations for all 43 items in the exploratory subsample. The CR compared mean scores
 19 between the upper 27% and lower 27% of total scorers; items with CR values below 3 were

1 removed. Item-total correlations above .30 were required for retention. All 43 items met both
2 criteria.

3 Data suitability for EFA was then assessed via inter-item correlations, the Kaiser-Meyer-
4 Olkin (KMO) measure, and Bartlett's test of sphericity. No item pair exceeded the
5 redundancy threshold of $|r| > .90$. The overall KMO index was .95, with individual item
6 values ranging from .89 to .97, all above the recommended minimum of .50 (Kaiser, 1974).
7 Bartlett's test of sphericity was significant, $\chi^2(903) = 7240.42, p < .001$, confirming the
8 matrix was factorable.

The Kaiser criterion, scree plot, and parallel analysis all converged on a four-factor solution. Items were removed one at a time under three sequential criteria: 6 items were removed for low factor loadings below .40 (FI2, FI3, FI14, FI22, FI33, FI36), and 12 items were removed for cross-loading with a primary-secondary difference of less than .20 (FI1, FI8, FI9, FI18, FI19, FI23, FI24, FI27, FI31, FI37, FI41, FI43), yielding a final 25-item pool. Factor 1 accounted for 21% of the variance, Factor 2 for 17%, Factor 3 for 14%, and Factor 4 for 10%; the four factors together accounted for 62% of the total variance. Factor loadings and communalities are presented in Table 2.

17 [Table 2 about here]

18 Factor Interpretation Based on EFA

19 The four-factor solution yielded a theoretically coherent structure that partially maps

1 onto the original five-factor FIS while reflecting the caregiving context of Hong Kong
2 Chinese fathers. Factor 1, Educational and Rehabilitation Support (ERS; loadings .46 to .86),
3 consolidates the original education and rehabilitation subscales into a single dimension. The
4 highest loadings fell on professional consultation (.85) and seeking specialized equipment
5 (.78), consistent with prior evidence that Chinese fathers invest heavily in coordinating
6 therapeutic and educational resources as a primary expression of paternal responsibility (Li,
7 2013; Shek, 2007). This convergence replicates the pattern observed by Ko et al. (2022)
8 among South Korean fathers and is consistent with Confucian conceptions of paternal duty as
9 centered on the child's development and training.

10 Factor 2, Independence Training (IT; loadings .48 to .93), corresponds closely to the
11 original active help in achieving independence subscale and incorporates FI42, the newly
12 added item on digital technology use. The inclusion of this item within an independence-
13 building factor reflects the practical integration of digital literacy into structured life-skill
14 training among Hong Kong families.

15 Factor 3, Emotional and Social Engagement (ESE; loadings .51 to .88), draws from the
16 original interest in child's life and portions of the care subscales. Items loading on this factor
17 span recreational involvement, emotional expression, and values transmission, suggesting
18 that Hong Kong Chinese fathers organize these behaviors as a single relational domain rather
19 than as distinct categories.

Factor 4, Physical Care (PC; loadings .43 to .79), corresponds directly to the original care subscale and covers basic daily caregiving tasks. Its structural stability across cultural contexts is consistent with findings from prior cross-cultural FIS applications (Eubank & Leidy, 2025).

5

6 Confirmatory Factor Analysis

CFA was conducted on the confirmatory subsample ($n = 219$) to test the four-factor structure identified in the EFA. A first-order model with four correlated latent variables was specified using the lavaan package in R (Rosseel, 2012): ERS (8 items), IT (7 items), ESE (6 items), and PC (4 items). All standardized factor loadings were statistically significant ($p < .001$) and ranged from .65 to .85, indicating adequate to strong item-factor relationships. Inter-factor correlations ranged from .44 to .75, reflecting moderate to strong associations among the four dimensions (See Appendix Table A). Model fit was acceptable: $\chi^2(269) = 475.92, p < .001$; $\chi^2/df = 1.77$; CFI = .92; TLI = .91; RMSEA = .059; SRMR = .066 (See Appendix Table B). All indices met the pre-specified acceptance criteria, and the overall pattern of loadings and fit confirmed the factorial validity of the 25-item, four-factor FIS-CFCSN (Table 3).

18 [Table 3 about here]

19 *Reliability and Validity*

Internal consistency, composite reliability, and convergent and discriminant validity are reported in Table 4. All four factors showed strong internal consistency ($\alpha = .85-.92$; $\omega_3 = .86-.93$) and CR values above the .70 threshold (CR = .83-.94). AVE values ranged from .49-.58. Three factors met the .50 convergent validity criterion (Fornell & Larcker, 1981); the ESE factor's AVE of .49 fell marginally below this threshold but was accompanied by standardized loadings all exceeding .67 and a CR of .86, which together support acceptable convergent validity for this factor (Fornell & Larcker, 1981). Discriminant validity was evaluated using the Fornell-Larcker criterion, which requires each factor's AVE to exceed the squared correlation between that factor and every other factor in the model. The highest squared inter-factor correlation in the sample was .56 (between ERS and PC; $r = .745$, $r^2 = .555$), which was exceeded by both factors' AVEs (.58 and .53, respectively). All remaining factor pairs yielded squared inter-factor correlations below their respective AVEs, supporting the discriminant validity of all four dimensions.

[Table 4 about here]

Discussion

The present study translated, culturally adapted, and examined the structural validity of the short version of the Father Involvement Scale (Bragiel & Kaniok, 2011) among Hong Kong Chinese fathers raising children with developmental disabilities. EFA and CFA supported a four-factor structure comprising Educational and Rehabilitation Support (ERS),

1 Independence Training (IT), Emotional and Social Engagement (ESE), and Physical Care
2 (PC). This structure differs from the original five-factor model, and the nature of those
3 differences is interpretable in terms of the cultural and caregiving context of the sample.

4 *Factor Structure and Cultural Context*

5 The consolidation of the original education and rehabilitation subscales into a single
6 ERS factor is consistent with evidence that Chinese fathers, operating within a Confucian
7 framework that assigns paternal responsibility primarily to the moral cultivation and
8 developmental advancement of the child (jiao; Li, 2013; Shek, 2007), may not distinguish
9 educational from rehabilitative engagement as functionally separate domains. Within this
10 normative orientation, coordinating therapy appointments, consulting rehabilitation
11 specialists, and supporting academic progress may be experienced as expressions of a single
12 paternal duty rather than as distinct behavioral categories. A parallel pattern was reported by
13 Ko et al. (2022), who found that Education and Rehabilitation subscales collapsed into a
14 single factor among South Korean fathers of children with disabilities, suggesting this
15 convergence may reflect broader East Asian cultural organization of paternal caregiving
16 rather than a feature specific to Hong Kong.

17 IT emerged as a distinct factor, covering structured teaching of daily living skills,
18 financial management, use of public transport, and digital technology use. Its separation from
19 ERS is interpretable within Confucian accounts of fathering that assign particular salience to

1 structured, goal-directed guidance toward self-sufficiency (Li, 2013; Shek, 2007). This
 2 pattern contrasts with the original Polish FIS, in which independence-related activities were
 3 treated as one component of a broader caregiving role (Bragiel & Kaniok, 2011), and
 4 suggests that in the Hong Kong DD context, structured independence training carries
 5 sufficient salience to warrant its own dimension. The inclusion of FI42 (digital technology
 6 use) within this factor, rather than as a standalone item, reflects the practical integration of
 7 technology as a life skill within daily parenting routines.

8 ESE, comprising recreational involvement, emotional expression, and values
 9 transmission, draws from the original interest in child's life and portions of the care subscales.
 10 The consolidation of these behaviors into a single factor is consistent with accounts of
 11 relational engagement in Chinese families, where emotional expression and shared activity
 12 may be organized as an integrated form of paternal warmth rather than as separate behavioral
 13 dimensions (Cabrera et al., 2018; Li et al., 2024). It should be noted that this interpretation is
 14 provisional; the factor structure identifies how items cluster statistically, and cultural
 15 accounts provide a plausible interpretive frame rather than a confirmed explanation. PC,
 16 covering daily caregiving tasks, replicated the structure of the original care subscale and is
 17 consistent with prior cross-cultural FIS applications (Eubank & Leidy, 2025), suggesting this
 18 dimension is relatively stable across national contexts.

19 *Implications for Theory and Practice*

1 These findings extend Pleck's (2010) multidimensional framework by showing that the
 2 specific organization of paternal involvement dimensions varies across cultural settings. The
 3 ERS and IT factors in particular suggest that instruments developed in Western samples may
 4 inadequately capture the degree to which educational, rehabilitative, and independence-
 5 building activities are salient and structurally distinct components of fathering in DD families
 6 in Hong Kong. The high endorsement of both direct and indirect involvement across the
 7 sample suggests that fathers of children with DD in this context are actively engaged across
 8 multiple domains, including some, such as rehabilitation coordination, that have historically
 9 been treated as peripheral to paternal roles (Flippin & Crais, 2011).

10 Practically, the FIS-CFCSN provides researchers and practitioners with a
 11 psychometrically evaluated, DD-specific tool for assessing paternal involvement in Chinese-
 12 speaking populations, where previously no such measure existed (Eubank et al., 2025). The
 13 four-subscale structure enables differential profiling rather than a single total score. ERS
 14 scores can identify fathers who are disengaged from their child's therapeutic and educational
 15 ecosystem, a domain associated with better rehabilitation outcomes when fathers are actively
 16 involved (Flippin & Crais, 2011), and can guide referrals to rehabilitation literacy
 17 programmes or family-centred service coordination. IT scores are directly relevant to
 18 occupational therapy planning: low IT engagement may indicate fathers who would benefit
 19 from structured coaching in teaching daily living and independence skills. ESE scores can

1 flag fathers with limited recreational or emotional engagement, informing group-based
 2 programmes that use play and shared activity as the medium for building father-child
 3 relationships. PC scores provide a lens on basic caregiving equity relevant to co-parenting
 4 assessments and maternal caregiver burden reviews. Across all four domains, the scale
 5 provides a practical tool for intake and outcome monitoring in father-inclusive programmes
 6 in Hong Kong's early intervention and special education settings.

7 ***Limitations and Future Directions***

8 Several limitations should be noted. First, the sample was cross-sectional, which
 9 precludes conclusions about how paternal involvement changes over time or in response to
 10 intervention. Longitudinal designs would clarify developmental trajectories of involvement as
 11 children age and their disability-related needs shift. **Second, all data were self-reported,**
 12 **which introduces the possibility of social desirability bias, particularly for domains such as**
 13 **emotional expression that carry normative weight in Chinese cultural contexts. Future studies**
 14 **could incorporate partner-report or observational data to strengthen construct validity. Third,**
 15 **the sample was drawn from Hong Kong and consisted entirely of self-identified ethnic**
 16 **Chinese fathers; generalizability to fathers in Mainland China, Taiwan, or Chinese diaspora**
 17 **communities cannot be assumed, and replication in those populations is a priority. Fourth, the**
 18 **sample was predominantly married and full-time employed, which may also limit the**
 19 **generalizability of the findings to fathers with different marital, employment, residency, or**

1 caregiving circumstances. Future studies should recruit more diverse father samples to
2 examine whether the four-factor structure remains stable across different family and
3 socioeconomic contexts. Fifth, the present study provides initial structural validity evidence
4 only; predictive validity, test-retest reliability, and measurement invariance across subgroups
5 defined by child diagnosis, income level, and disability severity remain to be established
6 before the FIS-CFCSN is recommended for high-stakes assessment purposes.

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18

Table 1
Descriptive statistics of respondents (N = 437)

Variables	Frequency (%)/ Mean (SD)
Age of Father	
18-29	11 (2.5%)
30-39	145 (33.2%)
40-49	214 (49.0%)
50-59	56 (12.8%)
60-65	11 (2.5%)
Marriage status	
Married	397 (90.8%)
Unmarried Non-cohabitant couples	4 (0.9%)
Unmarried cohabitant couples	6 (1.4%)
Separated or Divorce	28 (6.4%)
Others	2 (0.5%)
Family Income (HKD)	
<\$10,000 per month	17 (3.9%)
\$10,000 - \$19999 per month	94 (21.5%)
\$20,000 - \$29,999 per month	91 (20.8%)
\$30,000 - \$39,999 per month	78 (17.8%)
\$ More than \$29,999 per month	148 (34%)
Unknown	9 (2%)
Education level	
Secondary or below	191 (43.7%)
Tertiary level	71 (16.2%)
Bachelor or above	175 (40.1%)
Work status	
Employed (Full-time)	359 (82%)
Employed (Part-time)	36 (8%)
Family caregiver	18 (3.5%)
Unemployed	13 (3%)
Others	11 (2.5%)
Number of children	
1	205 (46.9%)
2	198 (45.3%)
3 or more	34 (7.8%)
Number of children with special needs	

<i>1</i>	365 (83.5%)
<i>2</i>	65 (14.9%)
<i>3 or more</i>	7 (1.6%)
Sex of children with special needs (Female)	103 (24%)
Age of children with special needs	7.30 (0.14)
Types of special needs of children (1 or more)	
<i>AD/HD</i>	95 (21.7%)
<i>ASD</i>	96 (22.0%)
<i>SpLD</i>	6 (1.4%)
<i>ID</i>	7 (1.6%)
<i>Other type</i>	11 (2.5%)
<i>More than one type of special needs in development and learning disabilities</i>	138 (31.6%)
<i>More than one type of special needs in both physical, sensory, mental health, and/or development and learning disabilities</i>	84 (19.2%)

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Table 2
EFA results for the Four-Factor Solution of the FIS-CFCSN (n = 218)

Item	Factor 1	Factor 2	Factor 3	Factor 4	h ²	u ²	Communalities
FI7	0.46				0.66	0.34	1.03
FI15	0.61				0.77	0.23	1.03
FI25	0.85				0.48	0.52	1.00
FI26	0.73				0.55	0.45	1.68
FI28	0.83				0.61	0.39	1.05
FI29	0.86				0.70	0.30	1.13
FI30	0.74				0.50	0.50	2.21
FI32	0.50				0.54	0.46	1.04
FI20		0.48			0.58	0.42	1.19
FI34		0.56			0.47	0.53	1.82
FI35		0.60			0.62	0.38	1.67
FI38		0.71			0.37	0.63	1.28
FI39		0.88			0.59	0.41	1.08
FI40		0.93			0.74	0.26	1.06
FI42		0.64			0.66	0.34	1.12
FI4			0.79		0.72	0.28	1.02
FI5			0.88		0.81	0.19	1.02
FI6			0.71		0.61	0.39	1.04
FI12			0.51		0.54	0.46	1.74
FI17			0.58		0.62	0.38	1.44
FI21			0.67		0.56	0.44	1.34
FI10				0.77	0.72	0.28	1.13
FI11				0.79	0.71	0.29	1.02
FI13				0.68	0.80	0.20	1.01
FI16				0.43	0.56	0.44	1.18
Eigenvalue	5.13	4.25	3.54	2.58			
Contribution rate	0.21	0.17	0.14	0.10			
Cumulative contribution rate	0.21	0.38	0.52	0.62			

Note. Factor loadings from principal-axis factoring with oblimin rotation.
Loadings < .40 suppressed.

Table 3
CFA results for the Four-Factor Solution of the FIS-CFCSN (n = 219)

Item	ERS	IT	ESE	PC
7. I keep in touch with school or institution which my child attends.	0.65			
15. I will take my children for physical, speech, occupational, and other forms of rehabilitation therapy.	0.69			
25. I participate in the rehabilitation of my child.	0.79			
26. I rehabilitate my child on vacation.	0.78			
28. I participate in courses associated with rehabilitation of disabled children.	0.84			
29. I consult rehabilitation exercises for my child with physicians and specialists.	0.85			
30. I rehabilitate my child using the latest methods.	0.78			
32. I seek for equipment and people required for rehabilitation of my child.	0.78			
20. I teach my child how to accept his/her disability.		0.65		
34. I teach my child how to do housework, wash, prepare meals, do shopping, mail letters, etc.		0.71		
35. I teach my child how to translocate from place to place and how to use means of public transport.		0.71		
38. I teach my child how to use his/her free time.		0.80		
39. I teach my child how to deal with money.		0.76		
40. I teach my child how to use telephone and how to, with its help, deal with various matters.		0.73		
42. I will teach my children how to use the internet and electronic devices		0.69		
4. I will play, go for walks, engage in sports, and participate in recreational activities with my children during leisure time.			0.70	
5. I show my love to my child by telling him/her this, hugging him/her, being with him/her.			0.74	
6. I encourage my child to participate in his/her rehabilitation.			0.67	
12. I take my child for a walk.			0.74	
17. I teach my child values in which I believe and experience which I gained by myself.			0.68	
21. I praise my child if he/she deserves it.			0.68	
10. I prepare meals and participate in feeding my child.				0.75
11. I participate in dressing my child.				0.77
13. I give medicines to my child.				0.66
16. I help my child with maintenance of tidiness and order in his/her room.				0.74

Note. Educational and Rehabilitation Support (ERS); Independence Training (IT); Emotional and Social Engagement (ESE); Physical Care (PC)

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Table 4
Internal Consistency, Composite Reliability, and AVE

Factor	α	ω	CR	AVE
ERS	0.92	0.93	0.94	0.58
IT	0.89	0.90	0.88	0.52
ESE	0.87	0.88	0.86	0.49 ¹
PC	0.85	0.86	0.83	0.53

Note. AVE for ESE is marginally below 0.50, but standardized loadings exceed 0.60, supporting acceptable convergent validity in context.

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Appendix

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3 Table A

4 *Intercorrelations among FIS-CFCSN subscales in the CFA sample (n = 219)*

	ERS	IT	ESE	PC
ERS	1			
IT	0.681**	1		
ESE	0.666**	0.532**	1	
PC	0.745**	0.442**	0.581**	1

8 *Note.* Educational and Rehabilitation Support (ERS); Independence Training
 9 (IT); Emotional and Social Engagement (ESE); Physical Care (PC). ** p
 $< .01$.

Table B

Goodness-of-fit indexes for four-factor model

Scale	χ^2	df	χ^2 / df	SRMR	RMSEA	CFI	TLI
FIS-CFCSN	475.922	269	1.760	0.066	0.059	0.920	0.910

Note. SRMR, standardized root mean square residual; TLI, tucker-lewis index; CFI, comparative fit index; RMSEA, root mean square error of approximation.

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1 01 June 2026

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3 Manuscript ID 2125208

4 Response to Reviewer

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6 Dear Editor,

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8 Thank you for giving us the opportunity to submit a revised draft of our manuscript titled “Psychometric Evaluation
9 of the Father Involvement Scale Among Chinese Fathers of Children with Developmental Disabilities” for
10 publication in the *Family Relations*. We appreciate the time and effort you and the reviewer have dedicated to
11 providing valuable feedback on our manuscript and are grateful for the insightful comments and valuable
12 improvements to our paper. We have incorporated most of the reviewers’ suggestions. Those changes are
13 highlighted within the manuscript.

14

15 Please see below, in blue, for a point-by-point response to the reviewer’s comments and concerns. All page and line
16 numbers refer to the revised manuscript file with tracked changes.

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19 **Comment from the Editor**

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- 21 • **Comment 1:** *Reviewers were mixed in their assessment of your manuscript. Although they noted the*
22 *potential contribution of the study and the proposed measure, they also described numerous concerns*
23 *related to establishing a firmer rationale for the study, providing a stronger theoretical foundation and*
24 *linking theory more strongly to the construction of the measure, adequately covering previous research*
25 *and previously developed measures, clarifying and justifying methodological choices, and providing a*
26 *deeper discussion.*

27 **Response:** We have addressed all these areas systematically. The Introduction has been
28 substantially expanded to provide a richer theoretical foundation, clearer justification for the
29 choice of instruments, more comprehensive account of the existing measurement literature, and
30 explicit linkage between theoretical predictions and the expected factor structure (pp. 2-8, lines
31 34-158). The Method section now describes all five stages of the adaptation process in detail,
32 justifies all inclusion criteria, and provides citations for all statistical decision rules (pp. 8-15,
33 lines 159-295). The Discussion has been restructured to compare the identified factor structure
34 with prior cross-cultural FIS findings, ground cultural interpretations in cited evidence, and

provide concrete practitioner-level implications for each subscale (pp. 19-24, lines 372-454). The abstract has been converted to the structured format required by the journal (p. 1, lines 4-29). Each of these changes is documented in full below.

Comments from Reviewer 1

- **Comment 1:** *The introduction needs to be further developed. Important concepts are only briefly defined, and many definitions and pieces of evidence that underpin the study are not referenced.*

Response: Thank you for your comment. We have substantially expanded the Introduction. The first paragraph now provides a precise definition of father involvement drawing on Lamb and Lewis (2010), and distinguishes paternal contributions from maternal behavior with specific citations (Cabrera et al., 2014; Pruett et al., 2017) (p. 2, lines 34-43). The Introduction also directly addresses the unique demands facing fathers of children with DD (Bagner, 2013; Flippin & Crais, 2011; McBride et al., 2005) (pp. 3-4, lines 61-73). A dedicated paragraph now describes Lamb et al.'s (1987) three-component framework and Pleck's (2010) revised four-dimensional model, explaining why these frameworks have direct implications for cross-cultural measurement (pp. 2-3, lines 44-60).

- **Comment 2:** *When referencing the lack of studies in non-Western contexts, the reasons for this could be better discussed, as well as the consequences of not having studies and measurement tools in these contexts.*

Response: Thank you for your suggestion. We have added a paragraph explicitly addressing the methodological costs of measurement non-equivalence, drawing on Vandenberg and Lance (2000) (p. 5, lines 90-95). This paragraph explains that using instruments without establishing cross-cultural equivalence produces biased latent construct estimates, which distorts conclusions about the predictors and consequences of paternal involvement and compromises intervention outcome interpretation (p. 5, lines 90-103).

- **Comment 3:** *It is known that at least the Inventory of Father Involvement (Hawkins et al., 2002) has already been adopted in non-Western societies. I suggest a more thorough review of these measures.*

Response: Thank you for noticing this, we have corrected this. The revised manuscript acknowledges that the IFI has been adapted for Chinese-speaking contexts (Chuang & Fagan, 2021) (p. 4, lines 74-80), and specifies the reason the FIS rather than the IFI was selected: the

FIS was developed explicitly for fathers of children with disabilities and includes rehabilitation-specific subscales absent from the IFI (p. 4, lines 81-86).

- **Comment 4:** *Since there is more than one measure, and you choose to adapt one of them, it is important to justify the choice.*

Response: The revised Introduction now provides an explicit justification for selecting the FIS over more general fathering instruments (p. 4, lines 74-89). The FIS encompasses five subscales — Interest in the Child's Life, Care, Education and Upbringing, Rehabilitation, and Active Help in Achieving Independence — that map directly onto the disability-specific caregiving demands of the target population (p. 4, lines 81-84). This specificity is the primary basis for selection (p. 4, lines 84-86).

- **Comment 5:** *The description of the measure that will be the focus of the study is also relatively superficial. The theoretical basis and the factors evaluated are basically unknown. Details about the context in which the measure has already been used would enrich this description.*

Response: The revised Introduction now includes a dedicated paragraph describing the FIS's theoretical basis and five-subscale structure (p. 4, lines 81-85), and prior cross-cultural applications, including the four-factor solution identified by Ko et al. (2022) in South Korea, the divergent structures reported by Semešiová et al. (2024) across European samples, and further structural variability documented by Langley (2025) among fathers of children with intellectual and developmental disabilities (p. 5, lines 95-103).

- **Comment 6:** *You cite Pleck's (2010) theory, but you don't describe it. Since it guides the study's objectives, I think it is relevant to describe it better.*

Response: Pleck's (2010) revised conceptualization is now fully described in the Introduction, including his four dimensions — positive engagement characteristics, availability, responsibility, and process involvement — and his argument that these dimensions are not interchangeable and must each be captured by any adequate measurement framework (pp. 2-3, lines 49-56). This description is then explicitly connected to the cross-cultural measurement implications in the paragraph that follows (p. 3, lines 56-60).

- **Comment 7:** *In the section about the present study, there is only a detailed description of the psychometric analyses that will be performed. Mentioning the steps of cross-cultural adaptation that should precede these described steps is extremely relevant.*

Response: The Present Study section now states two primary aims: (a) to translate, culturally adapt, and establish content validity for a Chinese version of the FIS through a five-stage process including qualitative construct exploration, forward-back translation, expert review, and item revision; and (b) to evaluate the structural validity, reliability, and construct validity of the resulting structure through EFA and CFA in independently drawn subsamples (p. 8, lines 149-158).

- **Comment 8:** *Upon finishing the introduction, I do not have sufficient information to justify the proposed method, especially the sample inclusion criteria: why biological fathers? Why not mothers? Why children aged 2 to 12 years? Why children with diagnosed or suspected developmental disability?*

Response: The revised Participants section now provides explicit justification for each criterion. Biological fathers were targeted because this population carries distinct normative role expectations and experiential challenges, including internalized stigma, role renegotiation, and provider-caregiver conflict, documented in qualitative research with Hong Kong Chinese fathers (Lo, 2025; Lo et al., 2025) (pp. 9-10, lines 184-189). The 2 to 12 year age range was selected because this window encompasses the critical early intervention period through primary school entry, the phase during which paternal decisions about therapeutic participation and educational support carry the greatest developmental consequence (McBride et al., 2005) (p. 10, lines 189-193).

- **Comment 9:** *I recommend consulting the International Test Commission guidelines for test adaptation and the APA Standards for Educational and Psychological Testing. These Standards provide widely accepted guidance on how to refer to different sources of validity evidence for psychometric instruments.*

Response: AERA et al. (2014) and ITC (2017) are now cited as the guiding standards throughout the manuscript (p. 8, lines 153-158). The terminology "sources of validity evidence" replaces the broader claim of "validation," and the Present Study section explicitly states that the study provides initial evidence for structural validity rather than constituting a definitive validation (p. 8, lines 154-158).

- **Comment 10:** *A detailed description of the procedures employed in the different stages described is lacking.*

Response: The revised Procedure section now provides step-by-step descriptions of all five adaptation stages: (1) qualitative exploration with 31 fathers via Zoom using inductive thematic analysis (Braun & Clarke, 2006), identifying three underrepresented domains and informing item additions and revisions (p. 11, lines 204-210); (2) forward-back translation with research team discrepancy review (p. 11, lines 211-215); (3) expert panel review with content validity index calculation (Lynn, 1986; Polit & Beck, 2006) (p. 11, lines 216-221); (4) survey administration via Qualtrics and consent procedures (pp. 11-12, lines 222-226); and (5) statistical analysis as described in the Statistical Analysis section (pp. 13-15, lines 256-295).

- **Comment 11:** *Many of the decisions and reference values presented in the Statistical Analysis section are not appropriately cited.*

Response: All item removal thresholds, factor retention criteria, rotation choices, and fit index cutoffs are now accompanied by specific citations: Costello and Osborne (2005) for item removal criteria; Horn (1965) for parallel analysis; Tabachnick and Fidell (2019) for cross-loading thresholds; Fabrigar et al. (1999) and Revelle (2022) for principal-axis factoring (pp. 14-15, lines 266-287); Kaiser (1974) for KMO (p. 16, lines 303-306); Hu and Bentler (1999) for fit index cutoffs (p. 15, lines 282-287); McDonald (1999) for omega (p. 15, lines 288-290); and Fornell and Larcker (1981) for AVE and discriminant validity (p. 15, lines 290-295).

- **Comment 12:** *The proposed approach may ultimately result in a measure that is very different from the original — not constituting an adapted measure but, potentially, a new measure. I believe this is a necessary discussion.*

Response: We have addressed this directly in the Discussion. The use of EFA rather than CFA as the starting point is now justified in the Introduction by reference to documented structural variability in prior cross-cultural FIS applications (Ko et al., 2022; Semešiová et al., 2024; Langley, 2025) (p. 5, lines 95-103), and by the rationale that imposing the original five-factor model without prior exploration would risk misspecifying the measurement model for this population (p. 7, lines 128-134). The Discussion acknowledges that the resulting instrument constitutes a culturally adapted version whose structure reflects the Hong Kong DD context, and notes that this distinction has implications for cross-cultural comparisons (pp. 19-22, lines 372-419). The Limitations section identifies measurement invariance testing as a priority for future research precisely because this limits direct score comparisons with other FIS versions (p. 24, lines 451-454).

- **Comment 13:** *The initial description in the Results section does not refer to results — but rather to the method. The same occurs in the description of the CFA results.*

Response: The Results section now opens directly with outcomes. Item analysis results are stated concisely (all 43 items met CR and item-total correlation criteria) without re-describing the procedure (pp. 15-16, lines 296-302). The CFA subsection similarly presents results only, with procedural descriptions confined to the Statistical Analysis section (p. 18, lines 344-354; pp. 13-15, lines 256-295).

- **Comment 14:** *Discussion elements are presented in the description of results.*

Response: Cultural interpretation has been removed from the Results section entirely. The Factor Interpretation subsection now reports what the items are and how they cluster, with citations to prior literature used only for factual cross-study comparisons (e.g., Ko et al., 2022) (pp. 17-18, lines 318-342). All cultural explanatory accounts appear in the Discussion with appropriate epistemic qualifiers (pp. 20-22, lines 380-423).

- **Comment 15:** *It is not possible to state that these findings are robust and complete enough to claim that the measure is 'validated'.*

Response: The word "validated" has been replaced throughout the manuscript with "psychometrically evaluated" or "initial structural validity evidence," consistent with AERA et al. (2014) and ITC (2017) standards (p. 8, lines 154-158). The Discussion opening now reads: "The present study translated, culturally adapted, and examined the structural validity of the short version of the Father Involvement Scale" (pp. 19-20, lines 373-375).

- **Comment 16:** *Some evidence needs to be referenced in the discussion. Chinese culture is deeply affected by traditional Confucian values; the primary responsibility of Chinese fathers is to emphasise education and training for their children.*

Response: All cultural claims in the Discussion are now accompanied by specific citations (pp. 20-22, lines 380-413). The Confucian conception of paternal duty is cited to Li (2013) and Shek (2007) (p. 20, lines 381-388; pp. 20-21, lines 393-396). Relational engagement in Chinese families is cited to Cabrera et al. (2018) and Li et al. (2024) (p. 21, lines 403-408). Disability stigma and shame in Hong Kong DD families are cited to Chan and Lam (2018), Lo (2025), Lo et al. (2025), and Mak and Kwok (2010) (p. 6, lines 118-122).

- **Comment 17:** *The discussion does not compare the structure found in the present study with those identified in other cultural contexts, nor does it discuss reasons for similarities and differences.*

Response: The Discussion now explicitly compares the four-factor structure with Ko et al. (2022), noting that the convergence of Education and Rehabilitation into ERS replicates the Korean finding and may reflect a broader East Asian organization of paternal caregiving (p. 20, lines 381-392). The manuscript also notes the divergent European structures reported by Semešiová et al. (2024), supporting the context-sensitivity of the FIS factor structure (p. 5, lines 95-103; p. 22, lines 415-419).

Comments from Reviewer 2

- **Comment 1:** *The introduction does not fully articulate how these theoretical perspectives explicitly guide the adaptation or expected factor structure. How do Confucian paternal norms predict convergence of education and rehabilitation roles? Why might emotional and social engagement form a single factor in the Chinese context?*

Response: The Present Study section now articulates specific, theoretically grounded predictions. The convergence of educational and rehabilitative domains into ERS is predicted from Confucian conceptions of jiao (Li, 2013; Shek, 2007), in which these responsibilities are experienced as a unified paternal duty (p. 7, lines 137-145). The consolidation of emotional expression and shared activity into ESE is predicted from normative role restraint around direct emotional expressiveness in Chinese cultural contexts, which may lead relational and recreational behaviors to organize as an integrated form of paternal warmth rather than separate dimensions (p. 7, lines 144-145). Both predictions are stated as expectations to be tested empirically rather than as confirmed hypotheses (pp. 7-8, lines 146-148).

- **Comment 2:** *The procedure statement references 'qualitative exploration of the construct,' but no description of the qualitative methods or findings is provided. It is unclear whether this stage informed item revision.*

Response: The revised Procedure section now summarizes the qualitative phase in full: 31 biological fathers, semi-structured individual interviews via Zoom, February to September 2022, maximal variation sampling, inductive thematic analysis (Braun & Clarke, 2006) (p. 11, lines 204-207). Three caregiving domains not adequately represented in the original FIS were

identified — digital technology engagement, adventure and exploration play, and peer relationship support — directly informing the addition of three new items (FI41 to FI43) and the revision of two existing items in Step 2 (p. 11, lines 207-215; p. 13, lines 244-250).

- **Comment 3:** *Recruitment methods were not described. Without this, readers cannot evaluate sample representativeness.*

Response: Recruitment methods and period are now described in the Participants section: fathers were recruited between November 2022 and March 2023 through mainstream schools providing inclusive education, special schools, NGOs providing rehabilitation and support services, designated parent and relative resource centres, and self-help groups and community organizations (pp. 8-9, lines 161-167).

- **Comment 4:** *The high proportion of married, full-time-employed fathers may bias results; this should be acknowledged more explicitly as a limitation.*

Response: The revised manuscript now reports the high proportion of married (90.8%) and full-time employed (82%) fathers in the Participants section, making the sample composition explicit (p. 9, lines 171-173). We also added a limitation noting that this sample composition may limit generalizability to fathers with different marital, employment, residency, or caregiving circumstances (pp. 23-24, lines 448-453). The Limitations section also clarifies that the sample was drawn from Hong Kong and consisted entirely of self-identified ethnic Chinese fathers, so generalizability beyond this sample should not be assumed.

- **Comment 5:** *The manuscript states that the sample was 'randomly split' but does not provide the randomization procedure and whether demographic characteristics differed between the two subsamples.*

Response: The Statistical Analysis section now states that randomization was performed in R using a fixed seed to ensure reproducibility, and that chi-square tests and independent-samples t-tests confirmed no significant differences between the two subsamples on paternal age, education level, marital status, employment status, or child diagnosis (all $p > .05$), supporting subsample equivalence prior to analysis (pp. 13-14, lines 257-265).

- **Comment 6:** *The manuscript states that results reflect 'collectivistic orientation' or 'Confucian values,' but these claims are not empirically demonstrated within the study. Authors should explicitly acknowledge that these are theoretical interpretations, not measured constructs.*

Response: All such language has been removed from the Results section (pp. 17-18, lines 318-342). Cultural interpretation appears only in the Discussion, where it is consistently framed as a plausible interpretive account rather than an empirically demonstrated finding (pp. 20-22, lines 380-423). The ESE paragraph in the Discussion includes the explicit qualifier: "It should be noted that this interpretation is provisional; the factor structure identifies how items cluster statistically, and cultural accounts provide a plausible interpretive frame rather than a confirmed explanation" (p. 21, lines 408-410).

- **Comment 7:** *The manuscript positions Independence Training as reflecting paternal authority, discipline, and structured caregiving. However, the items appear focused on functional teaching. Clarify whether 'authority' is actually reflected in the items or is an inferred interpretation.*

Response: We have revised the IT description accordingly. The factor is now described as reflecting structured, goal-directed guidance toward self-sufficiency, with the items specifically covering daily living skills, financial management, use of public transport, and digital technology use (p. 17, lines 329-333; pp. 20-21, lines 393-402). The word "authority" has been removed from the factor description throughout the manuscript.

- **Comment 8:** *The manuscript asserts that the scale can guide interventions and policy, but lacks concrete examples. How might service providers use each subscale? What types of father-inclusive programming are suggested? What are the implications for practitioners in rehabilitation or educational settings?*

Response: The Implications section of the Discussion now provides subscale-specific practitioner examples: ERS scores for identifying fathers disengaged from the therapeutic ecosystem and guiding referrals to rehabilitation literacy programmes; IT scores for occupational therapy planning and coaching in daily living and independence skills; ESE scores for flagging limited emotional engagement and informing play-based father-child relationship programmes; and PC scores for co-parenting equity assessments and maternal caregiver burden reviews (pp. 22-23, lines 424-439). The abstract Implications heading also now reflects these concrete applications (p. 1, lines 27-29).

Thank you again for your time and consideration. We look forward to hearing from you in due time regarding our submission and to responding to any further questions and comments you may have.