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Parenting Styles and Functional Fine-Motor Performance in Children with Special Needs: A Cross-Sectional Study

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Abstract

Parenting practices may influence the development of self-care and fine-motor skills in children with special needs. This study examined the association between maternal parenting styles and functional fine-motor performance among children with special needs in Banjarmasin, Indonesia. A cross-sectional correlational study was conducted involving 34 mother–child dyads recruited from SLB Negeri Pelambuan and Pondok Terapi Autisma Anak Manis. Parenting styles were assessed using the 32-item Parenting Styles and Dimensions Questionnaire (PSDQ), covering authoritative, authoritarian, and permissive dimensions. The highest mean score determined the dominant parenting style. Functional fine-motor performance was evaluated using age-appropriate fine-motor and adaptive screening and a 16-item activities-of-daily-living checklist. Permissive parenting was the most prevalent style (70.6%), followed by authoritative (23.5%) and authoritarian parenting (5.9%). Regarding functional performance, 41.2% of children were independent, 47.1% required partial assistance, and 11.8% exhibited high dependence. No statistically significant association was found between dominant parenting style and fine-motor performance category (Fisher–Freeman–Halton exact test, $p = 0.295$; Cramér's $V = 0.27$). None of the PSDQ dimensions correlated significantly with total fine-motor performance scores ($r_s = -0.25$ to 0.28; all $p \geq 0.11$), including analyses adjusted for child age and those restricted to children with autism. Maternal parenting styles were not significantly associated with functional fine-motor performance in this sample. Larger studies using validated parenting measures and diagnostically stratified samples are needed to clarify these relationships.

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1. INTRODUCTION

Fine-motor skills are central to self-care, school participation, and the manipulation of everyday objects. Children with neurodevelopmental conditions do not form a homogeneous motor group; motor coordination, prospective motor control, sensory processing, and manual dexterity can differ substantially across diagnoses and individuals (Bremer & Cairney, 2018; Cavallo et al., 2021; Lin et al., 2024). These differences can influence functional independence in routine activities, including eating, dressing, schoolwork, and tool use (Rios & Scharoun Benson, 2020; Travers et al., 2022; Skaletski et al., 2024).

Parenting practices are another component of the child's developmental environment. Parenting style reflects recurring patterns of warmth, responsiveness, control, and discipline. The Parenting Styles and Dimensions Questionnaire (PSDQ) operationalizes authoritative, authoritarian, and permissive parenting patterns and has been used across cultural settings (Robinson et al., 1995; Oliveira et al., 2018). In families of children with autism and related developmental conditions, parenting behavior and the perceived quality of parent-child interaction may vary with parental characteristics, child behavior, and caregiving demands (Harker et al., 2016; Lin et al., 2023; Cronshaw & Midouhas, 2024; Wang et al., 2024). Conceptually, these dimensions are relevant to fine-motor development because they shape the child's everyday opportunities for practice: warmth and responsiveness may encourage a child to attempt self-care and manipulative tasks, and consistent structure may embed repeated practice in daily routines, whereas highly controlling or highly permissive patterns may either replace the child's own attempts or provide too little scaffolding for independent task completion.

Caregiver-mediated interventions can improve selected developmental outcomes, but their effects vary with the intervention model, intensity, and outcome domain (Conrad et al., 2021; Jeong et al., 2021; Drmic et al., 2024; Sandbank et al., 2023; Waddington et al., 2024). These intervention findings do not establish that naturally occurring parenting styles cause better motor outcomes in cross-sectional data. Children with greater functional difficulties may themselves elicit more directive, protective, or compensatory caregiving. Diagnostic heterogeneity is a further source of confounding. Fine-motor performance differs between children with autism, intellectual disability, ADHD, and specific motor disorders (Lin et al., 2024). Parenting styles and dimensions also vary with the child's diagnosis (Marston et al., 2022). In a mixed clinical sample, an apparent association between parenting and fine-motor performance may therefore partly reflect differences in diagnosis and developmental level rather than parenting itself.

Evidence directly linking parenting-style patterns with functional fine-motor performance remains limited, particularly in heterogeneous groups of children with special needs in Indonesia. Studies of parenting in autism and developmental disabilities have mainly examined behavioral or social outcomes, whereas studies of motor and daily living skills have rarely measured parenting (Marston et al., 2022; Lin et al., 2023; Skaletski et al., 2024). This study addresses that gap by pairing maternal PSDQ dimension scores with a task-based assessment of fine-motor independence in daily activities, conducted by the research team in the same mother-child dyads. Its contribution is therefore conceptual and methodological rather than merely geographical. It links specific parenting dimensions to observed functional performance, rather than to developmental milestones alone, while explicitly considering child age and diagnosis. Because fine-motor capacity increases with age and differs across diagnoses, we hypothesized that any association between parenting and fine-motor performance would be partly attributable to child age and primary diagnosis. The association was therefore also examined after adjustment for age and within the largest diagnostic subgroup (autism spectrum disorder). This study

examined the association between maternal parenting styles and functional fine-motor performance among children with special needs in Banjarmasin, Indonesia.

2. METHODS

A quantitative cross-sectional correlational design was used because the study aimed to describe associations at a single time point; the report follows the STROBE statement for cross-sectional studies. Data were collected in 2026, after ethical approval had been obtained, at SLB Negeri Pelambuan and Pondok Terapi Autisma Anak Manis, Banjarmasin, South Kalimantan, Indonesia. The accessible population comprised mother-child dyads in which the child was 5–13 years old and received educational or therapeutic services at one of the participating sites. Purposive sampling yielded 34 dyads with paired parenting and motor datasets. Mothers were the primary respondents for the parenting questionnaire. Records without complete paired data for the main variables were not included in the analytic sample. Dyads were therefore eligible when the child was aged 5–13 years and enrolled at one of the participating sites, the mother provided written informed consent and completed the parenting questionnaire, and the child completed the fine-motor assessment; dyads without complete paired data were excluded. With the 34 eligible dyads, the study had approximately 80% power to detect a correlation of $|r| \geq 0.46$ (two-sided $\alpha = 0.05$), so smaller associations could not be reliably detected and the analyses were regarded as exploratory.

Maternal parenting style was assessed using the Parenting Styles and Dimensions Questionnaire framework (Robinson et al., 1995; Oliveira et al., 2018; Rahmawati et al., 2022). The study instrument contained 33 printed items. One item (item 4) was excluded following the study's item-validation process, leaving 32 items for scoring. The Indonesian 32-item short form has shown adequate construct validity and internal consistency among Indonesian mothers (Cronbach's $\alpha = 0.86$, 0.76, and 0.67 for the authoritative, authoritarian, and permissive dimensions, respectively) (Rahmawati et al., 2022). In the present sample, Cronbach's α was 0.68, 0.47, and 0.18, respectively. Responses used a five-point Likert scale from 1 (never) to 5 (always). Mean scores (range 1–5) were calculated for the authoritative, authoritarian, and permissive dimensions; 10 of the 1,088 item responses (0.9%) were outside the 1–5 range because of data-entry errors and were treated as missing. These continuous dimension scores were the primary parenting variables. The dominant parenting style, a nominal variable, was defined as the dimension with the highest mean; one tie between the authoritative and permissive means was assigned to the authoritative style, and reassigning it did not change any result. Because the study used a locally administered form, the manuscript reports the scoring procedure actually used rather than assuming equivalence with every published PSDQ adaptation.

Fine-motor performance was evaluated using age-appropriate items from the Denver II fine-motor-adaptive sector and a 16-item functional activities-of-daily-living checklist. The Denver II is a developmental screening instrument that includes a fine-motor-adaptive domain and has shown excellent inter-examiner reliability and moderate-to-very-strong concurrent validity in a recent validation study; its norms, however, extend only to six years of age (Frankenburg et al., 1992; Santos et al., 2022). The 16-item checklist covered four task domains: eating and drinking, dressing and personal hygiene, school functioning, and tool manipulation or creativity. These domains reflect the broader relationship between motor ability and daily living performance reported in neurodevelopmental populations (Baker et al., 2021; Travers et al., 2022; Uljarević et al., 2023; Skaletski et al., 2024). Each checklist item was scored 0 (unable to perform or requiring full assistance), 1 (requiring partial assistance), or 2 (independent), giving a total score of 0–32 in which higher values indicate greater independence (Cronbach's $\alpha = 0.88$

in this sample); this total score was used in the correlation analyses. For descriptive reporting and the contingency analysis, total scores were classified as independent (25–32), partial assistance (12–24), or high dependence (0–11). After written informed consent was obtained, mothers completed the PSDQ and the children's fine-motor performance was assessed by the research team under the testing conditions described below.

Testing conditions were adapted to reduce avoidable distress and sensory overload. Cooperative children were assessed in a quiet learning room with sufficient space for task performance. Children who were highly active, anxious, or sensitive to environmental stimulation were assessed individually in a quieter room with a therapist present. These adaptations were intended to standardize task opportunity as far as practical without forcing participation during periods of marked dysregulation.

Descriptive statistics were used to summarize maternal and child characteristics, parenting-style distributions, and functional fine-motor categories. Because the dominant parenting style is a nominal variable, its association with the three fine-motor categories was tested with the Fisher–Freeman–Halton exact test, with Cramér's V as the effect size, and total fine-motor scores were compared across the three style groups with the Kruskal–Wallis test. To retain the multidimensional PSDQ information, Spearman rank correlations were calculated between each continuous dimension mean and the total fine-motor score. To address potential confounding, partial Spearman correlations adjusted for child age (in years) were computed, and the dimension-level analyses were repeated in the autism spectrum disorder subgroup (n = 20) as a sensitivity analysis; the other diagnostic groups were too small for separate analysis, and the sample size did not permit multivariable modeling. All variables were computed directly from the item-level data; an ordinal coding of the nominal dominant style was not used, because the result of such a correlation depends on an arbitrary category order. A two-sided p-value below 0.05 was considered statistically significant. Descriptive analyses were conducted in IBM SPSS Statistics, version 26, and the inferential analyses in Python 3 with SciPy (version 1.18); the exact test was computed by complete enumeration of all tables with the observed margins. Correlation coefficients were interpreted by magnitude and direction, while recognizing that a cross-sectional correlation does not establish causality.

Written informed consent was obtained from participating mothers before data collection. Ethical approval was granted by the Research Ethics Committee of the Suaka Insan Health Institute, approval no. 062/KEPK-SI/VI/2026. Participant confidentiality was maintained through coded research records and restricted access to study data.

3. RESULTS AND DISCUSSION

Table 1. Characteristics of mothers and children with special needs (N = 34).

Characteristic	Frequency (n)	Percentage (%)
Maternal age		
≤35 years	14	41.2
>35 years	20	58.8
Maternal education		
Primary school	1	2.9
Junior high school	6	17.6
Senior high school	11	32.4
Diploma	2	5.9
Bachelor's degree	14	41.2
Maternal employment		
Homemaker	24	70.6

Characteristic	Frequency (n)	Percentage (%)
Employed	10	29.4
Child age		
5 years	2	5.9
6–9 years	30	88.2
11–13 years	2	5.9
Primary child diagnosis		
Autism spectrum disorder	20	58.8
Speech delay/speech impairment	6	17.6
Intellectual disability	4	11.8
ADHD / hyperactivity	2	5.9
Other (microcephaly or emotional disorder)	2	5.9

Note: *Diagnoses are the primary diagnoses recorded for each child; co-occurring conditions were not analyzed.*

Table 1 shows that most mothers were older than 35 years (58.8%), 41.2% had a bachelor's degree, and 70.6% were full-time homemakers. Most children were aged 6–9 years (88.2%), and autism spectrum disorder was the most frequently recorded primary diagnosis (58.8%). The diagnostic distribution reinforces that the sample was clinically heterogeneous rather than representative of a single neurodevelopmental condition. These distributions limit interpretation in two ways. First, because 88.2% of the children were aged 6–9 years, the findings mainly describe this age band, and the few children aged 5 or 11–13 years could not be examined separately. Second, the overall estimates are weighted toward autistic children, whereas the remaining diagnostic groups (n = 2–6 each) were too small for separate inference; for this reason, the sensitivity analysis was restricted to the autism subgroup.

Table 2. Distribution of parenting styles and functional fine-motor performance (N = 34).

Variable	Frequency (n)	Percentage (%)
Parenting style (PSDQ)		
Authoritative	8	23.5
Authoritarian	2	5.9
Permissive	24	70.6
Functional fine-motor performance		
Independent	14	41.2
Partial assistance	16	47.1
High dependence	4	11.8

Table 2 shows that, when the dominant style was assigned from the highest dimension mean, permissive parenting was the most frequent pattern (70.6%), followed by authoritative (23.5%) and authoritarian parenting (5.9%). The mean (SD) dimension scores were 3.41 (0.49) for authoritative, 3.09 (0.42) for authoritarian, and 3.72 (0.53) for permissive parenting. Total fine-motor scores had a median of 22 (interquartile range 17.5–27; range 5–32); 41.2% of the children were classified as independent, 47.1% as needing partial assistance, and 11.8% as highly dependent.

Table 3. Association between maternal parenting style and functional fine-motor performance (N = 34).

Analysis	p value	Statistic/effect size	Interpretation
Dominant style × fine-motor category (Fisher–Freeman–Halton exact test)	0.295	Cramér's V = 0.27	Not significant
Total fine-motor score across dominant styles (Kruskal–Wallis test)	0.345	H(2) = 2.13	Not significant
Authoritative dimension mean vs total fine-motor score (Spearman)	0.152	r_s = −0.251	Weak negative; not significant
Authoritarian dimension mean vs total fine-motor score (Spearman)	0.110	r_s = 0.279	Weak positive; not significant
Permissive dimension mean vs total fine-motor score (Spearman)	0.734	r_s = 0.061	Negligible; not significant

As shown in Table 3, the dominant parenting style was not significantly associated with the fine-motor category, and total fine-motor scores did not differ across the three style groups. None of the PSDQ dimensions correlated significantly with the total fine-motor score; the authoritative dimension showed a weak negative and the authoritarian dimension a weak positive coefficient. The results were similar after adjustment for child age (partial r_s = −0.24, 0.30, and 0.08 for the authoritative, authoritarian, and permissive dimensions; all $p \geq 0.09$) and within the autism subgroup (n = 20; r_s = −0.29 to 0.21; all $p \geq 0.21$). Child age itself was not correlated with the total fine-motor score (r_s = −0.12, p = 0.518).

Permissive parenting was the most frequent dominant style in this sample. This classification should be interpreted cautiously: the permissive score was based on only five items with very low internal consistency (α = 0.18), and the mean authoritative score was also moderately high, so many mothers reported features of more than one style. The pattern differs from the predominance of authoritative scores reported among parents of children with developmental disabilities elsewhere, where parenting dimensions also varied by the child's diagnosis (Marston et al., 2022). Similar literature indicates that parenting style and parent-child interaction can be related to child behavioral and social functioning in families affected by autism, although associations differ across outcomes and family contexts (Harker et al., 2016; Lin et al., 2023; Wang et al., 2024). The present distribution should therefore be regarded as a description of one local sample, based on maternal self-report, rather than as evidence of a general parenting profile.

The motor findings are clinically plausible because fine-motor performance is closely tied to adaptive functioning and participation. Research in autistic and other neurodevelopmental populations has linked motor coordination and specific motor skills with daily living performance, while caregivers also identify motor limitations as barriers to participation (Bremer & Cairney, 2018; Rios & Scharoun Benson, 2020; Travers et al.,

2022; Skaletski et al., 2024). Prospective motor-control differences and diagnostic variation further indicate that children with special needs should not be treated as a motorically uniform group (Cavallo et al., 2021; Lin et al., 2024).

Several factors may explain the absence of an association. First, with 34 dyads, the study could reliably detect only correlations of about $|r| \geq 0.46$, so weaker associations cannot be excluded. Second, the low reliability of the authoritarian and permissive dimensions may have attenuated correlations and made the dominant-style classification unstable. Third, functional fine-motor performance in children with neurodevelopmental conditions may depend more on the child's diagnosis, motor coordination, and therapy exposure than on general maternal parenting style (Bremer & Cairney, 2018; Lin et al., 2024. Bidirectional processes are also possible: children with greater functional limitations may elicit more directive or protective caregiving, which could mask any benefit of supportive parenting in cross-sectional data (Cronshaw & Midouhas, 2024).

Because no association was found, these findings do not provide a basis for parenting-focused fine-motor interventions. Parent-mediated and caregiver-focused interventions have shown benefits in several developmental domains, yet systematic reviews and trials emphasize variation in effect size, implementation conditions, and outcome selection (Conrad et al., 2021; Jeong et al., 2021; Sandbank et al., 2023; Drmic et al., 2024; Waddington et al., 2024). Caregiver guidance for this population should therefore be grounded in existing intervention evidence and evaluated prospectively, rather than inferred from the present cross-sectional data.

This study has several limitations that affect the interpretation of its findings. First, the sample was small, purposively selected, and diagnostically heterogeneous, and diagnostic groups other than autism were too small for separate analysis. Second, the cross-sectional design precludes temporal or causal inference. Third, fine-motor assessment combined developmental screening items with a study-specific functional checklist; because Denver II norms extend only to six years of age, the resulting categories should not be equated with a standardized, age-normed adaptive-behavior scale. Fourth, parenting was reported by mothers only, and the dominant-style variable compresses multidimensional PSDQ information into one nominal classification. Finally, internal consistency was low for the authoritarian ($\alpha = 0.47$) and permissive ($\alpha = 0.18$) dimensions, and 10 item responses outside the scale range had to be treated as missing. Future studies should analyze continuous PSDQ subscale scores, use larger samples, more reliable parenting measures, and validated adaptive-behavior measures, adjust for diagnosis and child age, and prospectively evaluate whether caregiver coaching changes task-specific motor outcomes.

4. CONCLUSION

In this sample of 34 mother-child dyads, permissive parenting was the most frequently classified dominant style, and functional fine-motor performance was distributed mainly between independent and partial-assistance levels. Neither the dominant parenting style nor any PSDQ dimension was significantly associated with functional fine-motor performance, including after accounting for child age and within the autism subgroup. These exploratory null findings suggest that, in this heterogeneous group, children's fine-motor independence was not explained by maternal parenting style as measured by the PSDQ.

Larger and diagnostically more homogeneous cohorts, parenting measures with adequate reliability, validated adaptive-behavior scales, and longitudinal designs are required to establish whether any relationship exists before parenting-focused fine-motor

interventions are considered. Until such evidence is available, pediatric nursing, physiotherapy, and special-education services should base fine-motor support on established child-focused and caregiver-mediated intervention evidence.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Dania Relina Sitompul contributed to conceptualization, methodology, supervision, project administration, statistical analysis, interpretation, and writing of the original draft. Bernadus Sadu contributed to methodology, data validation, field coordination, and review and editing of the manuscript. Septi Machelia Champaca Nursery contributed to methodology, data curation, field assessment, and review and editing of the manuscript. All authors reviewed and approved the final manuscript.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

Generative artificial intelligence was used only to support language editing, readability, and manuscript organization. The authors reviewed all AI-assisted output and remain fully responsible for the accuracy, originality, statistical interpretation, and scientific integrity of the manuscript.

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