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Holistic-Integrative Early Childhood Education and Its Impact on Social-Emotional, Physical, and Cognitive Development: A Multi-Regional Regression Analysis

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Abstract
There is a notable gap in the literature regarding the implementation of Holistic-Integrative Early Childhood Development (PAUD HI) in Indonesia, particularly within PAUD institutions under the PESAT Foundation, which operates across multiple regions. Few studies have specifically examined the impact of PAUD HI on core dimensions of early childhood development—social-emotional, physical-motor, and cognitive—which are foundational pillars in early childhood education. This study investigates the influence of PAUD HI implementation on children's social-emotional, physical-motor, and cognitive development in PESAT Foundation-affiliated institutions. A total of 122 early childhood education teachers were selected as respondents through an online survey using Google Forms. Collected data were analyzed using SPSS version 24, employing descriptive statistics, normality tests, significance tests, regression analysis, and hypothesis testing to examine the relationships between PAUD HI practices and child development outcomes. Findings demonstrate a significant positive impact of PAUD HI on social-emotional and physical-motor development, with contributions exceeding 80%. The presence of a supportive, interactive, and cross-sectorally collaborative learning environment enriches children's learning experiences. While the influence on cognitive development is also positive, it is relatively lower, highlighting the need for more targeted and contextualized instructional strategies. This study underscores the importance of a multidisciplinary approach in PAUD HI to support children's comprehensive development. However, the quantitative design limits in-depth exploration of the contextual dynamics of PAUD HI implementation. The absence of qualitative data restricts understanding of social interactions, local challenges, and emerging best practices. Future research is recommended to adopt qualitative or mixed-methods approaches to generate more comprehensive insights into the effectiveness and challenges of PAUD HI across diverse regional contexts.

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Introduction

Holistic-Integrative Early Childhood Education (Pendidikan Anak Usia Dini Holistik Integratif – PAUD HI) is a national strategy in Indonesia that integrates services in health, nutrition, education, protection, and parenting to support optimal child development. This concept is regulated under *Peraturan Presiden Republik Indonesia Nomor 60 Tahun 2013*, which emphasizes the importance of multi-stakeholder collaboration in creating safe, healthy, and developmentally appropriate learning environments. Internationally, holistic early intervention is also a major concern. The World Health Organization (2023) estimates that 5–25% of preschool-aged children worldwide experience mild developmental disorders, particularly delays in fine motor skills. These delays can hinder cognitive, emotional, and social development if not addressed early. Studies have shown that maternal emotional intelligence and environmental motor affordances significantly influence children's early development (Valadi et al., 2022).

Research has demonstrated that motor, cognitive, and emotional domains are deeply interconnected in early childhood. According to Florit et al. (2024), motor-based interventions significantly impact cognitive and socio-emotional skills, especially when implemented outdoors. This is echoed in findings by Bird et al. (2024), who emphasize the importance of parental interaction in learning contexts, and by Ghanamah (2025), who found that motor creativity is directly related to cognitive and emotional functioning. In Indonesia, the urgency for comprehensive early interventions is supported by data from the Ministry of Health (2024), which recorded 2.4 million children diagnosed with autism spectrum disorder and 5.2 million with intellectual disabilities. These figures highlight the critical need for inclusive and holistic services for early learners. Therefore, PAUD institutions must be strengthened to address not only academic readiness but also developmental resilience.

PAUD plays a central role in building foundational competencies among young children. Within PAUD settings, physical, cognitive, and socio-emotional domains intersect in ways that shape lifelong learning and adaptation. Studies show that effective teacher–child relationships improve motor and autonomy development (Jang & Hong, 2022), and quality interactions in early years predict greater playfulness and engagement (Rüdisüli et al., 2024). Moreover, screen time and sedentary behavior have been linked to reduced creativity and motor flexibility, underscoring the need for active pedagogical approaches (Ghanamah, 2025a; Tonge et al., 2024). In this context, PAUD HI becomes a vital model to ensure that children's comprehensive needs are met through coordinated services. However, gaps in implementation continue to limit its effectiveness.

Several case studies have illustrated the practical implementation of PAUD HI across various regions in Indonesia, such as Pasaman Barat, Lombok Utara, Ruteng, and Samarinda (Abi et al., 2023; Aeni et al., 2023; Yulianti, 2023). Although these programs refer to national frameworks, their quality and consistency vary considerably. Key barriers include a lack of teacher comprehension regarding PAUD HI principles (Ambariani & Suryana, 2022), insufficient parental involvement (Yearshi et al., 2023), and minimal cross-sector collaboration in areas such as nutrition and social protection (Rupnidah et al., 2022). These findings align with international studies that emphasize parental involvement as a crucial factor in children's movement and motor learning (Cahyani et al., 2024). Without strong coordination among families, schools, and public services, achieving holistic development remains challenging.

Despite the widespread promotion of PAUD HI, most studies on its implementation are descriptive or qualitative in nature. There remains a shortage of empirical research that quantifies the effects of PAUD HI on specific child development domains. For instance, while Domínguez-Muñoz et al. (2021) demonstrated the benefits of structured physical exercise on preschoolers' cognitive and physical development, such approaches are rarely evaluated within Indonesian PAUD HI contexts. Similarly, studies on motor affordances and early play interactions are often not integrated into broader policy-oriented assessments (Barfoot et al., 2024; Li et al., 2023). This indicates a theoretical gap in understanding how integrative services contribute to developmental outcomes and a practical gap in providing empirical support for policy improvements.

Moreover, international literature offers compelling models that Indonesia can learn from. Interventions such as the I-MovE project have proven effective in stimulating movement and development through structured indoor and outdoor activities (Florit et al., 2024). Similarly, Bird et al. (2024) showed that parental verbalization during joint learning activities influences children's literacy, social behavior, and emotional regulation. Research also shows the mediating effect of teacher quality on playfulness and developmental spontaneity (Hayati et al., 2023; Rüdisüli et al., 2024), and that screen exposure can negatively impact motor and creative development (Ghanamah, 2025b). These insights reinforce the necessity of integrated, evidence-based approaches to early childhood education that are responsive to local and cultural contexts. Nonetheless, Indonesia still lacks a body of research that links PAUD HI implementation to specific developmental indicators in statistically measurable ways.

This study aims to address these research gaps by conducting a quantitative assessment of the impact of PAUD HI on early childhood development, focusing on socio-emotional, motor, and cognitive domains. The research will be carried out in PAUD institutions managed by Yayasan PESAT, which operates across various provinces in Indonesia, providing a rich and diverse sample. Through statistical analysis, this study seeks to examine the extent to which integrated services influence early developmental outcomes. Drawing on theoretical frameworks from international studies, this research aims to contribute to refining national policy and pedagogical practices. In doing so, it will bridge both theoretical and practical gaps in the literature and support Indonesia's broader educational goals for early childhood.

Methods

This study employs a descriptive quantitative approach using a multiple linear regression model to analyze the impact of the implementation of Holistic-Integrative Early Childhood Education (PAUD HI) on child development across three core domains: socio-emotional, physical-motor, and cognitive. This approach was chosen for its ability to systematically and measurably explain the relationships between independent and dependent variables (Cresswell, 2017).

The sample was determined using Slovin's formula with a margin of error of 5%, allowing for generalization of findings to a broader population. The study population consists of all PAUD teachers under the management of Yayasan PESAT, which operates across five major regions in Indonesia: Sumatra, Java, Kalimantan, Sulawesi, and Papua. The total number of PAUD teachers recorded was 173, resulting in a calculated sample of 122 respondents based on Slovin's formula. A simple random sampling technique without stratification was employed, with the inclusion criterion being a minimum of two years of teaching experience in the respective PAUD institutions.

The research instrument was a structured questionnaire developed by the researchers, based on a literature review and the service indicators outlined in *Peraturan Presiden Nomor 60 Tahun 2013* on PAUD HI. The questionnaire comprised 56 closed-ended items using a 4-point Likert scale. The distribution of items was as follows: 21 items to measure the level of PAUD HI implementation, 14 items for children's socio-emotional development, 14 items for physical-motor development, and 7 items for cognitive development.

Prior to the main study, the instrument underwent validity and reliability testing. Validity was assessed using Pearson's Product Moment correlation analysis, and all items were deemed valid, with correlation coefficients (r) exceeding the critical value at a 0.05 significance level. Reliability testing was conducted using Cronbach's Alpha, with the following results: PAUD HI implementation ($\alpha = 0.902$), socio-emotional development ($\alpha = 0.887$), physical-motor development ($\alpha = 0.873$), and cognitive development ($\alpha = 0.861$). All scores exceeded the 0.7 threshold, indicating high internal consistency across the instrument.

Data collection was conducted via Google Forms. All respondents were instructed to answer based on their real-life experiences and direct observations related to the implementation of PAUD HI services. Prior to completing the questionnaire, technical guidance was provided directly by regional coordinators from Yayasan PESAT to minimize response bias, particularly in relation to digital access and literacy levels in certain areas.

The collected data were analyzed using multiple linear regression with the assistance of SPSS version 24. The analysis aimed to examine both the simultaneous and partial effects of PAUD HI implementation on the three aspects of child development. Indicators such as the coefficient of determination (R^2), significance values (p-values), and standardized beta coefficients (β) were used to assess the strength and direction of the relationships among variables. Classical assumption tests, including normality and multicollinearity, were also conducted to ensure the validity of the regression model.

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Result

The initial step in assumption testing was descriptive analysis, which aimed to provide a general overview of the characteristics of the dataset. The table below presents the descriptive statistics for the four research variables:

Table 1. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Standard Deviation
PAUD HI Implementation	122	27.00	84.00	66.31	13.38
Socio-Emotional	122	22.00	56.00	43.70	8.91
Physical-Motor	122	19.00	56.00	44.07	8.81
Cognitive	122	8.00	28.00	20.98	4.24

The average score for PAUD HI implementation is relatively high, as are the scores for the socio-emotional and physical-motor domains. However, the mean score for cognitive development is comparatively lower than the other two domains, highlighting the need for increased focus on instructional strategies that support children's cognitive development.

The next step in assumption testing was the normality test, as presented below:

Table 2. Normality Test (Kolmogorov–Smirnov)

Asymptotic Sig.	Standard α	Distribution
0.226	0.05	Normal

The significance value of 0.226 > 0.05 indicates that the data are normally distributed. Therefore, the assumption of normality is met, validating the use of parametric analysis in this study.

Table 3. Linearity Test

Dependent Variable	Deviation from Linearity (Sig.)	Conclusion
Socio-Emotional	0.451	Linear
Physical-Motor	0.198	Linear
Cognitive	0.247	Linear

Since the significance values for all three variables are greater than 0.05, the relationships between PAUD HI implementation and each aspect of child development are linear. This confirms the appropriateness of using a linear regression model to analyze the relationships between PAUD HI implementation and various dimensions of early childhood development.

Table 4. Pearson Correlation between Variables

Variable	Socio-Emotional	Physical-Motor	Cognitive
PAUD HI	0.910**	0.887**	0.800**
Significance (1-tailed)	0.000	0.000	0.000

The Pearson correlation results indicate a strong and positive relationship between PAUD HI implementation and all three dimensions of child development. The strongest correlation is observed in the socio-emotional domain (r = 0.910). The results of the heteroscedasticity test using SPSS version 24 are illustrated in the figure below.

The results of the heteroscedasticity test, conducted using SPSS version 24, are presented in Figure 1.

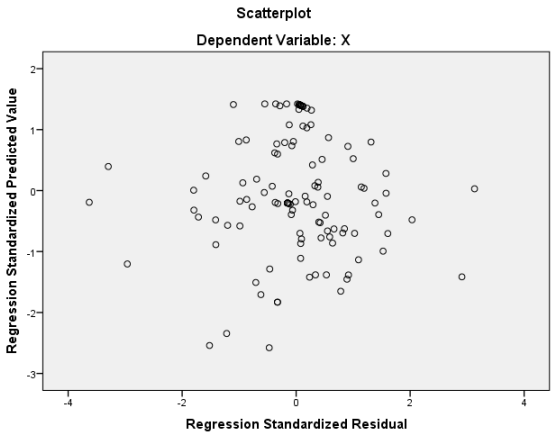

Figure 1. Heteroscedasticity Test Scatterplot

Based on the scatterplot output, the regression diagram using standardized residuals shows that the data points are randomly and evenly dispersed around the horizontal zero line, both above and below the X-axis. This pattern indicates the absence of heteroscedasticity in the regression model.

Table 5. Regression Results – PAUD HI and Socio-Emotional Development

β Coefficient	Sig.	R^2	Description
0.367	0.000	0.828	Highly Significant

This model explains 82.8% of the variability in children's socio-emotional development, indicating a significant and positive influence from PAUD HI implementation.

Table 6. Regression Results – PAUD HI and Physical-Motor Development

β Coefficient	Sig.	R^2	Description
0.347	0.000	0.786	Highly Significant

PAUD HI accounts for 78.6% of the variance in physical-motor development. This finding underscores the importance of providing stimulating facilities, such as adequate movement spaces and educational play materials.

Table 7. Regression Results – PAUD HI and Cognitive Development

β Coefficient	Sig.	R^2	Description
0.525	0.000	0.640	Highly Significant

Although the highest regression coefficient is found in the cognitive domain, the R^2 value is lower (64%), suggesting that while PAUD HI has a strong individual impact on cognitive outcomes, other factors outside the model may also significantly influence this aspect.

These findings emphasize the critical need for professional development programs that equip PAUD teachers to design and implement learning strategies that integrate all aspects of child development holistically. Teachers should be trained to develop play-based and experiential activities aimed at optimizing cognitive development. Effective strategies may include educational games, thematic projects, and exploratory activities that stimulate thinking and problem-solving.

In terms of physical-motor development, improving the quality of infrastructure—such as sufficient movement space, educational teaching aids, and safe, clean, and healthy learning environments—is essential for supporting optimal physical growth. For socio-emotional development, a strong community-based support system is needed, involving synergy among schools, families, and local communities. This collaboration can create a conducive environment for children to develop a sense of security, emotional attachment, and healthy social engagement from an early age.

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These results provide a strategic foundation for formulating more comprehensive early childhood education policies. Policymakers and stakeholders in early childhood education can use these findings to strengthen cross-sectoral integration—linking education, health, child protection, and social services. An integrated policy approach will offer more robust and sustainable systemic support for children's holistic development.

Discussion

The implementation of Holistic-Integrative Early Childhood Education (PAUD HI) demonstrates a significant contribution to the socio-emotional development of young children, as indicated by a high correlation coefficient (r = 0.910) and a coefficient of determination of 82.8%. These findings support the argument that active involvement of families, educators, and communities in an integrated educational system can create emotionally stimulating environments (Bird et al., 2024; Valadi et al., 2022). Education that emphasizes social and emotional connection provides space for children to recognize and regulate their emotions in healthy ways (Florit et al., 2024). As emphasized by Ghanamah (2025), physical activity and motor creativity are also correlated with emotional dimensions. This is reinforced by the PAIR model (Barfoot et al., 2024), which highlights the importance of sustained parent–child relationships in developing socio-emotional skills.

PAUD HI enables children to learn in real-life social contexts—such as sharing and cooperation—which form a crucial foundation for social development (Jang & Hong, 2022; Tonge et al., 2024). Previous research shows that when children are given opportunities to engage in group play, they are more likely to exhibit prosocial behaviors such as sharing and empathy (Bird et al., 2024; Rüdisüli et al., 2024). A study by Syahrul & Nurhafizah (2021) in Indonesia confirmed that children participating in PAUD HI programs are more socially active and show improved group collaboration. Furthermore, active parental participation in PAUD activities strengthens emotional stimulation for children (Cahyani et al., 2024). Consistent emotional and pedagogical support from both families and schools helps establish continuity in the caregiving process.

Implementation by Yayasan PESAT indicates that the success of PAUD HI strongly depends on the integration of basic health services, education, and spiritual development. Close collaboration between teachers and parents in the foundation serves as a key mechanism in ensuring the continuity of socio-emotional stimulation (Barfoot et al., 2024; Narea et al., 2022). In addition, learning environments enriched with social interaction through group play and the cultivation of spiritual values support the formation of stable emotional competencies (Li et al., 2023). Activities such as empathy simulations and the habitual expression of positive emotions help children develop self-regulation and communication skills (Ghanamah, 2025a; Hibana et al., 2024). These findings are consistent with Bronfenbrenner's ecological systems theory, which emphasizes the influence of microsystems and mesosystems on child development (Domínguez-Muñoz et al., 2021).

In the domain of physical-motor development, the coefficient of determination reached 88.7%, indicating a very strong influence of the PAUD HI approach. Learning environments that offer gross motor play and exploratory physical activities have been shown to effectively stimulate children's motor skills (Florit et al., 2024; Shorouk et al., 2025). Valadi et al. (2022) affirm that maternal emotional intelligence and physical engagement at home play a significant role in motor development opportunities. However, biological factors such as genetics and nutrition also remain critical (Van Tiel, 2019). This is further supported by findings from Fajzrina & Diana (2022), which show that genetic inheritance affects the pace of motor development in children.

Nevertheless, Yayasan PESAT faces challenges in providing play facilities and instructional materials derived from local environments, as noted by Mufidah & Pusvyta (Mufidah & Pusvyta, 2023). These limitations highlight the need for policy interventions to strengthen physical infrastructure and enhance teacher training in the use of the environment as a learning resource (Tonge et al., 2024). Budgetary support from the education and health sectors is essential to

expand access to child development facilities (Dinkel et al., 2021). Partnerships with the health sector can also enhance routine monitoring of children's motor development (Barfoot et al., 2024). Therefore, cross-sectoral policy integration is crucial to the success of the PAUD HI program.

By contrast, cognitive development recorded a coefficient of determination of 64.0%, indicating room for improvement. The limited variety of play-based learning methods and a lack of contextual curriculum adaptation contribute to weak cognitive stimulation (Florit et al., 2024; Domínguez-Muñoz et al., 2021). Moreover, insufficient teacher training in project-based learning approaches hinders the development of children's critical and reflective thinking skills (Ceciliani, 2021). Improvement strategies should include teacher training in the use of simple technologies, development of locally relevant teaching media, and the application of play-based methods that encourage problem-solving (Yuan et al., 2022). Such interventions have been shown to significantly support the development of children's executive functions.

Theoretically, all these findings align with Bronfenbrenner's ecological systems theory, which posits that child development is shaped by interactions among the microsystem, mesosystem, exosystem, and macrosystem. Direct relationships between children and their teachers or peers (microsystem), as well as home–school collaboration (mesosystem), contribute significantly to the success of holistic learning. The provision of health, nutrition, and cultural-spiritual values within broader systems (exosystem and macrosystem) strengthens developmental outcomes. Moreover, the chronosystem plays a key role in ensuring the long-term sustainability of such programs (Narea et al., 2022). These findings reaffirm the theoretical relevance of PAUD HI within the framework of transformative education.

Conclusion

The findings of this study confirm that the implementation of Holistic-Integrative Early Childhood Education (PAUD HI) has a highly significant impact on the socio-emotional, physical-motor, and cognitive development of young children. The coefficients of determination indicate strong contributions from PAUD HI: 82.8% for socio-emotional development, 88.7% for physical-motor development, and 64.0% for cognitive development. These results underscore the importance of a holistic approach that integrates education, health, nutrition, and child protection services in creating a conducive and stimulating learning environment.

The implementation of PAUD HI under the management of Yayasan PESAT has proven effective in supporting optimal early childhood growth. This finding reinforces the urgency of broadly adopting integrated approaches within Indonesia's early childhood education system. However, this study has several limitations. First, the use of a descriptive quantitative design and cross-sectional data limits the ability to draw causal inferences. Second, the study's focus on institutions under Yayasan PESAT restricts the generalizability of the findings to the broader PAUD context in Indonesia. Future research is recommended to employ longitudinal designs to examine the long-term effects of PAUD HI implementation on child development. In addition, incorporating qualitative approaches would provide deeper insights into the experiences of teachers, parents, and children. Experimental intervention studies may also be considered to more accurately identify the key elements of the PAUD HI approach that most significantly influence developmental outcomes.

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