

THE MONTESSORI METHOD AS A PEDAGOGICAL STRATEGY TO SUPPORT CHILDREN'S SELF-REGULATION IN EARLY CHILDHOOD EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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Keywords

[Self-regulation,
Montessori Method,
Early Childhood,
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Abstract

This study aims to examine the relationship between the Montessori method and self-regulation skills in early childhood through a Systematic Literature Review (SLR) approach. Self-regulation is an important foundation for children's psychosocial development and long-term academic success. The Montessori method, which emphasizes independence, freedom within limits, and a structured environment, is considered to have the potential to support the development of this aspect. The identification process involved 17 scientific articles published between 2015 and 2025. Inclusion criteria included empirical studies (quantitative and qualitative), a focus on early childhood, and a direct link between the Montessori approach and self-regulation. Data were collected through Google Scholar, with additional searches conducted on ScienceDirect, DergiPark, and ResearchGate to broaden the scope of relevant studies. The synthesis of findings showed that the majority of studies reported a positive relationship between Montessori implementation and improved self-regulation in children, particularly in the cognitive (executive function and attentional control) and behavioral (independence and self-discipline) dimensions. Evidence also supports a positive influence on emotional regulation, although the number of studies on this aspect remains limited. Variations in results are largely due to differences in study design, intervention duration, and implementation context. This SLR concludes that the Montessori method is an effective pedagogical approach in supporting the holistic development of self-regulation in early childhood. These findings have important implications for educators, parents, and early childhood curriculum designers to consider Montessori principles in efforts to strengthen children's self-regulation capacities from an early age.

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INTRODUCTION

Self-regulation in early childhood the ability to control emotions, attention, and behavior in accordance with situational demands serves as a crucial foundation for future social-emotional and academic development (Blair & Raver, 2015; McClelland et al., 2018). Children with strong self-regulation skills tend to be better prepared to face learning challenges, adapt to social environments, and demonstrate high levels of independence and perseverance. Conversely, difficulties with self-regulation during the preschool years are often linked to behavioral problems and academic difficulties later on (Eisenberg et al., 2019). In the context of early childhood education, pedagogical approaches are key to developing self-regulation skills. One approach that is increasingly being studied is the Montessori method, which emphasizes independent learning, freedom in choosing activities, and a structured yet flexible learning environment (Lillard, 2017). The Montessori philosophy positions the child as an active learner responsible for their own process, which is believed to foster self-control, internal discipline, and responsibility for learning choices (Montessori, 2018).

Recent research indicates that children in Montessori education demonstrate better self-regulation skills compared to those in conventional education. For example, Tiryaki et al. (2021) found that Montessori students exhibit higher levels of impulse control and concentration. Similar results were also found by Rathunde and Csikszentmihalyi (2020), who demonstrated that the Montessori environment fosters focus, self-awareness, and intrinsic motivation as key factors in the development of self-regulation. These findings reinforce the potential of the Montessori method as a pedagogical strategy that supports the development of self-regulation in young children, both globally and in Indonesia.

Although many empirical studies have examined the impact of the Montessori method on child development, there have been few systematic reviews that specifically highlight the relationship between the Montessori method and self-regulation in young children. Most studies remain descriptive or focus on cognitive, affective, and behavioral aspects in isolation (Day et al., 2022; Lillard et al., 2021). Furthermore, most studies have been conducted in Western countries, while research in the Indonesian context remains very limited in exploring the implementation of Montessori in supporting children's self-regulation (Siregar & Hartati, 2020). This gap highlights the need for a systematic literature review mapping research findings over the past 10 years (2015-2025) to provide a comprehensive overview of the effectiveness of the Montessori approach in fostering self-regulation. Through an analysis of Montessori principles such as freedom within limits, the use of concrete materials, and child-centered learning this study can enrich the literature on the relationship between self-regulated learning and early childhood education (Zimmerman & Schunk, 2011). This review is also expected to clarify the impact of Montessori on self-regulation, particularly in the aspects of cognitive, emotional, and behavioral control. Practically, the findings of this study are important for early childhood educators, curriculum developers, and education policymakers to understand pedagogical practices that support children's independence and self-

regulation. With the growing emphasis on the importance of life skills from an early age, the results of this systematic literature review can serve as a guide in designing learning experiences that foster responsibility and self-discipline through a Montessori-based approach (UNESCO, 2022).

The Montessori Method

The Montessori Method is an educational approach developed by Maria Montessori in the early 20th century that focuses on child-centered learning. This approach emphasizes the importance of independence, freedom within limits, and activities tailored to the individual child's developmental stage. In this method, the teacher acts as a facilitator who observes the child's needs and prepares a learning environment that allows the child to explore, choose, and learn through direct experience (learning by doing). Learning in the Montessori system is based on the belief that children possess a natural potential for development; thus, the learning process is guided by curiosity and intrinsic interest, rather than external coercion. The principles of freedom, internal discipline, and responsibility for chosen activities are believed to foster focus, self-control, and intrinsic motivation in young children (Lillard, 2017; Rathunde & Csikszentmihalyi, 2005).

One of the fundamental components of the Montessori method is the concept of the Prepared Environment a learning environment that is thoughtfully designed to support children's optimal development. Montessori emphasizes that a "prepared" environment must be orderly, aesthetically pleasing, accessible, and tailored to the child's size and needs. A neat, structured, and distraction-free environment helps children develop concentration, discipline, and independence through spontaneous exploration. The teacher's role is to prepare an environment that allows children to learn freely within clear boundaries (freedom within limits), ensuring that children's freedom remains within a guided framework. The study by Macià-Gual and Domingo-Peñafiel (2021) confirms that the prepared environment plays a crucial role in creating learning conditions that encourage children to focus, be independent, and actively engage with learning materials. This aligns with the findings of Astuti and Sandra (2021), which indicate that a well-prepared Montessori environment can foster independent habits, orderly behavior, and a sense of responsibility toward the environment. In the Indonesian context, Hidayatulloh (2014) adds that a learning environment that is enjoyable, aesthetically pleasing, and tailored to children's needs is a hallmark of the Montessori approach that fosters meaningful learning and the development of children's natural potential.

Self-Regulation

Self-regulation is an individual's ability to adaptively manage emotions, attention, and behavior in order to achieve specific goals. This ability plays a crucial role in the social-emotional development and learning readiness of young children. Blair and Raver (2015) describe self-regulation as the result of interactions between biological systems

and the environment that shape a child's ability to adapt to social and academic demands. Children with good self-regulation skills tend to be able to control impulses, focus their attention, and persevere in challenging learning activities, whereas children with poor self-regulation often struggle to manage their emotions, behavior, and focus.

According to Eisenberg, Spinrad, and Eggum (2010), self-regulation plays a crucial role in balancing emotional impulses with behavior that aligns with social norms. McClelland et al. (2015) add that this ability develops rapidly during the preschool years and serves as the foundation for executive functions such as planning, self-control, and problem-solving later in life.

Theoretically, self-regulation consists of three main components, namely:

1. Cognitive regulation, which relates to the ability to direct attention and control thought processes;
2. Emotional regulation, which relates to the ability to manage and express emotions adaptively; and
3. Behavioral regulation, which encompasses the ability to inhibit impulses and align actions with social rules and norms (Zimmerman & Schunk, 2011).

In an educational context, the learning environment plays a crucial role in stimulating the development of self-regulation. The Montessori approach provides a learning space that naturally supports this process through the principle of "freedom within limits" and the implementation of a "prepared environment." Children are given the opportunity to choose activities, set their own pace of work, and complete tasks without direct intervention from the teacher. An environment that is neat, orderly, and free from external distractions helps children learn to control their attention, regulate their behavior, and develop internal discipline. Rathunde and Csikszentmihalyi (2005) assert that the social atmosphere in Montessori classrooms, which fosters a sense of responsibility and self-autonomy, contributes to stronger self-regulation development compared to conventional approaches.

The empirical findings of Tiryaki et al. (2021) reinforce this view by showing that preschool children enrolled in Montessori education possess better self-regulation skills, particularly in the areas of impulse control and concentration. Through independent activities and guided freedom, the Montessori system encourages children to develop self-control and an intrinsic focus on . In line with the views of Schunk and Zimmerman (2011), learning experiences that provide autonomy and opportunities for self-reflection are key to the formation of effective self-regulation. Thus, the Montessori environment can be understood as a pedagogical context that fosters self-regulation through a balance between freedom, responsibility, and consistent structure.

Research Objectives

This systematic literature review aims to identify, evaluate, and synthesize empirical research published between 2015 and 2025 on the application of the Montessori

method in the context of early childhood education, with a focus on its impact on all aspects of children's self-regulation cognitive, affective, and behavioral.

This study also aims to identify patterns in existing findings and research gaps, as well as provide evidence-based recommendations for pedagogical practices that support children's self-regulation development in early childhood education settings. Through this study, it is hoped that a comprehensive understanding will be gained regarding how Montessori principles can be adapted as effective pedagogical strategies for fostering self-regulation in young children across various cultural contexts, including Indonesia.

METHODS

Eligibility Criteria

The eligibility criteria for this systematic review were established to ensure that only relevant and focused studies were included in the analysis. Studies included in this systematic literature review were based on the following inclusion criteria: (a) articles written in Indonesian or English to include relevant national and international sources; (b) studies that are fully and freely accessible (open access) through the specified databases, namely Google Scholar, ScienceDirect, Dergipark, and ResearchGate; (c) Publications released within the last eleven years specifically between 2015 and 2025 to ensure the literature reflects recent developments and findings in early childhood education; (d) Research discussing the Montessori method and self-regulation in early childhood or related topics, as well as studies examining the Montessori method as a strategy within the context of early childhood education and assessing its contribution to the development of aspects of children's self-regulation; (e) Research articles that use quantitative, qualitative, or mixed-methods approaches and present empirical data and research results that will be included in a comprehensive analysis.

Meanwhile, studies were excluded from this review if they did not meet the above criteria or fell into a specific category. Articles will be excluded if written in a language other than Indonesian or English, published outside the 2015–2025 timeframe, or not fully accessible (available only as an abstract). Additionally, non-scholarly publications such as books, book chapters, research reports, conference proceedings, theses, dissertations, and popular articles will not be included in the analysis. Articles that do not present empirical data for example, those that merely discuss concepts or theories without research findings as well as studies not conducted at the early childhood education level also do not meet the eligibility criteria. Thus, only peer-reviewed scientific articles that meet the inclusion criteria and do not fall under the exclusion criteria are used as sources in this systematic literature review.

Information Sources and Scholar Search Strategy

The primary database used in this systematic literature review is Google Scholar, with additional searches conducted on ScienceDirect, DergiPark, and ResearchGate to

expand the scope of relevant studies. The search was first conducted in September 2025, using a search strategy based on a combination of two main concepts: the Montessori method and self-regulation.

Keywords were first identified through an initial search using Publish or Perish, which allows users to search for articles based on citation count and year of publication. The keywords were then applied to the titles and abstracts using Boolean operators (AND, OR) to broaden the search results.

All articles found across various databases were then exported to the Rayyan AI application, an online platform specifically designed to assist with the systematic review process. This application was used to automatically remove duplicates and screen articles based on inclusion and exclusion criteria. The article selection process is detailed in the PRISMA diagram (Figure 1), which illustrates the stages of identification, screening, eligibility assessment, and the final number of studies included in this review.

Table 1. List of Keywords Based on Main Concepts

Montessori	Self-Regulation	Early Childhood
Montessori method	Self-regulation	Early childhood education
Montessori pedagogy	Emotional regulation	Preschool children
Montessori education	Behavioral regulation	Kindergarten
	Self-regulation	Early childhood education
	Children's self-control	Early childhood education

Study Selection

The search strategy that was designed was then applied to each database, and all articles found were downloaded and compiled into a single digital library using the Rayyan AI application. Duplicate articles those appearing more than once in search results across various databases were automatically removed to avoid data redundancy. Next, a double screening process was conducted on the titles and abstracts of each article. Articles deemed irrelevant by both reviewers based on their titles or abstracts were immediately removed from the list, while articles considered relevant, questionable, or lacking sufficient information were advanced to the full-text screening stage to assess their compliance with the inclusion and exclusion criteria. Articles meeting all eligibility criteria were then included in the final analysis (final inclusion), while those failing to meet the criteria were formally excluded with the reasons for exclusion documented.

The study selection process followed the PRISMA 2020 guidelines using a dual-track approach, which included a primary track involving searches of online databases such as Google Scholar, ScienceDirect, DergiPark, and ResearchGate, as well as a supplementary track involving manual searches of reference lists from relevant studies and other academic sources not indexed in the primary databases. This dual-track

approach was used to ensure the completeness and comprehensiveness of the literature search, while also enhancing the transparency of the selection process, which is then detailed in a dual-track PRISMA diagram.

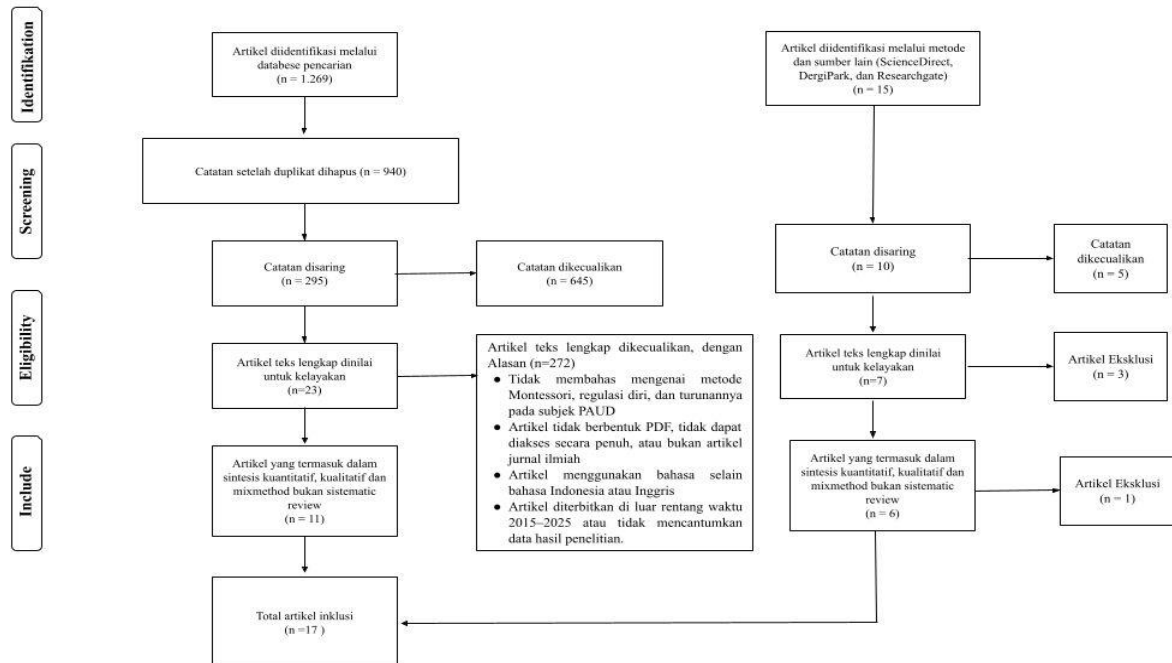


Figure 1. PRISMA flowchart depicting the study selection process.

Data Collection and Quality Assessment

Data collection was conducted by extracting structured information from each study using a standardized data extraction form, which included bibliographic details such as author information, publication year, journal, country of origin or research context, research objectives, methodological design (quantitative, qualitative, or mixed-methods), sample size and subject characteristics (age and educational level), use of Montessori intervention or approach, comparators, measurement instruments, primary outcomes (quantitative data analysis results or qualitative findings), timing of measurements, ethical considerations, and notes regarding relevance to self-regulation in early childhood.

Quality assessment was tailored to the type of study. For quantitative and experimental studies, the Cochrane Risk of Bias guide or the Newcastle–Ottawa Scale (NOS) was used, which assesses aspects such as clarity of the sample, control of variables, and reliability of results. For qualitative studies, the CASP Qualitative Checklist was used, which examines the clarity of the objectives, data collection procedures, and methods of data analysis. Meanwhile, mixed-methods studies are assessed using the MMAT (Mixed Methods Appraisal Tool), and meta-analyses are evaluated using AMSTAR-2. Each study is categorized as high, moderate, or low quality based on the assessment results across several key aspects: clarity of objectives and methods, appropriateness of the sample, reliability of measurement tools, and consistency of results. Studies rated as low quality were still included but were carefully considered when formulating conclusions to ensure the SLR results remained accurate and reliable.

RESULTS

Selected studies

An initial search using primary sources yielded a total of 1,269 articles from various online databases. After removing duplicates, 940 unique articles remained, which were then screened based on their titles and abstracts. From the screening results, 295 articles were deemed suitable for further review, while 645 articles were excluded because they were irrelevant to the topic. After conducting a feasibility assessment of the full texts, only 23 articles met the initial criteria, and of these, 11 were deemed suitable for analysis.

Through an additional method (manual searching), 5 additional articles relevant to the research topic but not indexed in the main database were obtained. Thus, the total number of articles included in the final analysis was 16, consisting of 10 main articles that formed the basis for the synthesis of results and 6 supporting articles that reinforced the interpretation of the findings.

Study Characteristics

The 17 articles reviewed in this literature review were published between 2015 and 2025 and highlight the latest trends in the field of education over the past decade regarding the use of the Montessori method as a pedagogical strategy to support children's self-regulation development in early childhood education. All of these studies used early childhood subjects at the early childhood education level, focusing on the application of the Montessori method in supporting self-regulation skills.

Generally, these studies employed quantitative experimental and comparative approaches, supplemented by several mixed-methods studies and meta-analyses that strengthened the empirical evidence. The research contexts spanned various countries, including Turkey, Spain, the United States, Europe, and Indonesia, thereby providing a cross-cultural perspective on the effectiveness of the Montessori method. The instruments used are diverse, including the Preschool Self-Regulation Assessment (PSRA), executive function tests, teacher observation sheets, and child behavior questionnaires. Most studies indicate that Montessori education, through the principles of independence, a prepared environment, sensory activities, and consistent classroom routines, positively contributes to the development of children's self-control, attention, emotional regulation, and social skills.

Overall, the characteristics of the reviewed studies confirm that the Montessori method is an effective pedagogical strategy for fostering self-regulation in young children. The distinctive features of a learning environment that supports autonomy, order, and guided freedom enable children to develop the ability to manage their emotions, attention, and behavior independently.

Table

Table 2. Synthesis of relevant information extracted from the studies included in the review

Author (Year)	Country	N	Method	Sample characteristics Age: M (SD) Gender distribution	Measure of Montessori Method or Self Regulation	Main Findings	Limitations
Azhari et al., (2024)	Indonesia	Tidak disebut angka spesifik	Kualitatif deskriptif teknik analisis Miles & Huberman	4-6 tahun di TK-IT Inam Bokhori	Observasi langsung perilaku kemandirian anak di kelas Wawancara semi-terstruktur dengan guru, wali kelas, dan kepala sekolah	Metode Montessori secara signifikan meningkatkan kemandirian anak usia dini. Enam indikator kemandirian yang meningkat: Kemampuan fisik (memakai sepatu, makan sendiri); Tanggung jawab (merapikan mainan); Percaya diri (berani menyapa orang baru); Saling berbagi; Disiplin (memahami aturan kelas); Mengendalikan emosi (berbicara sopan, mengekspresikan emosi tepat). Penerapan aktivitas Practical Life mendukung anak melakukan kegiatan sehari-hari tanpa bantuan. Faktor pendukung: lingkungan belajar terstruktur, kerja sama guru-orang tua, dan rutinitas pembelajaran. Faktor penghambat: kurangnya kesinambungan praktik Montessori di rumah.	Tidak ada data kuantitatif (non-numerik). Sampel terbatas pada satu sekolah. Generalisasi terbatas pada konteks lokal.
Courtier, P et al. (2021)	Prancis	Eksperimen 1: N = 176 (kindergarten, usia 5-6 tahun) Eksperimen 2 (longitudinal): N = 70 (PAUD usia 3-6 tahun)	Randomized Controlled Trial (RCT) – dua eksperimen (cross-sectional & longitudinal)	Eksperimen 1: rata-rata usia 5-6 tahun; kelompok Montessori publik, Montessori privat, dan konvensional Eksperimen 2: publik, gender seimbang (50% laki-laki / perempuan) Eksperimen 2: usia mulai 3 tahun dan diikuti sampai 6 tahun	Tes fungsi eksekutif (working memory, cognitive flexibility, inhibitory control), observasi perilaku sosial, dan pengukuran fidelity Montessori	Anak yang mengikuti program Montessori (baik publik maupun privat) memiliki fungsi eksekutif dan kemampuan regulasi diri yang lebih baik, khususnya pada aspek kontrol perhatian dan ketekunan dalam tugas dibandingkan anak dari sekolah konvensional. Meskipun efek paling signifikan terlihat pada aspek literasi, hasil pada fungsi eksekutif juga menunjukkan tren positif yang menegaskan hubungan antara metode Montessori dan perkembangan regulasi diri anak usia dini.	Kurikulum Montessori yang diterapkan merupakan adaptasi dari versi asli, sehingga fidelity tidak penuh. Efek fungsi eksekutif masih moderat dan tidak signifikan di semua subkomponen. Penelitian dilakukan pada anak dari latar sosial ekonomi rendah di Prancis, sehingga generalisasi perlu hati-hati. Beberapa partisipan keluar dari studi longitudinal (drop-out).
Damayanti (2020)	Indonesia	15 children	Quantitative (Pretest-posttest one group experimental design)	Anak usia 3-4 tahun Siswa Bright Star Makassar School. Tidak memiliki hambatan perkembangan	Skala Observasi Kemandirian Anak (Behavioral Checklist) berbasis skala Likert (26 item) disusun peneliti berdasarkan indikator Susanto (2017): kepercayaan diri, motivasi intrinsik, pilihan mandiri, kreativitas, tanggung jawab, adaptasi sosial, dan non-dependensi. Guide Interview untuk guru sebagai pendukung data observasi. Validitas isi diuji oleh ahli (validitas 0,326–0,825; reliabilitas 0,880).	Penerapan metode Montessori secara signifikan meningkatkan kemandirian anak ($Z = -3.409$; $p = 0.001$). Rata-rata skor meningkat dari 52,13 menjadi 94,4 (kenaikan 42,27 point). Semua anak menunjukkan peningkatan perilaku mandiri dalam berbagai aspek seperti keberanian, tanggung jawab, dan inisiatif belajar.	Ukuran sampel kecil (15 anak). Desain tanpa kelompok kontrol (one group design). Tidak meneliti efek jangka panjang.

Table 2 (continued)

Author (Year)	Country	N	Method	Sample characteristics Age: M (SD) Gender distribution	Measure of Montessori Method or Self Regulation	Main Findings	Limitations
Denangeon, A. et al. (2023)	Prancis (meta-analisis internasional)	33 studi (total N = 21.167 anak usia 3-11 tahun)	Meta-analisis – model multilevel tiga tingkat	Anak usia 3-11 tahun dari berbagai negara, gender campuran	Tes akademik, kognitif, sosial, observasi perilaku	Pendidikan Montessori menunjukkan efek positif yang kuat terhadap prestasi akademik ($g = 1.10$) dan efek sedang terhadap keterampilan sosial ($g = 0.22$). Tidak ditemukan efek signifikan terhadap kemampuan kognitif, kreativitas, atau keterampilan motorik. Hasilnya konsisten di seluruh benua dan jenjang pendidikan, menunjukkan ketahanan di seluruh metode analisis.	Variasi antarstudi tinggi; jumlah studi yang terbatas untuk beberapa domain (misalnya, kreativitas, keterampilan motorik); kemungkinan bias publikasi dan ketidakseimbangan kualitas studi antar wilayah; Hasil tidak dapat menyimpulkan arah kausal karena melibatkan studi non-acak
Danervand, S. (2019)	Switzerland	201 anak (99 Montessori, 102 tradisional)	Cross-sectional matched design (kontrol SES, usia, IQ, dan gender)	4,37-13,4 tahun: M = 9,01 (SD = 2,34) 96 perempuan, 105 laki-laki	Montessori fidelity tinggi (AMI criteria); Executive Function (Flinker task, WM Span), Creativity (EPoC test), Well-being (Feelings About School), Academic Outcomes (Reading & Math)	Anak Montessori unggul signifikan pada literasi, matematika, well-being (usia TK), dan kreativitas (baik divergen maupun convergent thinking). Tidak ada perbedaan signifikan dalam EF global, kecuali working memory sedikit lebih baik pada Montessori. Model mediasi menunjukkan kreativitas sebagai variabel kunci yang menjelaskan keunggulan akademik anak Montessori bukan executive function. Menunjukkan bahwa sistem Montessori mendorong pemikiran orisinal dan fleksibilitas kognitif intrinsik melalui kegiatan mandiri dan pilihan bebas (self-directed learning).	Sekolah Montessori bersifat privat, berpotensi selection bias. Tidak kontrol kemungkinan peran orang tua yang lebih kreatif. EF diukur berbasis komputer (tidak sesuai konteks Montessori). Desain lintas-seksi tidak menunjukkan efek kausal.
Dorell İman, E., Danışman, Ş., Akın Demircan, Z., & Yavaş, D. (2017)	Turkey	55 preschoolers (Exp. = 27; Ctrl = 28)	Mixed-method (Sequential Explanatory) – quasi-experimental pretest-posttest with control group + qualitative parent interviews	3,5-5,5 tahun, L = 62,96%, P = 37,04%	Social Competence and Behavior Evaluation (Teacher & Parent Forms; LaParriere & Dumas, 1996); Emotion Regulation Checklist (Shields & Cicchetti, 1997) – versi Turki	Montessori meningkatkan kompetensi sosial, regulasi emosi, dan perilaku positif, serta menurunkan agresivitas, keemasan, dan perilaku destruktif ($p < .005$). Hasil kualitatif: anak lebih percaya diri, disiplin diri, mandiri, dan prososial.	Ukuran sampel kecil (2 sekolah), efek guru belum dikontrol, generalisasi terbatas pada konteks Turki, dan follow-up hanya 4 minggu.

Table 2 (continued)

Author (Year)	Country	N	Method	Sample characteristics Age: M (SD) Gender distribution	Measure of Montessori Method or Self Regulation	Main Findings	Limitations
Esi, Marius-Cosel (2024)	Romania	104 (52 Montessori, 52 traditional)	Quantitative cross-sectional comparative study (survey)	Anak-anak dengan diagnosis ADHD (usia sekolah dasar, tidak disebutkan M ± SD)	Self-report questionnaire (9 items; Likert 5-point, $\alpha = 0.783$). Variabel: academic performance, classroom behavior, emotional self-regulation, self-efficacy, social interactions, global improvement, adaptation to school.	Montessori group menunjukkan peningkatan signifikan dalam performa akademik ($\beta=0.765$), perilaku kelas ($\beta=0.153$), interaksi sosial ($\beta=0.115$), dan peningkatan global ($\beta=0.172$) dibanding sistem tradisional. Namun, tidak ada perbedaan signifikan dalam emotional self-regulation ($\beta=0.007$) dan self-efficacy ($\beta=0.013$). Temuan ini mengindikasikan bahwa Montessori membantu peningkatan akademik dan sosial anak ADHD, tetapi belum cukup kuat dalam ranah regulasi emosi dan kepercayaan diri.	Data berbasis persepsi orang tua (potensi bias subjektif). Desain cross-sectional tidak menjelaskan hubungan kausal. Tidak ada kontrol terhadap faktor eksternal (terapi, SFS, dukungan rumah). Rentang usia anak tidak spesifik. Tidak menggunakan pengukuran objektif seperti observasi langsung atau tes standar.
Guerrero, S., Nùñez, M., & Corbucho, C. (2023)	Spain	90 anak prasekolah (Montessori = 45, Traditional = 45)	Kuantitatif – studi komparatif lintas-seks	Usia + 6 tahun; 48% laki-laki, 52% perempuan	Executive Function Battery (inhibitory control, working memory, cognitive flexibility)	Anak-anak Montessori memiliki kontrol diri dan memori kerja lebih baik dibandingkan anak tradisional. Lingkungan belajar yang otonom dan terstruktur mendukung fungsi eksekutif.	Ukuran sampel yang kecil membatasi generalisasi; Desain cross-sectional tidak dapat menyimpulkan kausalitas; Kurangnya informasi detail mengenai kepatuhan kelas terhadap prinsip-prinsip Montessori; Dilaksanakannya dalam satu konteks budaya (Spain).
Jacob, L., Benick, M., Dörrenbächer, S., & Parsls, F. (2020)	Germany	189 anak prasekolah (dan 30 guru)	Desain kelompok kontrol longitudinal (kuasi-eksperimental dengan pretes-postes; intervensi langsung dan tidak langsung)	M = 5,6 tahun (SD = 0,47) 49,5% ♀, 50,5% ♂	SRL Test (Jacob et al., 2019); External SRL Rating Scale (teacher-rated); Head-Toes-Knees-Shoulders (HTKS) for gSR	SRL dan gSR meningkat pada semua kelompok (autonomous, social-interactive, kontrol aktif), namun tidak ditemukan efek spesifik intervensi. Tidak ada perbedaan signifikan antara kelompok. Efek positif yang muncul lebih disebabkan faktor perkembangan alami daripada efek program.	Instrumen SRL Test memiliki reliabilitas rendah ($\alpha = .65$). Pengukuran eksternal dari guru mungkin bias. Tidak ada pengaruh spesifik intervensi; kemungkinan disebabkan keterbatasan durasi, fidelity, dan ukuran sampel guru kecil. Desain tidak menggunakan multilevel analysis meskipun data hierarkis.

Table 2 (continued)

Author (Year)	Country	N	Method	Sample characteristics: Age: M (SD) Gender distribution	Measure of Montessori Method or Self Regulation	Main Findings	Limitations
Lillard, A. S., et al., (2017)	United States (Hartford, Connecticut)	141 preschoolers (70 Montessori, 71 control)	Randomized longitudinal design (lottery-based assignment, 3-year follow-up)	M = 41.15 bulan (~3.4 tahun) pada baseline 54% laki-laki, 46% perempuan	Montessori fidelity high (AMI-recognized schools). Measures: Woodcock-Johnson III Achievement Test (academic), HTKS & NEPSY-II Design Copy (executive function), Theory of Mind Scale (Wellman & Liu), Mastery Orientation Task (Stricker & Davies), School Enjoyment Scale, Alternative Uses Task (creativity)	Montessori meningkatkan prestasi akademik, Theory of Mind, dan mastery orientation secara signifikan dibanding kontrol. Anak Montessori lebih menyukai kegiatan akademik dan menunjukkan perkembangan executive function yang lebih baik di usia 4 tahun.	Efek executive function tidak kuat di semua waktu. Ukuran sampel relatif kecil untuk generalisasi nasional.
Nusir, L., Cahyadi, S.R., Zari, N., & Helena, H. (2025)	Indonesia	19 children	Qualitative (Case study / phenomenology)	Anak-anak berusia 5-6 tahun dari taman kanak-kanak Islam	Daftar periksa observasi, wawancara guru & orang tua, dan dokumentasi kegiatan	Integrasi Montessori dengan aktivitas Islami dapat meningkatkan pengajaran diri, kemandirian, dan pengendalian emosi anak. Perilaku utama yang diamati: terlibat saat berdoa, mengikuti, merawat tanaman, dan menjaga kebersihan. Anak-anak menunjukkan peningkatan dalam kesabaran, kerja sama, dan rasa hormat terhadap orang lain. Guru bertindak sebagai fasilitator, mendorong otonomi dan tanggung jawab.	Sampel terbatas (hanya satu taman kanak-kanak). Tidak adanya validasi kuantitatif atau kelompok kontrol. Temuan spesifik konteks pada taman Montessori berbasis Islam.
Rodammer, J. (2024)	United States	13 students	Mixed-method (observational + surveys + teacher interview)	4-6 tahun (mean ±5), 8 perempuan, 5 laki-laki	Instrumen buatan peneliti: skala observasi regulasi diri selama transisi makan-tidur (1-3); survei orang tua, wawancara guru, dan survei anak	Sepuluh orang tua melaporkan peningkatan self-regulation setelah outdoor classroom diterapkan. Guru mencatat peningkatan ketahanan fisik, koordinasi, kontrol emosi, dan hubungan sosial antar anak. Anak-anak lebih tenang, sabar, dan memperhatikan orang tua (misal tidak memarahi saudara, merawat tanaman). Secara umum outdoor Montessori classroom berdampak positif terhadap regulasi diri.	Data tidak lengkap akibat kehamilan peneliti, pandemi COVID-19, dan kehilangan sebagian data observasi. Hanya satu kelas (N kecil). Banyak faktor pengganggu (rotasi staf, absensi anak, variabel eksternal). Korelasi tidak signifikan secara statistik.
Tobben, C. (2023)	Amerika Serikat (Washington State)	20 peserta (orang tua dan guru Montessori)	Mixed-method – survei kuantitatif dan wawancara kualitatif	Emotional Development Index (EDI) & Social and Emotional Learning PQA	Emotional Development Index (EDI) & Social and Emotional Learning PQA	Siswa prasekolah Montessori memperoleh skor perkembangan emosional yang lebih tinggi (M = 84,05%) dibandingkan dengan siswa prasekolah konvensional (M = 78,39%). Empat elemen utama Montessori yang diidentifikasi dapat mendorong pertumbuhan emosional adalah kemandirian individualisasi, komunitas lingkungan, resolusi konflik, dan rasa hormat.	Ukuran sampel kecil dan cakupan geografis terbatas (Negara Bagian Washington). Bus laporan diri mungkin terjadi dalam tanggapan orang tua. Partisipasi sekolah yang terbatas mengurangi representasi. Data kualitatif yang dikodekan oleh peneliti dapat menimbulkan bias subjektif.

Table 2 (continued)

Author (Year)	Country	N	Method	Sample characteristics Age: M (SD) Gender distribution	Measure of Montessori Method or Self Regulation	Main Findings	Limitations
Utmani, M., Muji & Sufri, L. T. (2024)	Indonesia	10 anak + 3 informan (kepala sekolah, guru, orang tua)	Deskriptif kualitatif (observasi, wawancara, dokumentasi)	Usia 4-5 tahun	Observasi berbasis indikator kemandirian Montessori (menyendok biji-bijian, melipat alas kerja, merapikan alat)	Montessori membentuk kemandirian dan self-discipline melalui aktivitas practical life dan prepared environment; anak lebih mandiri dan bertanggung jawab. Hambatan: false fatigue dan ketidakkonsistenan di rumah.	Sampel kecil, data kualitatif subjektif; tidak ada ukuran kuantitatif self-regulation, dan konteks lokal terbatas.
Yildirm Dogru, S. S. (2015)	United States (Hartford, Connecticut)	15 preschoolers (8 experimental, 7 control)	Quasi-experimental (pretest-posttest with control group)	Usia 4-6 tahun; proporsi gender seimbang (50% laki-laki/perempuan)	Preschool Self-Regulation Assessment (PSRA)	Anak-anak yang mengikuti pendidikan Montessori dan Reggio Emilia menunjukkan kemampuan regulasi diri lebih tinggi dibandingkan anak-anak dari sekolah tradisional dan Waldorf. Faktor lingkungan belajar yang memberi kemandirian, rutinitas, dan partisipasi aktif anak mendukung peningkatan regulasi diri.	Penelitian korelasional-komparatif sehingga tidak dapat menjelaskan gan sebab-akibat secara langsung; tidak menganalisis praktik pedagogis secara rinci; konteks penelitian terbatas di satu wilayah di Turki; sehingga membuat generalisasi
Yildirm Dogru, S. S. (2015)	Turkey	15 preschoolers (8 experimental, 7 control)	Quasi-experimental (pretest-posttest with control group)	5-6 years old, 6 Perempuan, 9 Laki-laki (7 ADHD + 8 AD only)	Frankfurter Test for Five Years – Concentration (FTT-K); intervention with Montessori sensorial materials (tactile boards, sound boxes, binomial cubes, color tablets)	Montessori training significantly improved attention scores ($\mu = 2.55$, $p < .05$). Gains maintained after 3, 5 and 7 weeks. Sensorial materials (esp. tactile & sound boxes) most effective. Supports "polarization of attention" principle.	Very small sample; no randomization; limited to ADHD/AD children; FTT-K reliability modest; no multilevel controls.
Yurteri Tiryaki et al. (2021)	Turkey	115 preschoolers (Exp. = 62, Ctrl = 53)	Experimental design (2x2 mixed pretest-posttest)	4-6 tahun; mayoritas usia 5-6 tahun (97.1%) 58% perempuan, 42% laki-laki	Preschool Self-Regulation Assessment (PSRA) versi Turki oleh Fındık & Yıldız (2014); subskala Attention/Impulse Control & Positive Emotion. Montessori diterapkan selama satu tahun ajaran penuh dengan guru tersertifikasi AMI.	Montessori secara signifikan meningkatkan Self-Regulation dan Attention/Impulse Control dibanding kontrol ($p < .05$; $p < .001$). Tidak ada efek signifikan pada Positive Emotion. Hasil mendukung bahwa lingkungan Montessori memperkuat regulasi perhatian dan perilaku, bukan regulasi emosi.	Populasi homogen (orang tua berpendidikan tinggi; satu universitas); tidak menilai fidelity implementasi Montessori; durasi relatif singkat (1 tahun); alat ukur tidak mengevaluasi regulasi emosi secara langsung; desain tidak random murni.

Key Findings

Relationships between the main variables

A review of the literature indicates that there is a positive correlation between the implementation of the Montessori method and improved self-regulation in young children. Various cross-national studies suggest that preschoolers in Montessori classrooms tend to demonstrate higher levels of self-regulation skills compared to their peers receiving conventional education (Courtier et al., 2021; Yurteri Tiryaki et al., 2021). Self-regulation manifests across several dimensions, such as cognitive aspects (related to executive function and attention focus), behavioral aspects (such as impulse control, independence, and self-discipline), and emotional aspects (including the ability to manage emotions and adapt socially) (Dereli İman et al., 2017; Lillard et al., 2021; Nusir et al., 2025). These findings align with the philosophical foundations of the Montessori approach, which emphasizes independence, guided freedom (freedom within limits), and a structured environment; these foundations form a robust pedagogical concept for fostering children's ability to regulate themselves intrinsically from an early age (Damayanti, 2020; Utsmani & Safitri, 2024).

Several studies specifically highlight improvements in cognitive regulation (such as attention and executive function) among Montessori children. According to an experimental study conducted in France by Courtier et al. (2021), children participating in Montessori programs (whether in traditional or private schools) demonstrated higher levels of attention control and task performance compared to children from traditional schools. This is supported by an RCT study conducted in Turkey by Yurteri Tiryaki et al. (2021), which showed that after one year of learning, there was a significant increase in self-regulation and impulse control scores among Montessori students, but no noticeable changes in the control group. According to the Montessori principle of attention polarization, Montessori interventions using sensory materials for children with attention deficit/hyperactivity disorder (ADHD) also significantly improve children's focus and concentration (Yıldırım Doğru, 2015). However, it should be noted that not all studies have found Montessori advantages across all components of executive function; for example, the study by Denervaud et al. (2019) in Switzerland found no significant differences in global executive function between Montessori and non-Montessori students, although Montessori children showed a slight advantage in working memory. This suggests that the Montessori approach's impact on cognitive aspects of self-regulation may vary depending on the specific indicators measured.

In addition to cognitive regulation, children's emotional and social regulation also benefit positively from the Montessori approach. A study by Dereli İman et al. (2017) in Turkey showed that children in Montessori classrooms exhibited significant improvements in emotional regulation skills as well as a reduction in aggressive, anxious, and destructive behaviors compared to children in the control group. Qualitatively, parents in the study reported that their children became more confident, self-disciplined,

independent, and prosocial after participating in the Montessori program (Dereli İman et al., 2017). These findings regarding social-emotional development are supported by other studies; Tebben (2023) found that Montessori preschool students achieved higher emotional development scores than students in conventional schools, and identified key Montessori elements (such as independence, community/environment, and conflict resolution) that contribute to children's emotional growth. Similarly, a case study in Indonesia by Nusir et al. (2025) demonstrated that integrating the Montessori method within an Islamic kindergarten context helps children better manage their emotions and behavior; children are more disciplined in daily activities (e.g., during prayer and personal care), more patient while waiting their turn, and exhibit increased cooperation and respect toward others. However, there are also certain aspects of emotional regulation that do not always show differences between educational approaches; for example, Yurteri Tiryaki et al. (2021) reported no significant differences in "positive emotions" between the Montessori group and the control group in their study. This finding suggests that the Montessori method tends to have a greater impact on children's attention and behavioral regulation than on the expression of positive emotions; therefore, the influence of Montessori on various dimensions of emotional regulation warrants further examination.

In terms of behavioral regulation and independence, the literature also highlights the significant contributions of the Montessori method. Several studies in Indonesia consistently report that the Montessori approach fosters the development of independence, self-discipline, and responsibility in young children. Various studies in Indonesia indicate that this approach is highly effective in enhancing the independence of young children. Damayanti's (2020) study found that after children engaged in Montessori-based activities, their independence scores increased significantly. For example, children aged 3–4 years showed a substantial increase in independence scores from 52.13 to 94.40. A study by Azhari et al. (2024) also found that children experienced increased independence, such as the ability to care for themselves, tidy their surroundings, interact with confidence, share, follow rules with discipline, and manage their emotions. The Practical Life activities in Montessori help children learn to perform daily tasks independently without adult assistance, which also helps them develop self-control. Research by Utsmani and Safitri (2024) also found that the structured and prepared environment in the Montessori approach encourages children to be more independent and disciplined. Children are able to manage themselves in daily activities such as scooping, folding work mats, and tidying up materials after use. Research by Rodammer (2024) shows that after Montessori-based outdoor classes were implemented, preschoolers became more independent and demonstrated better self-control. Thus, based on empirical evidence, the Montessori approach significantly contributes to fostering independent behavior in children from an early age, which is an essential component of self-regulation.

Although the overall trend in the findings strongly supports the effectiveness of the Montessori method in enhancing self-regulation in young children, some variations in the results should still be noted. Not all studies found equally strong positive effects across

every dimension of self-regulation. The study by Denervaud et al. (2019) found no significant differences in executive function, while Yurteri Tiryaki et al. (2021) found no effect on positive emotional aspects. These differences in results may be due to variations in research design, methods of measuring self-regulation, program duration, children's age, or the context of Montessori method implementation. However, the majority of studies over the past few years indicate that the Montessori method has a positive impact on the overall development of self-regulation in young children, encompassing cognitive, emotional, and behavioral aspects. These findings reinforce the role of Montessori as a potential pedagogical strategy for fostering self-regulation skills in children and provide a foundation for further discussion regarding theoretical and practical implications in the field of early childhood education.

The Relationship Between Montessori Aspects and Self-Regulation

1. The Relationship Between the Prepared Environment and Self- Regulation

A well-prepared environment is a cornerstone of Montessori education that directly influences children's self-regulation skills. A tidy, aesthetically pleasing, and distraction-free environment provides children with the space to independently direct their behavior and concentration. Research conducted by Lillard et al. (2017) shows that children who learn in a Montessori environment with a prepared environment have better abilities to control their emotions, follow rules, and complete tasks without direct guidance from the teacher. Similar findings were reported by Dereli İman et al. (2017), who confirmed that a calm and structured classroom environment helps children reduce impulsive behavior and improve self-discipline. Thus, the prepared environment significantly contributes to children's development of behavioral regulation and emotional regulation.

2. Independence and Self-Discipline

Independence is a fundamental Montessori principle closely linked to the development of self-discipline. Through the concept of "freedom within limits," children are given the opportunity to choose activities based on their interests, set their own pace of work, and take responsibility for the results they achieve. A study conducted by Mujib and Safitri (2024) in Indonesia demonstrates that practical life activities, such as organizing work materials and scooping grains, foster a sense of responsibility, perseverance, and independence in children. These findings align with the research by Azhari et al. (2024), which states that learning autonomy in Montessori encourages children to self-regulate during the learning process. This aspect is directly related to self-monitoring and goal-directed behavior, two key components within the executive function framework that form the foundation of self-regulation.

3. Sensorial Activities and Concentration (Polarization of Attention)

Sensory activities in the Montessori method, such as using tactile boards, sound boxes, and binomial cubes, help children practice focused concentration and attention. These activities promote a process known as the polarization of attention a state in which children achieve deep focus through engagement with meaningful tasks. Yıldırım Doğru (2015) found that the use of sensory materials improves children's ability to maintain focus and reduces impulsive behavior, particularly in children with attention deficit hyperactivity disorder (ADHD). This mechanism underscores that the Montessori sensory-motor approach supports cognitive regulation by strengthening the selective attention and cognitive control functions necessary for effective learning.

4. The Role of the Teacher as a Facilitator (Guided Autonomy)

In the Montessori system, teachers serve as supportive facilitators rather than dictating instructors. This approach gives children the space to develop autonomy and personal responsibility for their actions. Research by Dereli İman et al. (2017) and Rodammer (2024) indicates that the non-authoritarian teaching style employed by Montessori teachers encourages children to develop self-control and social sensitivity in their daily interactions. Teachers who act as observers and guides create supportive relationships, enabling children to reflect on their own actions and regulate their social behavior. Thus, the teacher's role as a facilitator has been shown to support the development of social regulation and self-reflection in children.

5. Social Interaction and Emotional Regulation

Montessori classrooms, which consist of children of different ages, create natural opportunities for cooperation, sharing, and helping one another. This social structure contributes to the development of children's ability to manage their emotions and build positive social relationships. Dereli İman et al. (2017) found that children in Montessori classrooms demonstrated significant improvements in prosocial behavior, emotional regulation, and self-confidence. A similar finding was reported by Eşi (2024), who noted that children with ADHD in Montessori schools exhibit better social adaptation compared to those in traditional schools. This finding underscores that social interactions within the Montessori environment support emotion regulation and strengthen the social dimension of self-regulation.

6. Connection with Nature and Strengthening Emotional Regulation

The Montessori approach, which emphasizes nature-based learning, plays a crucial role in strengthening children's emotional regulation and self-awareness. Outdoor activities provide children with opportunities for multisensory learning while fostering empathy toward the natural environment. Rodammer (2024) reports that children's participation in outdoor classroom activities enhances calmness, patience, and empathy, while reducing emotional stress. A natural environment that supports free exploration makes children more aware of their own feelings and behaviors. Thus, a connection to

nature within the Montessori context strengthens the integration of environmental awareness, self-control, and emotional balance in children.

DISCUSSION

Synthesis of Key Findings

1. Interpretation of Results

In general, the synthesis of the main findings indicates that the application of the Montessori method has a positive effect on the development of self-regulation in early childhood, in cognitive, behavioral, and emotional aspects. The Montessori approach provides a learning experience that allows children to regulate their behavior, attention, and emotions independently, without excessive reliance on teacher guidance.

In terms of cognitive function, children who follow the Montessori method demonstrate better executive function performance, which includes the ability to focus (inhibitory control), working memory, and cognitive flexibility. An experimental study by Courtier et al. (2021) also showed that Montessori children have higher attention control and task persistence compared to children from conventional schools. These findings are supported by research by Yurteri Tiryaki et al. (2021) in Turkey, which reported a significant increase in self-regulation and impulse control scores after one year of learning using the Montessori method.

From an emotional and social perspective, the Montessori method also has a significant impact. Creating a peaceful, structured, and mixed-age learning environment can encourage children to develop empathy, responsibility, and emotional regulation skills. A study by Dereli İman et al. (2017) indicates that Montessori children exhibit reduced aggressive behavior and improved emotional regulation skills. Meanwhile, a study by Tebben (2023) suggests that students with a Montessori education demonstrate higher emotional development, particularly in terms of independence, respect, and conflict resolution skills. In the Indonesian context, research by Nusir et al. (2025) also shows that the application of the Montessori method helps children become more patient, orderly, and cooperative, both in learning activities and in social and religious contexts.

In terms of behavior, the Montessori method has been shown to foster self-discipline and independence in children from an early age. Practical Life activities such as tidying up materials, scooping, folding cloths, and organizing the environment provide opportunities for children to learn responsibility and self-control naturally (Damayanti, 2020; Azhari et al., 2024; Utsmani & Safitri, 2024). The principle of “freedom within limits,” which emphasizes freedom with boundaries, helps children understand rules through direct experience rather than coercion. Overall, these findings indicate that the Montessori method is not merely an academic approach but also a pedagogical approach that lays the foundation for children’s self-regulation through independent, meaningful, and continuous learning experiences.

2. Comparison with Previous Research

These findings are consistent with previous theories and research that position the Montessori approach as one that naturally supports the development of executive function and self-regulation. Lillard et al. (2017), in a longitudinal study in the U.S., demonstrated that children from Montessori environments not only excel academically but also exhibit better self-control and social skills compared to children from conventional educational systems. This confirms that guided freedom-based learning can enhance self-regulation through intrinsic engagement and the repetition of meaningful activities.

Compared to traditional education systems that are more teacher-centered in the learning process, the Montessori method gives children an active role in controlling their own learning process. This difference explains why Montessori often yields better results in the dimensions of attention, self-discipline, and personal responsibility. Furthermore, the success of the Montessori method is also significantly influenced by the quality of the prepared environment and the teacher's role as a facilitator. Lillard (2021) and Dereli İman et al. (2017) emphasize that a quiet, well-organized learning space and a non-authoritarian teacher are key to fostering good emotional regulation and behavior in children.

However, not all studies yield equally strong results. Denervaud et al. (2019) in Switzerland, for example, found no significant differences in overall executive function, although children with a Montessori background showed a slight advantage in the working memory dimension. These variations may be attributed to differences in the duration of Montessori method implementation, children's age, cultural context, and the fidelity of method implementation. Nevertheless, the general pattern indicates that the higher the consistency in applying Montessori principles (fidelity), the greater its impact on children's self-regulation.

3. Strengths and Limitations of the Research

In terms of strengths, the reviewed studies possess strong and significant methodological rigor. Some employed experimental designs and RCTs (Courtier et al., 2021; Yurteri Tiriyaki et al., 2021), while others were longitudinal (Lillard et al., 2017) and mixed-methods (Tebben, 2023). This provides sufficiently strong and reliable empirical evidence. Furthermore, consistent results across various cultural contexts such as France, Turkey, Indonesia, and the United States indicate that Montessori principles are universal and adaptable in supporting the development of self-regulation in young children.

However, several limitations should also be noted. First, there is still variation in the degree of fidelity in the implementation of the Montessori method. Many schools adapt this method partially (e.g., only sensory or practical life activities), so the results may not reflect the full effects of an authentic Montessori system. Second, small sample sizes in some studies (e.g., Tebben, 2023; Dereli İman et al., 2017) limit the generalizability of the findings. Third, most studies still rely on teacher or parent reports (self-reports), which may contain subjective bias. Additionally, most studies focus on short-term effects, while

evidence regarding the long-term impact on self-regulation remains limited and requires further investigation.

General Synthesis Conclusion

Overall, the synthesis of key findings from various studies indicates that the Montessori method is an effective and consistent pedagogical strategy for fostering executive function, self-control, and emotional regulation in young children. The Montessori philosophy, which emphasizes a prepared environment, guided autonomy, and freedom within limits, has been proven to be empirically and theoretically relevant in shaping children who are independent, disciplined, focused, and better able to manage themselves socially and emotionally.

These findings not only reinforce the theoretical foundation of the Montessori approach as a constructivist and humanistic method but also provide practical guidance for early childhood education (ECE) in various cultural contexts to adopt learning strategies that are more child-centered and focused on fostering long-term self-regulation.

Limitations

This systematic literature review still has several limitations that need to be noted. First, there are limitations regarding the scope of data sources. Although the search was conducted through several major databases such as Google Scholar, ScienceDirect, DergiPark, and ResearchGate, not all studies related to the Montessori method that discuss self-regulation in early childhood were fully accessible, particularly paid articles or those not available via open access. This may introduce selection bias since only articles available for free were analyzed.

Second, methodological heterogeneity across studies poses a challenge to conducting a fully comparative synthesis. The studies reviewed in this literature review employed various designs, such as experiments, case studies, and meta-analyses, using different measurement instruments, such as the PSRA, BRIEF, or behavioral observation. These differences in measurement tools and self-regulation indicators can affect the consistency of results and limit the generalizability of findings.

Third, limitations regarding cultural context and the implementation of the Montessori method are also a concern. Most studies were conducted in Western countries, while studies from the Indonesian context and other developing nations remain very limited. This results in research findings that primarily reflect the effectiveness of the Montessori method within Western educational contexts, which have different resources, teacher-to-student ratios, and teacher training compared to Indonesia.

Fourth, there are still differences in the level of fidelity or authenticity of the Montessori method's implementation. Many schools adopt only some components of the overall Montessori method (for example, only Practical Life or Sensorial Activities), so the results do not always represent the full effect of an authentic Montessori system.

Additionally, some studies only examine short-term effects without considering the longitudinal impact on children's self-regulation development.

Additionally, limitations in data reporting were identified. Some articles did not include details on participant characteristics, effect sizes, or a complete description of the measurement tools used. This makes it difficult to compare studies and conduct an in-depth assessment of their quality.

Recommendations

Based on the results of this literature review, future research is recommended to expand the cultural and geographical context, particularly in Indonesia, to examine how Montessori principles can be adapted to local characteristics. Additionally, research with a longitudinal design or long-term experimental studies is needed to trace the impact of the Montessori method on children's self-regulation development over time. Measurements of self-regulation should also employ more objective and diverse approaches, such as direct observation or executive function tests, to minimize perceptual biases from teachers and parents. Future research is also crucial for assessing the degree of comprehensive implementation of the Montessori method, as many institutions adopt only certain components without applying the principles in their entirety.

Furthermore, future research is expected to delve deeper into the dimensions of emotion and intrinsic motivation, which have yet to be fully explored, as well as to develop Montessori-based interventions in digital and inclusive contexts, including for children with special needs such as ADHD. Additionally, it is important to examine the synergistic role between teachers and parents in supporting children's self-regulation development, given that the success of the Montessori method heavily depends on consistent application both at school and at home. Thus, future research is expected to provide a deeper and more contextual understanding of the Montessori method's contribution to the development of self-regulation in early childhood.

CONCLUSION

Based on the synthesis of the articles analyzed in this systematic review, it can be concluded that the Montessori method has an impact on the development of self-regulation in young children. Cross-study findings indicate that Montessori education promotes improvements in children's self-regulation skills across cognitive, behavioral, and emotional dimensions. In the cognitive dimension, children receiving Montessori education demonstrate significant improvements in executive function abilities, particularly in attention control, working memory, and impulse control. Learning focused on independent activities and a structured environment in Montessori has been shown to support children in developing focused attention and self-control in both academic and non-academic contexts. In the behavioral realm, the Montessori method has proven highly effective in fostering independence, self-discipline, and personal responsibility in children. Children in a Montessori environment exhibit more orderly behavior, are able

to make conscious decisions, and demonstrate better behavioral control compared to children in conventional settings. Furthermore, regarding emotional regulation, although the number of studies is more limited, several quantitative and qualitative studies indicate that Montessori can support the development of emotional awareness, the regulation of negative emotions, and prosocial behaviors such as empathy and cooperation. Thus, the conclusion drawn from these findings confirms that the Montessori pedagogical approach based on freedom within limits, concrete materials, and active child involvement is an effective approach for stimulating and strengthening young children's overall self-regulation skills. Montessori not only fosters academic skills but also lays a crucial foundation for children's psychosocial development.

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