

Unveiling alternative schools: A systematic review of cognitive and social-emotional development in different educational approaches

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ABSTRACT

Alternative schools such as Montessori, Reggio Emilia or Waldorf emerged on the educational scene over a century ago but have proliferated internationally in the last 15–20 years. In addition to being considered as educational alternatives to conventional approaches, these schools are often associated with enhanced benefits in cognitive, social, emotional, and personal development of attending children. This assumption stems from the fact that these approaches are aligned with the basic principles of child development, especially because in these schools, daily practices are organized according to children's developmental strengths and considering individual learning rhythms. However, empirical research on this assumption is scarce and little is known about the type of schools studied and the aspects of development analyzed. Thus, this systematic review aims to address two objectives: to identify which types of alternative schools have captured the interest of researchers and to explore the most studied areas of cognitive and socioemotional development during childhood, along with the main findings. The review includes studies conducted in the last decade that compare the effects of attending alternative schools versus conventional preschools, elementary schools, or high schools. Twenty-four articles were included, most of them focused on Montessori and, to a lesser extent, Waldorf schools. Other types of alternative schools (democratic, Freinet) had limited representation. Executive function, creativity and academic achievement have received more attention in research compared to well-being, social competence, or independence. Overall, the results show a better performance in children from alternative schools or no differences with their counterparts in conventional schools. However, this study provides a critical perspective on these findings, highlighting limitations that should be considered when interpreting them and guiding future research endeavors.

1. Introduction

The structure of the typical contemporary classroom does not differ substantially from the most widespread and commonly known version in use since the introduction of mass schooling. Most classrooms today continue to function structurally and conceptually as they did a century ago, with a teacher at the front and students as listeners; the former presents content and the latter study it at the same time and with the same material (usually a textbook), to be later assessed and graded, with the score as a criterion of the extent to which something has been learnt (Dintersmith, 2018). Since its inception, compulsory education has coexisted alongside alternative proposals, critical of the prevailing

system (Carneros & Murillo, 2017; De Coster et al., 2009). Despite always having been a minority and continuing to be so, recent decades have witnessed an increase in demand for such schools, not only in the USA (Lillard, 2019), but also in Europe (de Bilde, 2013; García, 2017; Kirkham & Kidd, 2015; Wagnon, 2021), arguably as a result of dissatisfaction with the outcomes of the mainstream education system (Ashley et al., 2005; García, 2017).

From a developmental and educational psychology perspective, this conventional school scenario, based on an adult-centric approach, is far from the basic principles on which educational contexts should be built (Diamond, 2010; Poletti, 2020). In contrast, alternative schools are grounded in an understanding of education that is allied to the evolving

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rhythms of children's development and their specific capacities (Aljabreen, 2020; Edwards, 2002; Lillard, 2012),¹ closer to a child-centered approach. It is surprising that more than a century after their origins, alternative schools (sometimes presented as "recent innovations") remain unknown to society, in general, and to many educational professionals, in particular. The phenomenon of alternative education has been the subject of little empirical research, and so our knowledge of the actual effectiveness of alternative schools in child development compared to conventional schools is still scant (Lillard, 2012; Ramos & Vandecandelaere, 2018). The aim of this systematic review is to explore the alternative schools that have been most frequently studied in recent years, the aspects of development that have been addressed when comparing children in conventional and alternative schools, and the main results.

1.1. Conventional vs alternative schools

The lack of a solid body of research in this field is partly related to an initial problem identified decades ago, namely, the difficulty of defining alternative and conventional schools (Thomas & Berk, 1981). There are as many schools as there are cultural settings or educational realities, since, given their role as a social institution, schools are totally permeable and inseparable from the social, economic and political context in which they are embedded. In order to *operationalize* and empirically compare the different styles of schools, researchers have sought to refine the basic characteristics that define them. However, the use of labels such as "open," "free," and "alternative" has served more to oppose them to mainstream school styles rather than to clearly define them (Thomas & Berk, 1981). On occasions, studies describe the characteristics of the school environments under study in a global way, but contingent on the aims and interests of the specific research, without this description being systematic or objective (Gump, 1978).

Despite these difficulties, several authors agree on certain characteristics that may define a typical conventional school (Besançon et al., 2015; Danvers, 2003; Dintersmith, 2018): 1) the central role is that of the teacher, who is physically located in front of the students; 2) the number of students in the classroom is typically large and relationships with teachers are not particularly close; 3) the content is focused on knowledge that is not very meaningful to children; 4) it is based on rules, the aim of which is to maintain calm, control and structure in the classroom; 5) autonomy and the expression of adventurous options are limited: the teacher tends to present tasks whose resolution involves a single answer that is marked as correct; 6) the activities and grading system encourage competition, rather than cooperation, between pupils.

In contrast, so-called alternative² education is an umbrella term that embraces various proposals (Díaz-Bajo, 2019; García, 2017; Wagnon, 2021), including internationally recognized systems such as Maria Montessori, as well as Waldorf, Freinet, Reggio Emilia, democratic, and active learning schools. As in conventional schools, approaches may be notably diverse, although here too authors have sought to identify key

¹ In fact, there exist links between key figures in developmental and educational psychology and some of these alternative proposals. Piaget himself had first-hand knowledge of Maria Montessori's proposals, and was director of the renovated *Maison Des Enfants* in Geneva inspired by her philosophy. There, he made observations for his first book, *Le Langage et la Pensée chez L'enfant*. Jerome Bruner (2001) was a staunch defender of the ideas of Loris Malaguzzi, founder of the schools known as Reggio Emilia.

² In some countries, such as the US, the term alternative school also refers to schools that enroll vulnerable youth whose needs are not met by the system. They attend young people facing academic failure, suspension or expulsion, school absenteeism, disruptive behaviors, or factors associated with temporary or permanent withdrawal from school, such as pregnant girls. Notice that these types of schools were not included in the current study because they have very different characteristics from the concept of alternative schools that are the scope of this review.

aspects shared by these child-centered approaches (Aljabreen, 2020; Carneros & Murillo, 2017; Carnie, 2003; Edwards, 2002; Lillard, 2018, 2019; Powers et al., 2016). These would be: 1) the role of the teacher is primarily that of a guide or companion; 2) they are small schools, with flexible schedules and structures, and empower children to participate in decision-making processes; 3) education is approached from a holistic perspective, which transcends the academic curriculum and the specific methodology implemented; 4) they prioritize respect for the children's own rhythms and motivations over the achievement of curricular objectives; 5) the child is the axis around which educational decisions are made, giving them a fully active role in their learning; 6) they understand that a fairer society can only be reached by developing children's capacities, achieving their full intellectual, creative and personal potential.

1.2. Initial assumption

The studies analyzed in this review are grounded in the assumption that the characteristics of the school setting in which children spend many hours of their lives and which nurture many of their experiences and social interactions have an impact on their sociocognitive and emotional development and the evolution of their personality. Given that practices in alternative schools are more consistent with the conceptual principles of developmental psychology and education, greater benefits in different aspects of development are expected to be found in children who attend these schools compared to those from conventional schools. Advances in neuroscience in recent decades support this hypothesis. The human brain is highly malleable and the role of what occurs during the first years of life may be crucial (Immordino-Yang & Damasio, 2007). The developmental plasticity that enables us to adapt to the demands of our environment and to learn is largely triggered and organized through socially framed, emotion-driven cognitive developmental opportunities. Consequently, high-quality social contexts and interactions represent an opportunity, but also a critical responsibility, for education (Immordino-Yang et al., 2019). School practice provides us with a unique natural context in which to explore the potential benefits attributed to these alternative, *child-centered* approaches, compared to more conventional, *adult-centered* practices that are less aligned with our knowledge of human development.

The interest in testing the relationship between alternative and mainstream settings and child development is by no means new. For example, Horowitz et al. (1979) analyzed the effect of specific alternative practices, such as the so-called open classroom, concluding that children exposed to less mainstream practices are less cognitively rigid, show a greater capacity for imagination, are more open and inclined to take the initiative. However, most of the previous studies have focused on Montessori schools (Besançon & Lubart, 2008; Demangeon et al., 2023) and conducted in the USA (Lillard, 2018; 2019), although interest has recently begun to shift to other countries (e.g., in Turkey, Kiran et al., 2021). The research by Lillard and Else-Quest (2006) was pioneering and seminal to subsequent research (Marshall, 2017). They compared preschool and elementary school children from Montessori and conventional schools in the USA, reporting evidence of benefits of the former for executive functions, social problem solving and academic achievement, results supported in the recent *meta-analysis* by Demangeon et al. (2023). Other alternative approaches, such as Waldorf schools, have received less attention. Studies are mainly concentrated in Europe, especially in Germany, where the approach was originated and is more widespread (Paul & Henning, 2020). There are also numerous Waldorf schools in England, with demand being so great that a national study was conducted to assess the extent to which this alternative approach could be incorporated into the country's mainstream curriculum (Ashley et al., 2005). This study identified benefits of these schools in learning, achievement, and students' educational and social development, although experts underlined the need to treat these findings with caution, mainly due to the lack of comparisons between Waldorf

schools and mainstream institutions.

Although this starting assumption is generally supported, this is not always the case. For example, the 6th graders at a Waldorf school in Brutsaert's study (1993, cited in de Bilde, 2013), scored lower on school engagement, were less positive towards school and were less committed to their studies than peers in conventional schools. De Bilde et al., (2013) and Lopata et al. (2005) found poorer mathematical outcomes in children at alternative schools (Waldorf and Freinet, in the first case, and Montessori, in the second) compared to those in conventional schools. In a similar line, the classic study by Dreyer and Rigler (1969) found lower levels of creativity in children in Montessori schools than in those at conventional schools.

1.3. Purpose

Considering the mixed results that characterize the study of the potential effects of alternative vs. conventional education on child development, the purpose of this review is to document the corpus of research in recent years on alternative education that has focused on comparing children attending conventional and alternative schools with regard to different aspects of child development. In contrast to previous studies conducting reviews of the efficacy of one of these alternative systems (mainly Montessori, Demangeon et al., 2023; Marshal, 2017), we extend the focus to different approaches. Specifically, our aim is to identify the alternative educational settings that have most frequently been explored along with the geographical contexts and educational stages most widely addressed. We also seek to determine the variables related to child development that have been most extensively studied, as well as the most significant results when comparing the effects of educational setting.

2. Method

The review was undertaken following the guidelines established in PRISMA 2020 (Page et al., 2021). The search strategy included consulting Web of Science, Scopus, ERIC and PsycINFO databases in March-April 2022. To locate records related to the purpose of the review, the search equation employed in each of the databases combined terms referring to conventional schooling (conventional or traditional or "other school*" or "national curriculum" or "standard-educated" or "mainstream school*" or "mainstream elementary school*") and terms associated with alternative education (montessori or waldorf or freinet or steiner or magaluzzi or "reggio emilia" or "democratic school*" or "forest school" or "nature school*" or "child centred" or "child centered" or "student centred" or "student centered" or "alternative education" or "alternative school*" or "alternative pedagog*"). To select the papers to be included, the following eligibility criteria were considered:

- Studies comparing alternative and conventional schools based on research results, excluding didactic experiences without empirical evidence or theoretical contributions.
- Studies exploring variables related to any of the main aspects of child development in school settings.
- Studies on samples with participants aged between 3 and 16 years, and populations with no learning difficulties and/or disability.
- Articles published since 2010 and in peer-reviewed journals, written in English or Spanish, languages in which the authors were fluent.

The records retrieved from the databases, once duplicates had been excluded, were examined by two of the authors to determine their relevance and potential eligibility. The title and abstract were reviewed and, if necessary, the full text. During this screening, in cases where the characteristics of the papers gave rise to discrepancies of opinion between the two researchers as regards their eligibility, the third author was consulted to clarify and reach a consensus on the decision. In a second phase, we examined the full text of the selected papers to

determine inclusion.

Fig. 1 shows the flow diagram with the results of this process. The search strategy retrieved a total of 1077 records from the databases, excluding duplicates. After the initial review, 186 articles were pre-selected for eligibility and, following an exhaustive review, 24 studies were finally included (see Table S1 in appendix A). The process followed for extracting the information was similar to that used by the authors for the organization and development of the study, with the third author being consulted to resolve any discrepancies between the two researchers that reviewed the content of the articles. Participant data, such as sample size, age and educational stage, country and alternative school model were extracted from each study included in the review. The variables examined in each study and the instruments used were also recorded, as well as the results obtained in terms of advantage, disadvantage, or lack of differences between alternative and conventional schools.

3. Results

This section summarizes the results obtained in the studies included in the review. First, we provide a general description of these studies. The results are then categorized into three major sections, focusing on sociocognitive development, emotional and personal development, and academic achievement.

3.1. General characteristics of the studies

This section describes, on the one hand, the alternative models investigated, and the educational stages and countries in which the studies were conducted (see Table 1). On the other hand, basic elements of the study methods are discussed, such as the design, sample size, data analysis and some control variables, which are of interest in this type of study (Table S1 in appendix A summarizes this information).

3.2. Alternative educational Approaches, educational stages and countries analyzed

In the 24 articles analyzed, only four alternative educational approaches were identified. The most commonly studied was the Montessori pedagogy (17), followed by Waldorf schools (8). The other two models were Freinet schools (2) and democratic schools (1). Typically, only one alternative approach was compared with the conventional school, although five studies compared two alternative approaches to the mainstream one. As regards educational stages, the studies focused on a single stage or cover different ones. Most included participants from elementary school (19), and, to a lesser extent, from preschool (10) and high school (8). Some included a sample of adults because they follow up the participants to that age and show retrospective data (Ruijs, 2017) or compared the results of children and adults (Denervaud, 2020c). Finally, most of the studies were conducted in Europe (17) and North America (6), with only one carried out in Asia. The studies in North America focused exclusively on the Montessori method; the others included Waldorf, Freinet and democratic schools.

3.3. Alternative model fidelity

In 8 of the 24 studies, no specific information was provided on how they rated the fidelity to the educational model of the alternative schools. Instead, some studies reported on the degree of fidelity to the original standards of the alternative school studied: whether the school had been accredited by recognized organizations (e.g., in the case of Montessori, the studies typically indicated whether the schools belong to the Association Montessori Internationale-AMI), whether they met the basic criteria proposed by these bodies, or whether the teachers had specific training (e.g., Denervaud et al., 2019, 2020 a & d; Elben & Nicholson, 2017; Fleming et al., 2019; Lillard et al., 2017; Mix et al.,

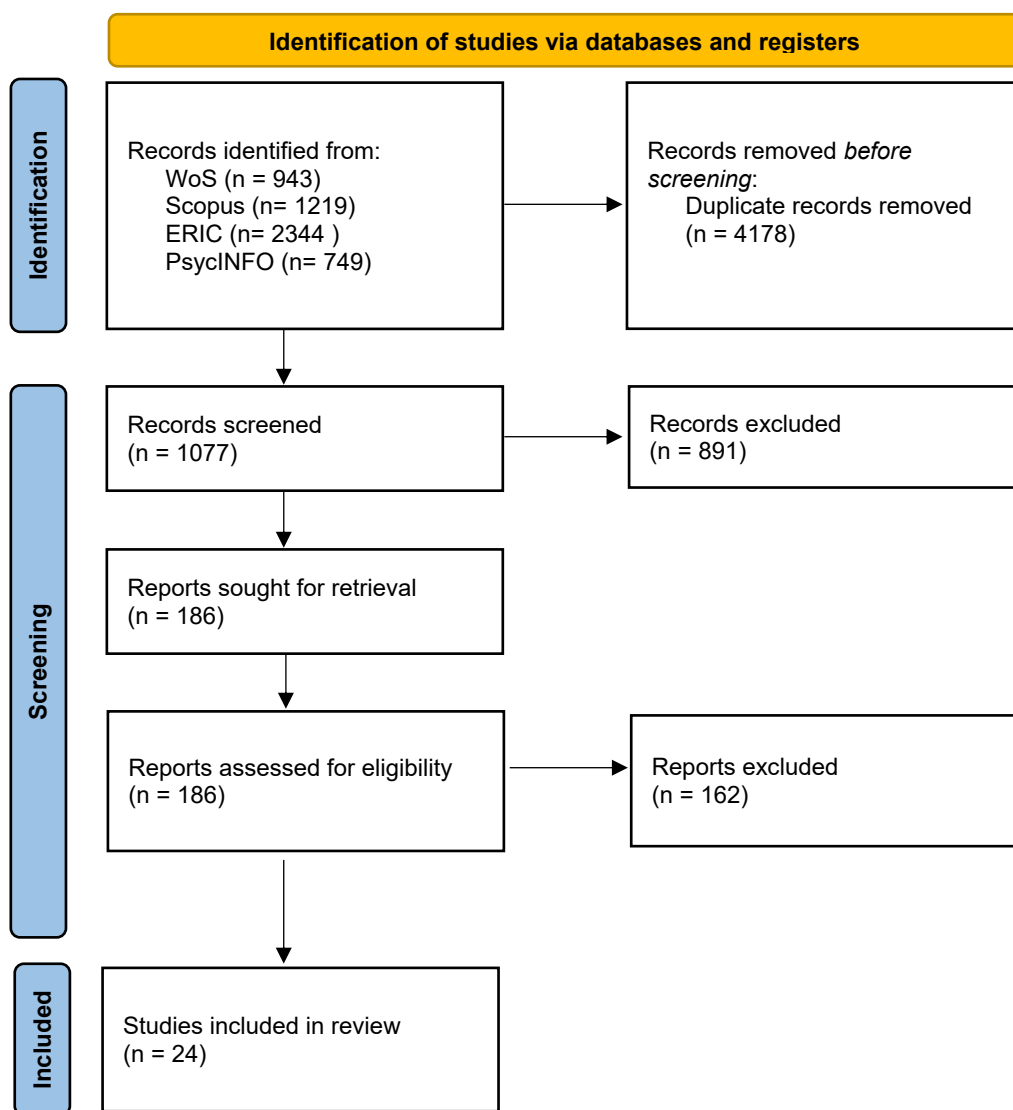


Fig. 1. PRISMA Flow Diagram.

2017; Rose & Jolly, 2019). Other studies included schools listed in the country's official network (e.g., Kirkham & Kidd, 2015, for Waldorf and Montessori schools, UK). On occasions, highly precise information was provided on specific practices implemented in the classrooms of the schools under study (e.g., Denervaud et al., 2019, 2020d; Kirkham & Kidd, 2015; Lillard, 2012), which allows the extent of their fidelity to the original proposals to be determined (for more information, see table 1 of appendix A, section "Alternative Model Fidelity").

3.4. Design, sample size and data analyses

All studies had a quasi-experimental design in which two or more educational approaches were compared. One study was retrospective as it was conducted on secondary and college students who reported on their education in previous stages in alternative or conventional schools (Ruijs, 2017). Another study also involved a qualitative approach by comparing the content of drawings of alternative and mainstream school children (Rose & Jolley, 2019).

Of the 24 studies, 14 were cross-sectional and 10 were longitudinal. The latter assessed participants several times over several years (e.g., Besançon et al., 2013; de Bilde et al., 2013; Lillard et al., 2017), at the beginning and end of the same school year (e.g., Cunningham & Carroll, 2011; Lillard, 2012), or tracked participants' academic progress using

data obtained from national educational databases (Ramos & Vandecandelaere, 2018; Ruijs, 2017).

Sample size reached more than 100 participants in 15 studies. Three studies had sample sizes above 200 participants (Denervaud et al., 2019; Denervaud et al., 2020a; Ruijs, 2017) and three around 2,000 or more participants (De Bilde et al., 2013; Dorfman & Fortus, 2019; Ramos & Vandecandelaere, 2018). In the other studies, the sample was less than 100 participants, but only in two was it less than 50 children (Denervaud et al., 2020b; Elben & Nicholson, 2017). The data were analyzed in most of the studies by descriptive statistical and variance analyses. In addition to these analyses, regressions were carried out (Denervaud et al., 2019; Dorfman & Fortus, 2019; Fleming et al., 2017; Ramos & Vandecandelaere, 2018), factor analyses (Acevedo & Carrillo, 2010; Besançon et al., 2015; Dorfman & Fortus, 2019) and hierarchical modeling (Lillard, 2012; Lillard et al., 2017; De Bilde et al., 2013). Other studies conducted network analysis (Denervaud et al., 2021) or thematic and content analysis (Rose & Jolley, 2019).

3.5. Control Variables: Socioeconomic status and cognitive development

It is worth noting that alternative schools are private in most countries and are not included as an option in state education. Participants,

Table 1
Main characteristics and results of studies included.

Study and Country	Schools	Educational Stages	Research Area	Main results
Acevedo & Carrillo (2010) Mexico	Montessori Conventional	Elementary	Emotional development: anxiety, adaptation, self-esteem	No differences between schools
Besançon et al. (2013) France	Montessori Conventional	Elementary	Sociocognitive development: creativity	Better overall performance on creative potential tasks in Montessori
Besançon et al. (2015). France	Waldorf Conventional	High school	Sociocognitive development: creativity Emotional development: motivation and well-being	No differences in creativity Higher levels of extrinsic motivation in conventional No differences in overall satisfaction with life Higher levels in satisfaction with the student environment in Waldorf
Cunningham & Carroll (2011) United Kingdom	Waldorf Conventional	Preschool Elementary	Academic achievement: language	No differences in word reading nor letter knowledge Conventional outperformed on spelling Waldorf overall lead in phonological skills
De Bilde et al. (2013) Belgium	Waldorf Freinet Conventional	Preschool Elementary	Emotional development: school enjoyment and independent participation	No differences on school engagement Waldorf and Freinet less independent
Denervaud et al. (2019) Switzerland	Montessori Conventional	Preschool Elementary	Sociocognitive development: executive function, creativity Emotional development: well-being at school Academic achievement: language and mathematics	Montessori outperformed in academic outcomes and in creativity skills Montessori higher well-being at school (preschool) No differences in EF, except working memory
Denervaud et al. (2020a) Switzerland	Montessori Conventional	Preschool Elementary High school	Sociocognitive development: error control and monitoring	Montessori paused longer post-error in early childhood and, by adolescence, were more likely to self-correct A developmental shift from longer to shorter pauses post-error being associated with self-correction happened younger in the Montessori
Denervaud et al. (2020b) Switzerland	Montessori Conventional	Elementary	Sociocognitive development: error control and monitoring	No differences in accuracy Montessori skipped fewer trials, responded faster and showed more neural activity in right parietal and frontal regions involved in math processing Conventional showed greater functional connectivity between the anterior cingulate cortex, involved in error monitoring, and hippocampus following correct trials Montessori showed greater functional connectivity between the anterior cingulate cortex and frontal regions following incorrect trials
Denervaud et al. (2020c) Switzerland	Montessori Conventional	Elementary Adulthood	Sociocognitive development: error control and monitoring	No differences in Post-Error Slowing Conventional processed correct actions as positive events Adults (not children) processed errors as negative events
Denervaud et al. (2020d) Switzerland	Montessori Conventional	Elementary	Emotional development: emotion recognition	Higher sensitivity to fear-recognition in Conventional Higher integration of social cues and perceive expressions of happiness for longer durations in Montessori
Denervaud et al. (2021) Switzerland	Montessori Conventional	Preschool Elementary High school	Sociocognitive development: creativity and semantic memory	More flexible semantic network structure and higher scores on creative thinking tests in Montessori
Dorfman & Fortus (2019) Israel	Waldorf Democratic Conventional	Elementary High school	Emotional development: self-efficacy (general and academic)	In Waldorf, the perception of what the teacher thought of personal ability was a better predictor of science self-efficacy than what the teacher explicitly said. In conventional, science self-efficacy was only predicted by what the teacher said. In democratic, none of the teachers' social persuasions was a significant predictor.
Elben & Nicholson (2017) Switzerland	Montessori Conventional	Preschool Elementary	Academic achievement: language	No differences between schools
Fleming et al. (2019) United States	Montessori Conventional	Elementary	Sociocognitive development: creativity	Higher level on the Evaluation of Potential Creativity in Montessori
Kirkham & Kidd (2015) United Kingdom	Montessori Waldorf Conventional	Elementary	Sociocognitive development: creativity, pretend play	Waldorf higher on the TCT-DP than both the Montessori and Conventional Waldorf better on the pretend actions task than the Montessori
Laski et al. (2016) United States	Montessori Conventional	Preschool Elementary	Academic achievement: mathematics	No differences in place-value understanding in second and third grades nor in addition accuracy at any grade level Advantage on correct use of base-10 canonical representation in Montessori kindergarten but not in first grade Use of different strategies in Montessori
Lillard (2012) United States	Montessori Conventional	Preschool	Sociocognitive development: executive function, Theory of Mind Emotional development: social problem solving Academic achievement: language and mathematics	Greater gains on outcome measures of executive function, reading, math, vocabulary, and social problem-solving in Classic Montessori, as compared with Supplemented Montessori and Conventional
Lillard et al. (2017) United States	Montessori Conventional	Preschool	Sociocognitive development: executive function, Theory of Mind, creativity	Montessori better on academic achievement, social understanding, and mastery orientation; and more liking of scholastic tasks; higher

(continued on next page)

Table 1 (continued)

Study and Country	Schools	Educational Stages	Research Area	Main results
			Emotional development/personality: social problem solving, mastery orientation, school enjoyment	on executive function when they were 4 years old Differences in academic achievement between lower income Montessori and higher income conventional was smaller at each time point; No differences at the end Montessori with lower executive function scored as well on academic achievement as those with higher executive function Montessori better understanding of base-10 structure
Mix et al. (2017) United States	Montessori Conventional	Preschool Elementary	Academic achievement: mathematics	
Ramos & Vandecastelaere (2018) Belgium	Freinet Conventional	Elementary	Academic achievement: progression in high education	Freinet elementary school students more likely to enroll in artistic secondary education
Rose et al. (2012) United Kingdom	Montessori Waldorf Conventional	Preschool Elementary	Sociocognitive development: creativity	Waldorf higher expressive drawing than Montessori and conventional. Stronger positive relationship between performance in expressive and representational drawing in Waldorf
Rose & Jolley (2016) United Kingdom	Waldorf Conventional	Elementary High school	Sociocognitive development: creativity	No differences in expressive drawing Waldorf higher representational drawings, larger, more scene-based free drawings and matched colors more often
Rose et al. (2019) United Kingdom	Waldorf Conventional	Elementary High school	Sociocognitive development: creativity	No differences in referring to ideas based on references from the real world or the imagination Waldorf talked more about expressive ideas
Ruijs (2017) Netherlands	Montessori Conventional	High school Adulthood	Emotional development: motivation, independence, well-being at school Academic achievement: progression in high education	No differences in academic achievement, progression in high education, independence nor motivation

therefore, typically had a medium–high or high socioeconomic status (SES). The studies mostly included some information regarding the SES of the participants (information details in Table S1 of appendix A), as well as the educational level of the parents and ethnic composition. Information was typically gathered ad hoc or using national databases, which made identify differences and even to control in the analysis (e.g., de Bilde et al., 2013; Lillard, 2012). However, some studies provided sketchy information (e.g., Dorfman & Fortus, 2019) or no information at all on these aspects (e.g., Besançon et al., 2015; Laski et al., 2016). In the countries whose national education system include both traditional and alternative schools, such as the United States or Belgium, some studies selected samples according to school admission lotteries, where children are randomly assigned to a school in the national network from among several previously chosen by the family (e.g., Lillard et al., 2017; Ruijs, 2017).

Some studies included measures related to participants' general cognitive development. Raven's Colored Progressive Matrices are frequently used to assess fluid intelligence (Denervaud et al., 2019, 2020 a, b, c & d; Denervaud et al., 2021) and, in the case of baseline differences, these were controlled for in subsequent analyses in some studies (Kirkham & Kidd, 2015). Vocabulary was also commonly assessed, using various tests, such as the British Picture Vocabulary scale (Rose & Jolley, 2019) and the Peabody Picture Vocabulary Test-4 (Cunningham & Carroll, 2011; Mix et al., 2017, study 2; Rose et al., 2016). In other cases, an initial measure of arithmetic and language achievement was implemented (de Bilde, 2013). Regarding the time that participants have been attending the type of school, despite no study including it as an analysis variable, some reported when the participants started at the school analyzed (Denervaud et al., 2019; Elben & Nicholson, 2017; Laski et al., 2016) or the minimum mean time enrolled at the school (Denervaud et al., 2020d; Kirkham & Kidd, 2015). In some case, participants that fail to meet a specific criterion were excluded (e.g., Ramos & Vandecastelaere (2019) do not include those not who completed their entire elementary education in the same type of school: Freinet or conventional).

3.6. Variables explored and main results

This section is structured around three large blocks, into which the variables analyzed in the studies can be grouped: sociocognitive

development, emotional and personal development, and academic achievement. Table 1 summarizes the main results of each study.

3.7. Sociocognitive development

Executive Function (EF). EF, understood as the cognitive ability that allows individuals to control thoughts and behaviors in pursuit of goals (Diamond & Taylor, 1996), include basic cognitive processes such as attentional control, cognitive inhibition, inhibitory control, working memory and cognitive flexibility. They improve dramatically in early childhood (Carlson, 2005; Doebel & Zelazo, 2015). Only the studies conducted in Montessori schools explored EF (Denervaud et al., 2019, 2020 a b & c; Lillard et al., 2012 and 2017). The results varied from reporting no differences to higher performance in preschool and elementary children from Montessori versus conventional schools. This disparity was found even in studies using the same test to assess EF. For example, when using the Head-Toes-Knees-Shoulders task, Lillard et al. (2012) identified an advantage in Montessori preschoolers over those in the control schools, but which was not found in Lillard et al., (2017). It was of note that in the latter, longitudinal study, the type of school was found to be a key factor when exploring the extent to which the initial level of EF predicted future academic achievement. While, in the conventional group, the expected positive association between these two variables was found, in the Montessori group, a low initial level of EF was not maintained in the long term. The authors thus concluded that the type of curriculum compensated for these baseline differences by enhancing performance, especially in those starting with less sophisticated executive functioning. The overall results on EF are so complex that even a study where more than one test is used to assess EF, differences are found to be attributable to the school setting in some, but not in others. Denervaud et al. (2019) measured EF in preschoolers and elementary school children, with the Montessori school children performing better than their conventional school peers in the former, but with no differences reported in the latter.

Three studies compared Montessori and conventional schools with respect to error monitoring and control, aspects that are closely related to EF (Denervaud et al., 2020 a, b & c). They examined what happens immediately after an error is detected, using tasks such as Flanker Fish (Denervaud et al., 2020a) or similar ("Go/no Go task", Denervaud et al., 2020c), or when erroneous responses were proposed in standardized

mathematical tasks (Denervaud, 2020b). The focus was on analyzing the length of participants' pauses and the ability to adapt their behavior and correct the error (Denervaud et al., 2020, a&c), the brain regions that are activated (Denervaud et al., 2020b) and whether the error was valued positively or negatively (Denervaud et al., 2020c). The trend of the results was quite clear: although the number of correct and incorrect answers were similar in both schools, the Montessori children's performance in dealing with the errors and processing them was more sophisticated. Specifically, with respect to self-correction, Montessori children aged under 9 (Denervaud et al., 2020a) showed an earlier maturation of the capacity to detect response errors compared to their peers in the conventional school. The post-error pause in the younger Montessori children was the same length as that of adolescents, which corresponds to a typical adult pattern, while children in the conventional school, however, paused much less than the adolescents, which is consistent with the expected developmental pattern. Additionally, in the Montessori school, especially in high school, the participants were more likely to self-correct than their counterparts in conventional school (Denervaud et al., 2020a). Furthermore, the Montessori children (8–12 years old, Denervaud et al., 2020c) did not interpret their correct answers positively, as occurred in the conventional school. Finally, when exploring brain activity, the Montessori group showed greater activity in frontal and parietal regions (areas involved in visual and mathematical processing and in regions related to attention and executive control), compared to greater hippocampal (memory) activity in the children in the conventional school (Denervaud et al., 2020b).

3.7.1. Social cognition and competence

Theory of Mind (ToM) was analyzed in two studies conducted exclusively in Montessori schools. Lillard (2012) and Lillard et al. (2017) found no differences between children attending Montessori school (either classic or supplemented) and conventional one. Nonetheless, in children attending Montessori school, this ability was found to develop faster compared to their peers in mainstream schools (Lillard et al., 2017). Social competence was also assessed with mixed results. Lillard (2012) found that, after one year attending the same class, the problem-solving strategies of children from classic Montessori schools were more sophisticated (fairness-focused and considering the interests of the other) than those of their peers from supplemented Montessori or conventional schools. In contrast, Lillard et al. (2017) reported no differences.

3.7.2. Creativity

The reviewed studies draw on the assumption that children's creative abilities are nurtured by the educational setting in which they develop; and for them to be sophisticated, the environment (mainly the classroom and materials), the educational program and the teachers must be creative (Mellou, 1996). Most studies compared conventional schools with Montessori ones (Besançon et al., 2013; Denervaud et al., 2019; Denervaud et al., 2021; Fleming et al., 2019; Kirkham & Kidd, 2015; Lillard et al., 2017). Only one compared conventional schools with Waldorf (Besançon et al., 2015), while another addresses all three school types (Kirkham & Kidd, 2015).

In the comparison of preschool and elementary school children in Montessori and conventional schools, the general trend of the findings was that the former show higher levels in the creative domain (Denervaud et al., 2019; Denervaud et al., 2021; Fleming et al., 2019), when assessing levels of both divergent and convergent thinking, as well as when administering more traditional tools, such as the Torrance TCTT (Besançon et al., 2013). The study by Lillard et al. (2017) bucked this trend in the results: it found no differences between preschoolers in Montessori and conventional schools when proposing different, unconventional uses for familiar objects. The results obtained in Waldorf schools with this type of standardized test were mixed. Although in the study by Kirkham and Kidd (2015), the elementary school children scored better compared to their counterparts in conventional and

Montessori schools (with no differences between them), Besançon et al. (2015) found that, on reaching adolescence, participants in Waldorf and conventional schools exhibited similar levels of graphic and verbal-literary skills.

3.7.3. Expressive and representational drawing

As a skill closely related to creativity, children's drawing has also been the focus of attention in a number of studies, with key, systematic differences being found between children from alternative and conventional schools, especially in the early stages. Rose et al. (2012) analyzed expressive and representational drawing in elementary school children (aged 5–9 years) from Waldorf, Montessori, and conventional schools. The children from the Waldorf school exhibited significantly better levels of expressive drawing: they addressed a greater variety of subjects and produced higher quality drawings than their Montessori and conventional peers. As regards representational drawing, although the children attending the Waldorf school were also found to perform better, the differences between the three groups disappeared at older ages. Two subsequent studies compared only Waldorf school children with conventional ones. In the first study, Rose and Jolley (2016) reported differences in representational drawings (not expressive ones) with the children from the Waldorf school performing better, using and combining more colors, and producing larger and more scene-based free drawings. The second study, Rose et al., (2019), explored the origin of creative intentions and ideas in the drawings of elementary and high school children (6–16 years). The results showed no difference in the frequency of real-world referents and imaginative ideas; however, Waldorf children included more expressive ideas than those from the conventional school.

3.7.4. Pretend play

Only one study explored differences in pretend play. Kirkham and Kidd (2015), after controlling for the effect of non-verbal ability, measured using the Raven test (which correlated with pretend play), showed that Waldorf students performed better compared to Montessori students, but with no differences with children from the conventional school. No differences were found between the latter two, either.

3.8. Emotional and personal development

3.8.1. Well-being

Studies on alternative education have addressed the general well-being of children in their lives, and, more specifically, at school. Besançon et al. (2015) found that adolescents from Waldorf and conventional schools did not differ in their general life satisfaction. Furthermore, Acevedo and Carrillo (2010), despite not actually using a satisfaction scale, examined the levels of adaptation, anxiety, and self-esteem of elementary school students (9–12 years old) from Montessori and conventional schools, without finding differences attributable to the type of school. In contrast to the results for general well-being, most studies on well-being at school tend to show higher levels in children from alternative schools. This is the finding reached by Lillard et al. (2017) when assessing children's enjoyment of leisure and school activities in Montessori and conventional preschools. Denervaud et al. (2019) reported the same findings for preschoolers, although the trend was less clear in elementary school. Other studies found a relationship between school well-being and type of school in later developmental stages. Ruijs (2017) reported that university students who attended high Montessori schools remember the stage with higher levels of school well-being and a better relationship with their teachers compared to their counterparts in conventional schools. Besançon et al. (2015) also identified higher levels of satisfaction with school among adolescents from Waldorf schools than among those from conventional schools. Only the study by de Bilde et al. (2013) deviated from this trend. When exploring school enjoyment of preschoolers and elementary children at Waldorf, Freinet and conventional schools, these authors

found no differences between either ages or schools. It should be noted that, in this study, the children were not tested. Rather, the teachers that report on these variables using 4 items on a Likert-type scale.

3.8.2. Emotion recognition

An essential aspect of emotional development, key to social interactions, is emotion recognition. [Denervaud et al. \(2020d\)](#) explored the role of school type in this ability. Elementary school students (8–12 years old) from Montessori and conventional schools were asked to perform two tasks. The first consisted of categorizing the emotion they recognized in digitally manipulated faces expressing ambiguous emotions (50 % surprise and 50 % fear). In the second, during the projection of a video showing faces with expressions that progressively changed from 100 % happiness to 100 % anger (also digitally manipulated), they were required to indicate the exact moment they perceived the change in emotion in the expression. The results showed, on the one hand, that children from the conventional school presented higher fear recognition sensitivity compared to their counterparts in Montessori school, while, on the other hand, the latter children showed a positive bias in perceiving happy expressions for longer durations than anger expressions, compared to their peers in the conventional school. The authors conclude that educational settings may potentially modulate emotion recognition in children.

3.8.3. School Motivation, Self-efficacy, and independence

Two studies compared intrinsic versus extrinsic learning motivation in different types of high school. Neither the retrospective study by [Ruijs \(2017\)](#), with a sample of undergraduates that attended either Montessori or conventional high school, nor that by [Besançon et al. \(2015\)](#), with adolescents from Waldorf and conventional school, reported significant differences. However, in the latter study, adolescents from a traditional school exhibited higher levels of extrinsic motivation than those from a Waldorf school (with no differences in terms of intrinsic).

Closely related to motivation is self-efficacy (SE), an aspect explored by [Dorfman and Fortus \(2019\)](#) in both general self-efficacy (SE) and science self-efficacy (SSE) in older elementary and high school students in Waldorf, democratic, and conventional schools. In addition to interviewing parents, teachers and students, they administered three ad hoc scales to assess self-efficacy. The results showed that, in Waldorf schools, students' perception of what the teacher thought of their personal ability was a stronger predictor of SSE than what the teacher expressly told them, although both aspects were statistically significant. In contrast, in traditional schools, SSE was only predicted by what the teacher said, while, in democratic schools, none of the teachers' social persuasions was a significant predictor. Additional results reported in the study might explain these differences, as only students in Waldorf schools referred to personal connection with their teachers beyond class.

Independence was addressed in two studies, with mixed results, although neither study collected data directly from children. [De Bilde et al. \(2013\)](#), asked preschool and elementary teachers from Waldorf, Freinet and conventional schools to complete 4 items adapted from the independent participation scale of the "Teacher Rating Scale of School Adjustment" questionnaire, finding no differences between the different educational settings. In the retrospective study by [Ruijs \(2017\)](#), undergraduates were asked to rate their independent participation at their high school, either Montessori or conventional, and outside school. The scales they were required to complete included questions, for independence at school, on taking initiative, working together, and evaluating the learning process, while, for independence out of school, individual autonomous functioning was assessed in a broad sense, including scales on evaluative thinking, need for confirmation (comparative validation) and behavioral autonomy. The Montessori students were found to have lower levels of independence out of school than those from conventional schools.

3.8.4. Mastery orientation

One of the studies analyzed mastery orientation in preschoolers attending Montessori and conventional schools, an ability closely related to the desire to learn by dealing with complex tasks, persisting even in the face of failure. [Lillard et al., \(2017\)](#) used [Smiley and Dweck's \(1994\)](#) task, in which, after having played with very simple or impossible puzzles, the participants were asked to choose which one they wanted to play with again. Although at the beginning of preschool there were no differences, at the end of this stage, only Montessori children preferred to redo difficult puzzles rather than easy ones. Interestingly, the children in the Montessori school explained they enjoyed doing the difficult puzzles, while those in the conventional school said they chose the simpler puzzles because they were easier.

3.9. Academic achievement

Two main aims have driven the research on academic achievement of students from conventional and alternative schools: the study of performance in language and mathematics and the analysis of academic progress in higher grades.

3.9.1. Language and mathematics

In the studies included on the present review, academic achievement was not directly related, as typically occurs, to the grades obtained by students in the subjects they study, since, in most of the schools with alternative programs, students are not graded in a way comparable to conventional schools, nor are the same subjects taught. These capacities were thus assessed based on the performance on various tests that allow for the evaluation of knowledge of basic skills, mainly in the areas of language and mathematics. Of the six studies that compared academic performance in language and mathematics in children from alternative and conventional schools, five focused on Montessori schools and one on a Waldorf school. The general trend was for children in Montessori schools to show a higher level in both fields of knowledge than those in conventional schools. [Lillard \(2012\)](#) and [Lillard et al. \(2017\)](#) found that children in Montessori programs fared better in academic achievement. The longitudinal nature of these studies confirmed the robustness of this finding over time since the gains in both language and mathematics were more significant in the final test in the last year of preschool than in the initial ones. [Denervaud et al. \(2019\)](#) also reported that preschool and elementary Montessori children outperformed their conventional school peers in both language and math tasks. Two studies focused specifically on the analyzing base-10 and place value understanding. [Laski et al. \(2016\)](#) found that the Montessori preschoolers correctly used the canonical representation of base 10 significantly better than their conventionally educated counterparts, but this difference was not maintained in the following grades (first, second and third grade) and no further differences attributable to the type of school were found. Additionally, [Mix et al., \(2017, study 2\)](#) compared preschoolers and second graders from Montessori schools and children from conventional schools. A particular feature of Montessori schools is that concrete material is fundamental and prioritized in the learning of mathematics (and in other knowledge domains such as language). The conventional schools selected in this study also used concrete, non-Montessori materials for math teaching. The results showed a clear advantage of Montessori children in place value tasks, but, in contrast to the findings of [Laski et al. \(2016\)](#), this advantage was not in preschool, but in second grade, after an average of 5 years in this type of school. Finally, the only study comparing early literacy in children from a Waldorf school and those from a conventional one ([Cunningham & Carroll, 2011](#)) concluded there were no differences between the two groups and that the potential effect of later schooling in these skills was offset by mainstream education.

3.9.2. Progression in high education

Two studies compared the progression in high education of students

from elementary alternative and conventional schools. Ruijs et al. (2017) found lower than expected academic achievement, based on their performance in elementary education, in children from conventional schools compared to those that had completed their elementary education in Montessori schools, with no differences in terms of grade repetition. Meanwhile, Ramos and Vandecandelaere (2018) explored Freinet schools in Belgium. Based on official national data for the first five years of High Education, they analyzed the progress of students in Freinet and mainstream schools and the school tracks chosen. Freinet students completed their school track in high school at a rate comparable to that of students in conventional schools and more frequently chose the artistic school track.

4. Discussion

The general aim of this systematic review was to identify the impact of different school settings on development during childhood and adolescence. By means of a systematic review of studies comparing different types of schooling published since 2010, we analyzed the alternative schools that have been most widely studied, what skills of development have received most attention and the overall findings reported. To the best of our knowledge, this is the first study to focus on this topic systematically and to seek to explore the phenomenon of alternative education in general, in contrast to other reviews that have limited their analysis to a specific model of alternative education (Demangeon et al., 2023; Marshall, 2017).

Through the review of the 24 articles included, we first detected that research is mostly concentrated in Montessori schools, in elementary education and in countries of Anglo-Saxon culture. The studies analyzed were quasi-experimental and the most frequently examined variables are the EF, creativity, and academic achievement, while well-being at school, intrinsic motivation or independence have been the subject of scant attention. In most cases, standardized instruments were used to explore the variables of interest. In all these studies, statistical analyses of the data obtained were appropriate to compare the performance of the conventional school group with that of the alternative school group. The general trend of the results suggests an advantage among children from alternative schools compared to those from conventional schools in the various developmental variables explored, or an absence of differences between the two groups. Only occasionally are negative results reported for students at alternative schools.

4.1. Alternative schools studied

Not all alternative approaches have received the same attention in research. For some systems, such as Reggio Emilia or active learning schools, no study was found that met the inclusion criteria, despite their currently having considerable social impact (García, 2017; Aljabreen, 2022; Wagnon, 2021). Unsurprisingly, Montessori education, the most widespread and internationally known alternative educational system (Lillard, 2019; Wagnon, 2021), is the most deeply researched. In addition to there being a specific journal on Montessori (Journal of Montessori Research, indexed in ERIC, with a peer review process), other factors may have fostered this interest over other alternative schools: it has a clear methodology and standards that allow for a precise definition of a Montessori class, how a working day should be organized or how a Montessori guide should be trained to implement the educational approach. Waldorf schools are also widely known, but their impact on society at the international level is less than that of Montessori, which is reflected in the lower scientific output available and the fact that it is focused on Europe. The other two alternative systems identified in the review, Freinet and democratic schools, have an anecdotal presence that limits the possibility of reaching robust conclusions.

Most of the conclusions of the articles in this systematic review are based on comparing children in conventional schools with children in Montessori and/or Waldorf schools. Additionally, although alternative

schools share common elements that clearly differentiate them from conventional schools (Aljabreen, 2022; Dintersmith, 2018; Edwards, 2002; Wagnon, 2021), there are also multiple factors that differ considerably in their daily educational practice, such that the findings on these two schools should not be directly extrapolated to the rest of the alternative approaches.

4.2. Most widely explored Topics: EF, academic achievement and creativity

The theoretical complexity that characterizes research on EF is transferred to empirical research in the field analyzed. In the studies in the review, we find that it is sometimes assessed using one or two tests, but not through a set of tasks, as several authors have suggested to be the most reliable way to assess this capacity (Zelazo et al., 2016). The use of electronic devices when assessing EF has also been criticized; some authors underline that the unfamiliarity of children in alternative schools with these devices might have impacted the results (e.g., Denervaud et al., 2019, in Flanker Fish Task). Despite these limitations, the trend is that Montessori education is associated with more sophisticated trajectories in control and higher executive skills. Specifically, studies monitoring errors report that the differences are not so much in the number of errors made but in how children and adolescents in both schools process them (Denervaud et al., 2020 a, b, and c). These results fit with the essence of the educational practice in which the Montessori method is grounded, directly related to a high demand for executive control in children. Numerous daily activities in Montessori classrooms are designed in order for them to be solved by the children themselves without the need for external elements, ranging from self-correction tests (where error is a necessary and valuable part of the learning process) to the use of real tools adapted to the children's size for them to be used autonomously (e.g., a small dustpan and brush to clean up anything that falls or is broken). These activities also focus on offering children the opportunity to perform multiple activities they choose themselves and that correspond to an appropriate level, that is, tasks that are difficult, but not too challenging (Lillard, 2019). In order to be able to deal with such activities correctly, sophisticated levels of executive control are required, and the findings suggest that these schools tend to bolster levels of EF.

One of the common characteristics of alternative schools such as Montessori or Waldorf is that they confer the academic curriculum and grading an important but secondary position in the teaching-learning process (Edwards, 2002). Nonetheless, several studies include academic achievement among their measures, likely due to the social concern generated by this type of school with respect to the more classic functions of the institution of school, associated with the certification of achievement and progress through the educational system and preparation for future demands and obligations. Only the studies that aimed to explore the academic paths of children from different school systems analyzed the grades obtained in official national exams (Ramos & Vandecandelaer, 2018; Ruijs, 2017), finding no differences between students from conventional schools and their Montessori or Freinet counterparts. In alternative schools, academic outcomes are not assessed by tests on knowledge worked upon by the whole class group, in which a specific grade is given to students. They are typically assessed with tests that identify basic aspects related to language and mathematical skills. Studying academic attainment has a great social impact, as many families are concerned that, if their children attend a non-conventional school where other aspects of development (social, emotional or personal) are prioritized over academic ones, achievement may be negatively affected (Hiles, 2018). With the exception of a study on a Waldorf school, which finds no differences compared to a mainstream school, studies have been conducted in Montessori schools, and generally report academic advantages in these children: However, on occasions no substantial differences in performance compared with the conventional system are reported.

Although grades are not used as a measure of performance, administering tests that assess more basic or general aspects of learning is not always without problems. As an example, the test used by Lillard (2012) on applied math problems may have underestimated Montessori preschoolers, since some specific content presented, such as an analog clock and coins, are worked upon in the conventional school curriculum at those ages, but not in Montessori schools. Thus, children would answer incorrectly not because they are unable to solve applied math problems, because they are not familiar with the content. Adaptations have sometimes been implemented to minimize the differences. For example, Lillard et al., (2017) overlaid cursive letters on the standardized test used to assess the linguistic area, as this is the typography that Montessori children are initially familiar with. One of the challenges of future research lies in using tests in which the specific characteristics of content worked on in the particular curriculum of the schools under study is not the element that facilitates or hinders performance of the tests. Moreover, this challenge is not only limited to the area of academic achievement but transcends to other fields.

Finally, creativity is one of the topics that has received considerable attention but only in Montessori and Waldorf schools. The findings show either no differences between the children from alternative schools and conventional schools, or a trend towards higher levels of creativity among the former. These results are consistent with classic studies that had already shown that children attending alternative schools tended to be less cognitively rigid, with more sophisticated and imaginative thinking (Horwitz, 1979). The positive results reported for Montessori schools run counter to criticism often aimed at this approach for not encouraging activities related to creativity, such as pretend play, in its daily practice (Lillard & Taggart, 2019). However, in these schools, children's autonomous control is fostered, and they are allowed a free choice of work and collaborative learning activities, aspects that are associated with higher levels of creativity (Amabile & Gitomer, 1984; Ryan & Grolnick, 1986). On the other hand, there are surprisingly few empirical studies on Waldorf schools, given that several elements that might facilitate the development of creative abilities have been identified in their approach. In these schools, art and artistic expression, in particular, are key elements of the curriculum (painting, modeling, sculpting and theater), promoting creative exercises in an autonomous fashion (Shankland et al., 2009). Following the teachers' indications, students create their own workbooks, adding information about what they are researching, illustrating them, and decorating the lessons they receive. In these schools, children's use of electronic devices tends to be explicitly rejected. For the teachers at these schools, art and creativity are core components of all lessons and these aspects are valued as essential characteristics of a teacher (Ashley et al., 2005). Nonetheless, although the tendency is for Waldorf students to score higher on creativity than those at mainstream schools, the articles on creativity included in our review present so many disparate elements with respect to the measures used (psychometric on most occasions, but not always) and the theoretical conceptualization of the phenomenon (how creativity is understood: divergent thinking, including convergent thinking, or children's drawings produced following instructions) that further research is needed to draw consistent conclusions. As in academic achievement, we face the same challenge of using tests that would include not only classical indicators measured by such scales (fluency, flexibility, originality, elaboration; e.g., Torrance's TTCT, 1974), but also the inclusion of other tests that are less dependent on conventional aspects such as ill-defined problem solving, problem discovery (e.g., open-ended situations), or alternative uses of common objects (Beck et al., 2016; Cutting et al., 2011).

4.3. Less widely explored topics

Montessori and Waldorf approaches (as well as Freinet and democratic schools) understand human development from a constructivist perspective. They comprehend children as active authors of their own

development, strongly influenced by intrinsic, dynamic, and self-determined forces that allow them to develop and learn (Edwards, 2002). However, the studies reviewed have not systematically operationalized or analyzed these aspects. It is noteworthy because although the objective of this systematic review was not to find evidence that specific alternative approaches lead to specific outcomes, it is surprising that the studies reviewed do not focus on those central outcomes that are pursued in the alternative educational practices explored. In fact, in contrast to the studies on EF, academic performance and creativity, other areas of development, including independence, self-efficacy, motivation, personality, social competence or ToM, have been the subject of considerably less attention. Two observations are worth making about the findings on these capacities. First, one of the characteristics of alternative schools is that by implementing an authentic teaching-learning model based on children's own interests, students are assumed to have higher levels of intrinsic than extrinsic motivation, be more independent and more perceptive of the effectiveness of their actions. However, very few studies have explored these variables, being the results inconclusive. In some cases, the data are collected retrospectively, with participants being asked to recall their experience of high education in alternative schools (Ruijs, 2017), or subjectively, asking parents and teachers to evaluate the children (de Bilde, 2013), without taking direct measurements of the participants. In other cases, studies focus on highly specific aspects, which cannot be easily extrapolated to the overall approach (e.g., Dorfman & Fortus, 2019, largely focus on learning in science). Further research is clearly needed to expand the evidence in this area of study. Secondly, the studies that explore the level of well-being in schoolchildren are based on the notion that it will be optimal in alternative schools, since this aspect is critical in child's development in such settings. In these schools, teachers are encouraged to be highly responsive to the children's emotional needs, and their interventions are expected to be closely adapted to children's development (Lillard & Else-Quest, 2006; Shankland et al., 2009). However, there are few studies, and the conclusions only allow us to identify trends that should be confirmed in subsequent studies. General well-being does not appear to be affected by the school setting, although school well-being does, especially in the early years of education. However, the disparity in the instruments used (sometimes ad hoc scales for a specific study, sometimes indirect retrospective evaluations of well-being or evaluations of an adult that infers how the child feels) and the differences between the ages explored are such that these aspects need to be addressed more systematically.

4.4. Limitations and future challenges

The nature of the phenomenon explored in the studies included in this review, that is, the educational school approach, is so complex that the designs should consider and minimize the impact of certain variables that might explain the results but transcend the type of school. Controlling for individual differences is fundamental and various studies homogenize the samples or take previous measures of elements such as fluid intelligence or language level to control them. The educational approach is inextricably linked to other sociodemographic factors, such as geographic location or SES. Although several of the studies in the review identify many of these individual and sociodemographic measures of control, it is worth remembering that most of the alternative schools are still privately run, such that comparisons are made between private schools and public schools, with SES arguably being a key factor that biases the results obtained.

4.4.1. Medium- to long-term effects

It is surprising that few studies examine the time children have been immersed in the school context under study, and even more so that none of them analyzes the impact of this factor on their findings, when it is presumably of considerable significance in explaining the differences between the school settings. Many of the daily activities in alternative

school classrooms differ greatly from those in conventional classrooms. For example, while in the latter, children are not typically allowed to handle knives or use chinaware, in Montessori schools, it is common for them to peel and cut their own fruit and use glass tumblers, pouring water for themselves from an early age. The level of attention and executive control required to successfully perform such tasks is very high and requires practice and skills that are acquired as they repeat actions and have multiple experiences with these ways of doing things. It is conceivable that the longer the children are familiar with these tasks, the better will be their results when EFs are assessed. Knowing how long each participant has been familiar with the characteristic practices of each type of school is key for testing the initial assumption and correctly interpreting the results. In line with the above and on the evidence of the findings reviewed in this study, longitudinal designs are more effective. Several studies reviewed participants' follow-up. In some cases, they assess the children over the same academic year, typically at the beginning and at the end (Lillard, 2012); in others, the follow-up even spans several years (Lillard et al., 2017). In this way, it is possible to determine more exactly not only whether there are differences between school settings, but also to explore the developmental trajectory of the capacities analyzed.

4.4.2. Additional measures from the School, Teachers, and family settings

The features of the school and the family are additional factors that complicate studying and identifying the effects of alternative education on child development. Regarding the schools, one area to be examined is arguably the fidelity to the program typical of each type of alternative school. Various studies specify the criteria that account for how faithfully the schools follow the educational program studied; with one of the studies analyzed even reporting that the greatest benefits are found among children who attend a school with a Classic Montessori program compared to those at a conventional school or a Supplemented Montessori one (Lillard, 2012). Montessori and Waldorf have international organizations (e.g., Association Montessori International, European Council for Steiner-Waldorf Education, International Association for Steiner-Waldorf Early Childhood education) that guarantee, to a certain extent, the participating schools comply with the basic principles of the type of education promoted. In other types of schools, such reference organizations do not exist or are less well known (e.g., for the Freinet school, FIMEN - International Federation of Modern School Movements). In any event, it would be useful for empirical studies to gather central data that give an account, at least, of general aspects that allow us to determine the extent to which a school is close or not to the original proposal of the type of educational approach practiced in its classrooms, for both the conventional and alternative schools. Such data might include the number of students in the whole school and the student/teacher ratio, educational stages covered, presence of multi-grade classes, type of assessment (grades, exams, etc.), curricular areas implemented, type of material used, level of directive instruction, the extent to which emotional development outweighs academic success and contact with nature.

Regarding teachers, it cannot be ruled out that the better outcomes for children in alternative schools might be explained because their teachers are better (Lillard et al., 2017). In addition to the qualifications required in each country to practice, in many cases, teachers in such schools have the specific additional training demanded by the alternative school model, as well as previous experience of teaching in conventional schools. Moreover, teachers in alternative education may have a different vision of childhood and educational processes that leads them to interact differently with children, both emotionally and academically (Lillard et al., 2017). Such aspects should be identified in future studies in order to examine their effects on outcomes.

As regards families, some studies suggest that the better outcomes of children attending schools such as Montessori or active learning ones might actually be explained by advantageous family conditions, and not by the educational program (Tirado and Sanchez, 1993). Moreover, the

choice of an alternative school over a conventional one could be considered endogenous (Ruijs, 2017). There may be essential differences between families choosing alternative or conventional education involvement in school issues, cultural environment, expectations of education- which may be associated with the outcomes children achieve (e.g., the shadow education, Entrich, 2021). In countries with alternative schools within their network of public schools, this problem can be addressed by the lottery admission system (de Bilde, 2013; Lillard, 2019). However, this only partially solves the problem, as even this system does not safeguard the same starting point for children from both types of schools: not all neighborhoods have alternative schools, nor are all parents satisfied with the assigned school they are allocated and so seek a change of school, with the "random" effect thus disappearing. Although some studies analyze the data by adding multiple controls to the lottery system that neutralize the starting differences with respect to gender, migrant level and origin, age, neighborhood SES, etc. (Ruijs, 2017), this is not typical and, in most cases, the specific impact of these variables on the findings is not identified.

4.4.3. Assessment focused on strategies and not only on outcomes

The findings of this review show there are broadly no differences between the two types of schools or that, if they exist, they tend to be in favor of the alternative school. However, the disparity of measures used, and variables analyzed and the overrepresentation of a particular type of alternative school -Montessori and Waldorf- mean we cannot categorically conclude that alternative education has greater benefits than conventional education. In this respect, it would be of interest for future research to focus on other widespread systems, such as Reggio Emilia, active learning schools, or other less structured and directive alternative proposals such as forest schools, free schools or even homeschooling and unschooling. Additionally, the instruments used, except in some studies, tend to be quantitative, standardized measures. More information should be gathered from interviews or tests that are more sensitive not only to results, but also to the processes, strategies or reasoning used by children to answer the tests and reach their results. Arguably, the truly key differences between the two educational settings are related precisely to these processes. Some of the studies analyzed in this review (e.g., those by Denervaud on error control; or those by Rose on drawing) support the proposal that studies in this line should be conducted in the future.

4.4.4. Language bias

This study was based on internationally recognized and widely disseminated databases as sources of information. In these databases, the vast majority of indexed journals use English as the language of publication. In the current search process, another language in which the authors were fluent (Spanish) was included; but this only resulted in the addition of one more article (Acevedo & Carrillo, 2010). Although English is the prevailing language in scientific reporting, this study may have omitted research in other languages and/or from other contexts that future reviews would identify in order to provide a more global picture of the phenomenon studied.

5. Conclusions

Society's growing interest in alternative education is not reflected in the scientific output on the extent to which these practices are truly beneficial for child development. Although the studies exploring this issue show a tendency towards more positive outcomes in these schools in aspects such as EF, creativity, or basic mathematical and linguistic knowledge, the low representativeness of the alternative schools explored and the lack of a systematic approach among the studies do not allow us to identify a solid line of research that would permit a generalization of the positive trends. It is worth noting, furthermore, that research in this area is based on the assumption that the educational settings in these schools bolster development during childhood, which

enhances the risk of negative results not being published. Some of the most deeply entrenched ideas about the benefits of alternative education, such as the promotion of children's well-being over academic performance, their autonomy and independence as developing individuals, their autonomous learning, and the specific role of the teacher, are areas unexplored in this review of studies. Future research needs to focus on these aspects, making it possible to examine the assumption that school settings in which children's developmental needs are the epicenter of educational practice foster harmonious socio-cognitive, emotional and personal development.

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CRediT authorship contribution statement

Silvia Guerrero: Conceptualization, Methodology, Formal analysis, Funding acquisition; Investigation; Methodology; Project administration; Supervision; Writing - Original Draft, Writing - Review & Editing. **Javier Valenciano:** Conceptualization, Methodology, Formal analysis, Investigation; Methodology; Supervision; Writing - Original Draft, Writing - Review & Editing. **Alicia Rodríguez:** Methodology; Data Curation; Funding acquisition; Writing, Review & Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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Appendix A. Supplementary data

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