

What does the evidence say about the relationships between ECEC structural quality and children's outcomes?

A literature review
Final Report



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Note: Further contextual analysis is required to determine suitable policy settings from this summary of evidence.

Preface

This report has been prepared for the Ministry of Education by Penny Fitzpatrick and Natalie James from MartinJenkins (Martin, Jenkins & Associates Ltd).

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Summary

High-quality early childhood education and care (ECEC) has well-documented benefits for children's learning and development, especially for those from disadvantaged backgrounds. "Quality" in ECEC encompasses structural features (such as qualifications, adult-to-child ratios, and group size) and process features (the daily interactions and experiences of children).

This literature review was commissioned to examine how key structural quality factors (specifically, educator qualifications, leadership, adult-to-child ratios, and group size) relate to child outcomes. The aim is to identify which structural levers have the greatest impact on children's cognitive, social, and emotional development, and where diminishing returns may set in, to inform policy development in ECEC (for example, regulation and funding priorities).

The review focuses on recent high-quality research (primarily meta-analyses and systematic reviews conducted post-2015) relevant to New Zealand's context. The evidence base spans mostly centre-based ECEC settings and covers both short-term outcomes (like preschool learning gains) and longer-term effects (into school years), with special attention to process quality as a mediating factor. We also discuss professional development, which while not a focus of the review is a persistent theme in literature.

Contextualising this review

Findings from this literature review should not be taken in isolation

This evidence review is intended to support future policy development by providing an updated picture of recent research on quality in ECEC. It is not intended to serve as policy advice, but rather as a resource to inform policy analysis and advice.

The review builds on existing institutional knowledge held in the Ministry of Education (the Ministry) and assumes familiarity with foundational concepts and seminal works in the field. As such, classic studies are not the focus, though some are referenced where necessary to clarify key ideas or contextualise newer findings. The focus of this review is on recent research, particularly meta-analyses, systematic reviews, and large-scale syntheses to reflect the most up-to-date international evidence available.

We have not independently assessed the quality, timeliness, or methodological rigor of the included meta-analyses and systematic reviews, instead we rely on their peer-reviewed status as an indicator of validity.

As the inclusion criteria for this review prioritises meta-analyses and systematic reviews, we have not undertaken comprehensive search or review of other sources, such as qualitative literature, case study



evidence, programme evaluations, theoretical or conceptual papers, or grey literature. However, in some areas where limited meta-analytic evidence exists (for example, leadership), we have included relevant qualitative findings where appropriate.

While this approach allows for a high-level overview of broad trends; it also comes with limitations. Meta-analyses tend to favour studies with measurable outcomes and standardised indicators, which are known to under-represent context-specific, qualitative, or culturally grounded insights. Furthermore, quantitative studies will only tell part of the story about "what works" due to known challenges with reliable measurement of outcomes for pre-school children.

It should also be noted that no New Zealand-specific studies met the search and inclusion criteria set for this review. Applying international evidence to the New Zealand context presents challenges. New Zealand's unique cultural, social, and regulatory environment, including the significance of Te Tiriti o Waitangi and the diverse needs of Māori and Pacific communities means findings from other countries may have limited application in New Zealand. This further emphasises the importance of interpreting evidence with attention to local context and values.

It is also important to note that within the reviewed literature, analysis of cost effectiveness, including financial trade-offs across structural quality inputs, or diminishing financial returns from quality settings, is sparse and sometimes influenced by authors' agendas. This limits our ability to draw firm conclusions about the economic trade-offs involved to inform the Ministry's work on the ECE funding review.

Overview of the key findings

What is the relationship between teacher qualifications and children's outcomes?

The relationship between teacher qualifications and children's outcomes is complex and shaped by multiple interacting factors

There is evidence that higher qualifications (such as holding a bachelor's degree or above) is consistently associated with improved process quality in ECEC settings. This includes more intentional teaching as classrooms led by more educated teachers tend to be better organised, with richer language use and more developmentally appropriate activities, which are known to support child learning and development. For example, meta-analyses confirm that, on average, educators with a higher-level of qualifications provide more stimulating and supportive interactions.

However, the direct impact of qualifications on measurable child outcomes (such as vocabulary, math skills, or social behaviour) is less consistently observed in the short term. The evidence shows only small positive effects of higher qualifications on some outcomes, for example, early language and literacy skills, and there are no significant differences in other domains. This does not necessarily imply that qualifications are unimportant, but rather than their effects are mediated through other



dimensions of quality and other contextual variables, such as curriculum, adult-to-child ratios, and the home environment. In this sense, qualifications contribute to a foundation for quality practice but are rarely the sole determinant of children's developmental outcomes.

Instructional quality is a function of experience, ongoing training, and qualifications

The reviewed literature emphasises that educator effectiveness is shaped by a combination of formal qualifications, professional experience, and the broader educational context. While a teaching degree provides foundational knowledge and pedagogical frameworks, it does not, in isolation, guarantee effective practice.

Experienced educators who have built professional judgment over time can demonstrate high levels of effectiveness, even in the absence of advanced academic credentials. Conversely, newly qualified teachers may still be developing the capacity to translate theoretical knowledge into responsive, in-the-moment teaching strategies. However, the extent to which educators, whether experienced or newly qualified, are effective also depends on the broader conditions in which they work, including team dynamics, the setting's pedagogical approach, and the extent to which they are supported in their role.

These observations point to the importance of ongoing professional learning and reflective practice throughout an educator's career. The strongest outcomes for children tend to emerge when teachers have both a solid initial qualification and access to sustained high-quality professional development. This highlights the value of supporting both educators and teachers at entry into the profession and across their professional journey.

A further nuance in the literature we reviewed is the recognition that unqualified or non-registered educators may bring other forms of expertise that contribute meaningfully to children's experiences, particularly in culturally-diverse contexts. For example, educators who share children's first language or cultural background can foster strong relational connections, support identity development, and enhance communication with families.

Some threshold effects have been identified, but their significance depends on contextual factors

The reviewed literature suggests that ensuring teachers have at least a baseline qualification (such as a relevant diploma or degree) is important for ensuring quality in ECEC settings. Advancing from no formal qualification, or from a diploma to a degree, is associated with improvements in caregiving quality. However, beyond this foundational threshold, the relationship between additional qualifications (such as a master's degree) and improved child outcomes is unclear from the literature we reviewed.

Similarly, the specialisation of qualifications, such as holding a degree specifically in early childhood education versus general education, does not consistently predict better outcomes for children in the reviewed literature. However, there is some evidence that specialised training may support higher-quality teaching practices and richer adult-child interactions. These effects, again, tend to manifest more clearly in process quality than in immediate developmental measures.



Overall, teacher qualifications should be viewed as an essential piece of the quality puzzle

Meta-analyses do not consistently demonstrate that higher qualification levels have direct effects on child outcomes. However, qualitative research and evaluative case studies that account for contextual and other structural factors may offer more valuable insights for policymakers seeking to understand the role of qualifications. These types of evidence can more effectively highlight the indirect ways advanced qualifications contribute to child outcomes, particularly by considering mediating factors and the place of qualifications within a broader set of levers for improving process quality.

What is the relationship between professional development and children's outcomes?

Note: Professional development was not a specific focus of our literature review, but emerged as a persistent theme. It is likely that the literature we reviewed does not cover the full picture of recent evidence in this area, and these findings should be read with that in mind.

Ongoing professional development (PD) for ECEC educators has a positive impact on children's outcomes by improving the quality of teaching and interactions

Across numerous studies, when teachers engage in substantial PD, their classroom practice improves, and children benefit. Meta-analyses find that PD interventions lead to meaningful increases in process quality (with educators demonstrating more responsive, stimulating, and effective interactions) and small but significant improvements in children's learning and development. More than half of the observed gains in child outcomes can be statistically attributed to PD-facilitated improvements in teaching practice.

In other words, PD works *indirectly* by equipping educators with better skills and strategies that can in turn enhance children's daily experiences and progress. For instance, professional training on language development might lead teachers to engage in richer conversations and frequent reading with children, and studies show this can translate into modest but real gains in children's vocabulary and early literacy skills. While the magnitude of child outcomes is generally modest, often equivalent to a few months of developmental progress, the effects are consistent and comparable to those observed in other educational interventions. Again, this reflects the complexity of the early childhood environment, where numerous interrelated factors beyond professional development can either amplify or constrain the benefits PD provides.

Crucially, some types of PD appear more effective than others

The evidence highlights intensive, practice-focused PD as the most impactful. On-site coaching or mentoring yields the greatest improvements: having a skilled mentor work with teachers in their classroom – observing, modelling techniques, and providing feedback – significantly boosts instructional quality and has been linked to better child outcomes (for example, higher language and social-emotional scores) compared to teachers who did not receive coaching.



In contrast, one-off workshops or lectures without follow-up tend to have limited effect on actual teaching practice and thus little measurable impact on children. Short workshops can raise awareness or knowledge, but without ongoing support, teachers often revert to old habits.

Content-specific PD is especially beneficial

Programmes that train teachers in a particular domain (such as early literacy, behaviour management, or math) lead to improvements in those corresponding child outcomes. For example, a targeted literacy PD programme that included individualised coaching led to children showing stronger gains in alphabet knowledge and story comprehension, whereas general PD not aligned to specific skills showed weaker effects. This alignment matters, and to improve a given outcome for children, the training needs to focus on that area (for example, social-emotional training to improve children's social skills).

Another insight is the importance of duration and dosage

Effective PD often spans several months with regular sessions or feedback cycles. There is some indication that very long or infrequent programmes lose momentum, whereas shorter, intensive interventions can prompt immediate practice change.

Overall, the research evidence for PD is strong. Multiple randomised trials and reviews concur that well-designed PD can enhance process quality and modestly improve child outcomes. It should be reiterated that "modest" improvements should not be interpreted as insignificant. Rather, this reflects the complex and multifaceted nature of early childhood development, where numerous interacting factors shape children's growth over time.

What is the relationship between leadership roles, responsibilities, and children's outcomes?

Note: Our search terms did not yield many results that fit our selection criteria in this area, and results were mostly for qualitative studies. Nonetheless, the studies consistently emphasise a few points. It is possible that additional research exists that could provide more detailed information in this domain.

Although the relationship between leadership and child outcomes is mostly indirect, leaders play a critical role shaping the conditions that support effective teaching and learning

Effective leadership in early childhood centres is widely recognised as an enabling condition for high-quality practice. Centre leaders, including directors, supervisors, and head teachers set the tone, policies, and culture that support high-quality teaching. This includes mentoring educators, guiding curriculum implementation, fostering a positive work environment, and promoting reflective teaching. Research suggests that centres with strong pedagogical leadership tend to exhibit higher levels of process quality. In these settings, educators are more likely to engage in intentional practice, deliver curricula with greater fidelity, and create warm, responsive interactions with children, all of which are linked to better developmental outcomes.



Isolating a direct causal link between specific leadership actions and measurable child outcomes is challenging. Leadership effects are often mediated through teaching practices, making their influence diffuse and difficult to quantify. Rather than impacting children's development directly, leadership contributes to a broader system of quality that shapes children's everyday experiences. For example, an involved centre leader who provides educators with feedback, encourages parental engagement, and maintains a stable, organised programme will indirectly support better outcomes by enabling teachers and educators to work more effectively. By contrast, weak leadership or a narrow focus on administrative management at the expense of pedagogical guidance can hinder process quality if, for example, educators are unsupported or inconsistent in practice.

Both administrative and pedagogical leadership functions are needed

Administrative leadership secures resources, manages operations, and ensures regulatory compliance (for example, proper staffing levels, safety), while pedagogical leadership guides the educational programme and teacher growth. In many high-quality centres the director wears both hats effectively; other models use a "shared leadership" approach (for instance, a centre manager plus a head teacher who mentors staff). What matters is that someone is actively attending to instructional quality.

Leadership is most effective when leaders are empowered and trained

Globally, centre leaders report that they tend to spend more time on average engaged in administrative leadership than pedagogical leadership, which may be decreasing their potential impact in this regard. Leaders also report having differing levels of autonomy over things like hiring decisions and budgeting, which may constrain their ability to elevate quality. This suggests that giving centre leaders the tools, training, and authority to lead on pedagogy (not just administration) is important.

Good leadership contributes to a positive organisational climate

Positive organisational climate matters because it correlates with lower staff turnover and higher morale, factors which themselves are beneficial for children (consistent and enthusiastic educators create a more secure, engaging environment).

In summary, leadership in ECEC is a critical behind-the-scenes driver of quality. While children do not benefit from a leader's presence in the same direct way they benefit from an educator's interaction, they do benefit from what strong leaders put in place: well-supported educators, intentional teaching practices, and a continuous improvement culture.



What is the relationship between adult-to-child ratios and children's outcomes?

Lower adult-to-child ratios are associated with higher quality interactions in ECEC settings, and are widely considered a key component of structural quality

Intuitively and theoretically, having more adults relative to children allows each child to receive more individual attention, quicker responses, and more language-rich engagement. These benefits are supported by decades of observational research: in settings with lower ratios, teachers and educators tend to be more responsive, more emotionally available, and less stressed, while children display more complex play, reduced conflict, and greater engagement with learning materials.

For example, an educator caring for 5 toddlers can have warmer, more extended conversations than if they were caring for 8 toddlers; similarly, in a preschool class, a 1:8 ratio allows for more small-group and one-on-one interactions than a 1:15 ratio. These differences in everyday experience are important because they set the stage for learning and socio-emotional growth.

However, when it comes to directly measured child outcomes the evidence appears more varied

Studies from early intervention programmes with very low ratios (1:4–1:6) showed strong child gains, underlining that extremely favourable ratios can make a difference. However, many robust studies find that once basic regulatory age-related ratio standards¹ are met, further incremental improvements do not consistently result in measurable gains on child outcome indicators. For instance, improving a ratio from 1:10 to 1:8 may have only a small or statistically insignificant impact on average vocabulary scores, especially if both settings are already meeting safety benchmarks and an engaging environment.

This should not be interpreted as evidence that ratios are unimportant. Rather it highlights that ratios interact with a range of other factors, such as group size, centre resources or teacher qualifications. For example, a centre with more children per adult may still support strong outcomes if they are able to compensate with experienced and qualified teachers who use effective teaching strategies for larger classroom sizes. Conversely, even fewer children per adult may not translate to better outcomes if the learning environment is poorly managed.

Threshold effects are also relevant in relation to ratios. Research suggests there are ratio “floors” above which small changes have minimal effect, and below which gains are more significant. A meta-analysis of preschool programmes found that ratios around 1:7 (one adult per seven children) were associated with stronger cognitive outcomes. However, once ratios reach around 1:10, additional reductions show no additional benefit. In contrast, moving from clearly inadequate ratios (1:15) to more developmentally appropriate levels (below 1:10) appears to yield more consistent benefits, particularly in programmes serving children with additional needs or in high-risk contexts. This

¹ Basic standards as defined by regulation within study-countries.



suggests that the greatest impact comes from moving programmes above the minimum threshold of quality, rather than from fine-tuning ratios once they are already within an acceptable range.

Optimal ratios differ with age and should be considered alongside other quality factors

The appropriate adult-to-child ratio in ECEC settings varies by age group, reflecting differences in children's developmental needs. For infants and young toddlers, there is broad consensus in the reviewed literature that significantly lower ratios are essential for healthy development. Although rigorous causal studies involving under-twos are relatively limited, expert opinion and observational data converge around 1:3 or 1:4 as an optimal range. Most countries' regulatory frameworks align with this view.

For older preschool children (typically ages 3 to 5), slightly larger ratios are generally considered permissible with less risk. However, the literature we reviewed consistently cautions against very high ratios in this age group, for instance, one teacher with more than 20 preschoolers, as such conditions are associated with lower instructional quality. In these environments, educators may be forced to focus on behaviour management rather than teaching, and opportunities for individualised interactions are greatly reduced.

It is also notable that many high-performing ECEC models cited in the research literature, such as the Perry Preschool and Abecedarian programs, featured low ratios and small group sizes as a central component. These favourable ratios likely contributed to the positive outcomes observed. However, they were part of a wider package of quality features. This again highlights the importance of viewing ratios as one interdependent element within a broader quality framework.

Some studies argue that, once minimum quality thresholds are met, additional resources might be more effectively directed toward educator training, coaching, or curriculum development than toward reducing ratios further. In this sense, while maintaining appropriate ratios is essential, improvements to educator capability and pedagogical quality may, in some contexts, yield greater returns for children's development.

What is the relationship between group size and children's outcomes?

Smaller group sizes in ECEC are beneficial for process quality; as with ratios, group size interacts with other factors in shaping children's outcomes

While closely related to ratios, group size also has distinct implications for the social and emotional climate of a classroom. Smaller groups tend to promote more individualised attention, greater responsiveness from educators, and calmer, more manageable environments. These features of process quality are widely recognised as important for supporting learning and well-being.



Small group sizes can create conditions that support learning

Some studies have linked smaller group sizes (for example, 10–15 children) with stronger early learning outcomes. For example, one study found that preschoolers in classrooms of ~15 showed more progress in language and academic skills than peers in groups of ~25, under otherwise similar conditions. Longitudinal research has also identified cumulative benefits from small class settings in the early years, suggesting that early exposure to personalised learning environments may have lasting effects. However, controlled studies isolating group size from other variables remain limited, making it difficult to draw firm causal conclusions.

Importantly, the greatest benefits from small groups tend to emerge when comparing extreme conditions, for example, large classes (20+ children) versus much smaller ones. In the mid-range (12 vs 18 children), the differences in child outcomes are less pronounced, and other variables such as teaching quality often play a more decisive role. A comprehensive synthesis of pre-kindergarten evaluations (US-based study) identified a threshold effect: class sizes of 15 or fewer were generally associated with stronger cognitive outcomes, but further reductions below that point yielded diminishing returns. The key message is that extremely large group settings should be avoided in ECEC, and keeping group sizes reasonably small is supportive of quality.

Age can influence what group size is most appropriate

Developmental stage plays a key role in determining optimal group size. For infants and toddlers, very small groups – typically no more than 6 to 8 children – are recommended to ensure responsive care and minimise stress for both children and educators. Indeed, crowded infant rooms have been associated with higher stress levels for both babies and educators.

For 3- to 4-year-olds, somewhat larger groups may be appropriate, provided that the environment remains supportive. While many jurisdictions allow up to 20–24 children per group with adequate staffing, research suggests that process quality can be harder to maintain at the upper end of this range. For example, some Scandinavian models feature larger, mixed-age groups supported by multiple educators and embedded in play-based curricula. However, even in these systems, there has been recent pushback on group size from parents and educators, with a view that smaller groups would support better emotional well-being and teaching effectiveness.

A group of around 16 or fewer is often cited as ideal. At the same time, there is some evidence that moderately sized groups offer diverse peer interaction opportunities, which can support social learning. The goal, therefore, is balance: enough children to foster peer engagement, but not so many that individual needs are overlooked.

Like other structural factors, group size interacts with other quality elements; how teachers teach, and how they are supported, can mediate the measured benefit of small group size

Overall, small group size and favourable adult-to-child ratios tend to go hand in hand, and their effects overlap, primarily through improvements in process quality.



Many policy frameworks address group size through indirect mechanisms. For instance, in New Zealand, licensing requirements do not mandate explicit group size limits but instead regulate factors such as total centre roll and space per child, which effectively constrain group size in practice. Ensuring that group sizes for young children remain well within these limits, and considering smaller grouping norms for infants, toddlers, and younger preschoolers, can help support richer interactions and greater individual attention.

However, as with ratios, the benefits of reducing group size should be weighed against other possible quality investments. For example, an additional teacher in a room of 20 children may achieve more by leading targeted small group learning than by simply dividing the class into two groups of 10 without changes to teaching strategy.

In practice, a modestly larger group supported by an experienced teacher, a capable assistant, and a strong curriculum may deliver better outcomes than a smaller group with fewer supports. While small groups are generally advantageous, especially for ensuring each child is known, heard, and attended to, they are best viewed as one element of a broader quality improvement strategy.

In addition to the main factors above, the review surfaced some cross-cutting themes

All children can benefit from high-quality ECEC, but some children may stand to gain more

High-quality ECEC is strongly linked to better outcomes for children, especially in cognitive and social development. Research from CESE (2018) emphasises that benefits from early education only occur when the quality of service is sufficiently high, defined by safe environments and positive teacher-child interactions.

Where ECEC is high-quality, all children can benefit, but disadvantaged children may gain the most if ECEC compensates for fewer learning opportunities at home. Indeed, studies show that good ECEC can substantially improve outcomes for children in poverty or facing other challenges. However, due to systemic factors, those same children are often at risk of attending lower-quality services and going on to attend lower-quality schools. It is also possible that the moderate impacts observed in some studies understate the potential of high-quality ECEC for disadvantaged children, as home environments may mitigate or limit the extent to which improvements in ECEC settings translate directly into measurable child outcomes.

Another perspective is the "differential susceptibility" of children: some children are more sensitive to the quality of their environment than others. For instance, a child with learning difficulties might thrive in a classroom with a low ratio and struggle in one with a high ratio, whereas a very resilient child might do fine in either. This reinforces the importance of structural conditions for inclusive education, so that children who need the most support are placed in environments equipped to provide it.



Measuring quality and outcomes

A key challenge identified in the review is that the way quality is measured can shape conclusions about what matters for children's development. Structural metrics, such as teacher qualifications, adult-to-child ratios, or group sizes are concrete and relatively easy to measure. As a result, they frequently form the basis of regulations and quality rating systems in ECEC.

However, these structural indicators alone do not capture the richness or complexity of children's everyday experiences. Measures of process quality, which reflect the quality of adult-child interactions, the emotional climate, and the instructional support provided are often more predictive of children's developmental outcomes but are harder to quantify and require trained observation.

Further, as the reviewed literature illustrates, it is not guaranteed that the same structural settings will result in the same level of process quality in different settings.

Some widely used quality rating tools (like ERS or CLASS) attempt to combine structural and process elements. For example, North Carolina's quality rating and improvement system awards stars partly based on structural features such as teacher qualification and ratios and uses observation scores for process. In this system, programmes with the very highest rating did have measurably better classroom environments and slightly better child outcomes (like lower behaviour problems), but the difference between 4-star and 5-star programs was minimal. Some lower-rated programmes still showed decent interaction quality, suggesting that the rating based on structural compliance doesn't always align with actual process quality.

There are also broader questions about what constitutes quality. While structural and process indicators offer useful benchmarks, quality is shaped also by context, culture, and purpose. What counts as "high quality" can vary depending on values, or the needs of different children, their families, and communities.

These nuances create challenges both for assessing centre quality and for research that aims to identify what works in ECEC. If the tools used to measure quality fail to capture the most meaningful aspects of children's experiences, then even high-quality practice may go undetected in studies. Similarly, if child outcomes are assessed only through broad standardised tests, they may miss the specific gains influenced by improved practice. These measurement limitations help explain why studies often find weak or inconsistent links between observed quality and child outcomes, even when practitioners or observers perceive improvements in the learning environment. This points to the need for comprehensive monitoring and the need to complement analysis of structural indicators with direct observations of classroom practice to truly assess quality in context.

This evidence review suggests that structural quality in ECEC is essential but works largely by facilitating high process quality

Across all structural levers, a consistent narrative is that structural quality enables process quality, which in turn drives child outcomes. Structural elements like qualifications, ratios, and group size are



most impactful when they translate into richer teacher–child interactions, better curriculum delivery, and a more responsive learning environment.

The role of process quality in driving child outcomes

Measures of process quality (for example, observation scales of teacher warmth, sensitivity, and educational support) have been found to predict children's developmental gains more strongly than structural indicators alone. For instance, children who experience high emotional support and stimulation in preschool tend to show better language, cognitive, and social-emotional skills over time, regardless of the class size or teacher degree in isolation.

This highlights how improving structural quality may be more of a means to the end goal of improved interactions and experiences for children. The review of the literature shows that high structural standards create the conditions for good process quality. However, if structural improvements are implemented without attention to process, the impact for children may be muted.

Key structural components, including well-qualified teachers, strong leadership, favourable adult-to-child ratios, and manageable group sizes, function as enablers of positive teacher–child interactions and rich learning experiences. When these structural elements are in place and balanced, children are more likely to experience the warm, stimulating, and secure environments that research shows support better cognitive and social outcomes. However, the direct one-to-one link from any single structural input to child outcomes is often weak, indicating that no single "input" guarantees success on its own.

Conclusions

This report reviewed recently published international meta-analyses and systematic reviews of evidence that explores the links between features of structural quality in ECEC and outcomes for children. The reviewed evidence does not provide clear direction regarding specific thresholds for structural settings, or optimal combinations of settings across structural features. Rather, the reviewed evidence reinforces existing understandings that:

- structural features work together in complex and sometimes non-linear ways
- process quality is often more directly linked with child outcomes than structural quality inputs
- structural features and process quality are interlinked, and
- the same structural settings are not guaranteed to deliver the same level of process quality in different ECEC settings or contexts.

While this review synthesises a substantial body of international evidence on the relationship between ECEC structural quality and children's outcomes, several important limitations and gaps remain. To develop a comprehensive understanding of ECEC quality and its implications, readers are advised to interpret findings in this report alongside insights from three types of studies—international qualitative studies, contextually relevant New Zealand research, and longitudinal studies.



- International qualitative studies. Many robust studies may have been excluded under the literature review's search and inclusion criteria. These often provide insights into equity, what quality looks like, and its relationship to outcomes for underserved communities.
- Contextually relevant New Zealand research. There is limited work explicitly examining ECEC quality factors and outcomes within Aotearoa's cultural, social, and policy context. Combining quantitative and qualitative approaches is important to capture both measurable inputs and nuanced process quality.
- Longitudinal evidence. Few studies track children's development over time or use large-scale datasets to understand sustained impacts of ECEC quality in New Zealand.



Introduction

Background to this literature review

This literature review investigates the relationship between structural quality inputs in early childhood education and care (ECEC) settings and outcomes for children. Structural inputs, such as educator qualifications, supervisory roles, adult-to-child ratios, and group sizes, are foundational features of ECEC environments that are typically regulated and easily documented. While these inputs do not guarantee high-quality provision on their own, they are essential for enabling the process quality that directly shapes children's learning and development.

This literature review examines the link between structural inputs, specifically educator qualifications, leadership roles, adult-to-child ratios, and group sizes, and outcomes for children who attend early childhood education.

The Ministry of Education (the Ministry) commissioned this review to support two key policy initiatives: the Ministry's response to the Regulatory Review of Early Childhood Education (ECE) and the upcoming ECE funding review. We aim to identify which structural inputs have the greatest impact on child outcomes. Where evidence allows, we also examine the point at which further investment in structural quality begins to yield diminishing returns. In doing so, we consider how different structural elements might be balanced to maintain high-quality service delivery while minimising unintended consequences or reduced service quality.

Ultimately, this literature review seeks to support evidence-informed decision-making about how structural settings can be leveraged to improve outcomes for children across different service types and age groups.

Defining structural quality inputs

Structural quality inputs refer to the foundational, regulable² features of ECEC settings that support effective teaching and caregiving practices. These include:

- **Qualifications:** The formal education and specialised training of educators and administrators, which influence their ability to deliver developmentally appropriate and responsive education and care.
- **Supervisory roles:** Leadership and oversight structures that ensure consistent implementation of quality practices and support professional development.

² Regulable: capable of being regulated through policy or licensing standards. Typically, this refers to features of the ECEC system that can be formally mandated, monitored, and enforced by governing bodies.



- **Adult-to-child ratios:** The number of children per educator, which affects the level of individual attention and responsiveness possible in daily interactions.
- **Group sizes:** The total number of children in an early childhood setting, influencing the social dynamics and manageability of the environment (Ackerman, 2021).

These structural inputs are typically regulated by licensing bodies and are easily documented. They form the infrastructure that enables process quality (the interactions and experiences that directly shape children's learning and development). While structural quality alone does not guarantee positive outcomes, it is essential for creating the conditions under which high-quality interactions can occur (Ackerman, 2021).

Current structural quality inputs in New Zealand

The following inputs reflect minimum structural requirements as set out in New Zealand's regulatory framework for ECE. These standards are mandated and serve as a baseline for service operation. However, they do not necessarily reflect how all providers operate in practice as many services may exceed these minimum requirements.

Qualifications

In teacher-led, centre-based services, at least 50% of required educators must hold a recognised ECE teaching qualification. Additionally, there must be one adult who holds a first aid qualification present for every 25 children.

The "required staff" count is based on the total number of adults needed to meet the minimum adult-to-child ratios, either according to the service's full licence maximum or, in the case of a probationary licence, the number of enrolled children. A recognised ECE qualification refers to one approved by the Teaching Council of Aotearoa New Zealand for registration purposes. All home-based educators must hold at least a Level 4 ECE qualification by 2025 (Education (Early Childhood Services) Regulations, 2008).

Overseas qualifications must be comparable to a New Zealand early learning or primary teaching qualification. Teachers with an overseas qualification must apply to the New Zealand Qualifications Authority (NZQA) for an International Qualifications Assessment (MoE, 2024).

Person(s) responsible roles

In centre-based services, there must always be one or more person(s) responsible present when children are attending. There must be one person responsible for every 50 children in attendance. This person oversees curriculum implementation, and regulations require the person responsible to be directly involved in and primarily responsible for the day-to-day education and care, comfort and health and safety of the children. The person responsible at a centre-based service must hold a recognised early childhood or primary teaching qualification and current practising certificate, as well as a current first aid certificate.



Adult-to-child ratios

Minimum adult-to-child ratios vary by age group. For example, in centre-based services, one adult is required for every five children under 2. For children 2 years and over, the requirement is for one adult for the first six children, two adults for seven to 20 children, and thereafter a 1:10 ratio. Home-based services require one adult for every two children under 2 and for every four children aged 2 years and over, including mixed aged groups (Education (Early Childhood Services) Regulations, 2008). These are minimum standards that services may exceed but are not required to. The adult-to-child ratio must be kept at all times, including on excursions or during staff breaks (MoE, 2024).

Group size

In New Zealand, group size is not directly capped in legislation. Rather it is regulated indirectly through a combination of settings, including licence size (or service size), adult-to-child ratios, and space requirements. For centre- and hospital-based services, there should be no more than 150 children aged 2 years and over at any one time, no more than 25 children under 2 at any one time, or no more than 50 children at any one time if mixed age groups. For home-based services, there should be no more than 100 children attending at any one-time (Education (Early Childhood Services) Regulations, 2008). However, the way that children are grouped within a licenced service is still at the discretion of providers, provided that other regulations are met (Alexander, 2011).

Scope of this research

The review examines the relationship between four key structural quality inputs and child outcomes in early childhood education and care settings:

- Educator qualifications: including level, specialisation, prior experience, and in-service professional development.
- Supervisory roles: including pedagogical and administrative leadership, and the regulatory role of the "person responsible."
- Adult-to-child ratios: across different age groups and service types.
- Group sizes: and their influence on social dynamics, manageability, and developmental outcomes.

These inputs are considered in relation to a broad set of child outcomes, including cognitive, social-emotional, language, cultural, and health-related domains. The review includes both concurrent (short-term) and cumulative (long-term) outcomes, with contextual clarity provided throughout.

This literature review also includes substantive discussion regarding professional development (PD). Although PD is not a fixed or regulated feature of service design, it emerged as a major theme across the literature we reviewed in relation to structural quality. The volume and consistency of evidence linking PD to improvements in service quality and child outcomes warranted its inclusion.



The review focuses primarily on teacher-led, centre-based and home-based ECEC services. The following areas were considered **out of scope**:

- Playgroups and hospital-based services, unless directly relevant.
- Parent- and whānau-led services (for example, kōhanga reo or playcentres).
- Curriculum, health and safety, or premise and space requirements.
- Regulatory system design and broader workforce issues.
- Funding mechanisms.

However, curriculum and health outcomes were considered where they were demonstrably influenced by structural inputs (for example, the role of qualified teachers in curriculum delivery or the impact of ratios on physical safety).

Given the review's focus on international meta-analyses and systematic reviews (discussed below), which rarely include culturally-specific service types, the evidence base does not adequately reflect the unique characteristics or outcomes associated with kōhanga reo. Further work is needed to understand the body of research specific to culturally grounded ECEC models in Aotearoa New Zealand.

Methodology and inclusion criteria

Studies were included if they:

- directly examined the relationship between one or more structural inputs and child outcomes
- provided quantitative or qualitative evidence relevant to ECEC settings
- were published from 2015 onwards, with preference given to meta-analyses, systematic reviews, and high-quality empirical studies, or
- Were relevant to the New Zealand context or to jurisdictions with comparable ECEC systems.

Selected grey literature was included where it met the above criteria, with priority given to publications from the OECD, EU, and recognised research institutes, including country reviews from Australia and Scotland.

Literature was either:

- Provided by the Ministry from a store of articles and reports compiled by policy staff working in this area, or



- Identified by MartinJenkins through a search of Google Scholar, using the below terms. All articles that were deemed relevant or potentially relevant³ based on their title were accessed, regardless of whether they were opensource or behind paywall.

In rare cases, additional articles were sourced directly if they were referenced repeatedly in the articles in our core set.

Table 1: Search terms used to identify relevant literature

Filter settings	Search terms
Articles (not case law) 2015-present Published in English or English translation available	Meta analysis of; and Systematic review of; early years education teacher qualifications early years education qualifications early years education ratios early years education group size leadership roles in early years education roles in early years education person responsible requirements in early years education structural quality in early years education structural quality indicators in early years education relationship between child outcomes and structural quality in early years education relationship between child outcomes and teacher qualifications in early years education relationship between child outcomes and group size in early years education relationship between child outcomes and ratios in early years education relationship between child outcomes and leadership roles in early years education Searchers were repeated replacing 'early years education' with 'ECEC'

³ Searches tended to surface many thousands of results. These were sorted by 'relevance' and titles on the first 10 pages were reviewed. In most cases it was immediately obvious from the title whether an article was relevant to the review, for example the same search returned these results: "The impact of teachers' qualifications on development outcomes in early childhood: a systematic literature review", "Effects of physical activity on motor skills and cognitive development in early childhood: a systematic review", and "Artificial intelligence literacy in higher and adult education: A scoping literature review".



Triage and prioritisation

The search process resulted in 118 articles and reports that were 'relevant' or 'potentially relevant'. All these documents were triaged and prioritised in two steps (abstract review and lite-read full article), and assessed for:

- relevance to one or more topics of interest: qualifications (including professional development), leadership roles, ratios, and group size
- published 2015 or later
- published in peer-reviewed journal or is from other reputable source
- reports findings of a meta-analysis or systematic review, and
- relevance to multiple countries / jurisdictions.

As well as recording key information about the article for easy sorting in the review proper, we also assigned a 1-4 priority ranking to the article. In rare cases, the priority ranking assigned when the abstract was reviewed was changed following a lite read of the full article.

Table 2 provides an overview of the prioritisation categories, results, and how each article from each priority category were used in the review. The results of our prioritisation process were tested with advisors from the Ministry for further quality assurance.

Table 2: Literature prioritisation categories

Priority 1	Priority 2	Priority 3	Priority 4
Highly relevant for review • Meta-analysis or systematic review • Peer-reviewed • published 2015 or later • Relevant to at least one of the factors we are exploring.	Relevant but not highly generalisable • Is peer-reviewed • has clear methodology • Published 2015 or later • Relevant to at least one of the factors we are exploring. But not meta-analysis or systematic review.	Context Provides good summary of issues, concepts, context, or background; published 2015 or later But not meta-analysis or systematic review, methodology is unclear, it is unclear how fulsome or selective the literature review is.	Not relevant for review Not peer-reviewed, or credible, lacks transparent method, or doesn't relate to any of the factors we are exploring.
Key input to analysis	Included selectively to add richness or illustrate additional / nuanced points	Included selectively to provide richness and context	Excluded from further analysis
N=31	N=27	N=25	N=35



Limitations and intended uses

The report is intended to provide a summary of evidence to inform policy development. Further analysis is required to determine policy settings that are suitable in the New Zealand context.

While our search was extensive, it is possible that relevant literature has been missed – particularly in relation to Leadership Roles (where our search terms were not well-targeted) and professional development (which is not a feature of structural quality, and was not a primary focus of the review but arose as a relevant sub-category of qualifications throughout the review). We highlight these limitations in the relevant sections.

This evidence review is intended to support policy analysis by providing an updated picture of the recent research on quality in ECEC. It is not intended to serve as policy advice, but rather as a resource to inform analysis and advice.

The review builds on the Ministry's existing institutional knowledge and assumes familiarity with foundational concepts and seminal works in the field. As such, classic studies are not the focus, though some are referenced where necessary to clarify key ideas or contextualise newer findings. The focus is recent research, particularly meta-analyses, systematic reviews, and large-scale syntheses to reflect the most up-to-date international evidence available.

We have not independently assessed the quality, timeliness, or methodological rigor of the included meta-analyses and systematic reviews, instead relying on their peer-reviewed status as an indicator of validity.

While this approach allows for a high-level overview of broad trends, it also comes with limitations. Meta-analyses tend to favour studies with measurable outcomes and standardised indicators, which tend to under-represent context-specific, qualitative, or culturally grounded insights. In some areas where limited meta-analytic evidence exists (for example, leadership or culturally responsive practice), relevant qualitative findings have been included where appropriate.

Importantly, applying international evidence to the New Zealand context presents challenges. New Zealand's unique cultural, social, and regulatory environment, including the significance of Te Tiriti o Waitangi and the diverse needs of Māori and Pacific communities means findings from other countries may not always directly translate. This further emphasises the importance of interpreting evidence with attention to local context and values. Other gaps relate to Kohanga Reo and Playcentre settings.

It is also important to note that within the reviewed literature analysis of cost effectiveness, including financial trade-offs across structural quality inputs, or diminishing financial returns from quality settings is sparse and sometimes influenced by authors' agendas. This limits our ability to draw firm conclusions about the economic trade-offs involved to inform the Ministry's work on the ECE funding review.



Omissions from this report

While the focus on quantitative studies allows for systematic analysis of structural quality indicators, it also means that some important questions remain underexplored due to limited evidence contained within the sample of studies reviewed. A broader or more qualitative review of the literature, including studies outside our inclusion criteria, may yield further insights in the following areas:

- The relative impact of different structural quality indicators over the short and long term, including whether there are diminishing returns associated with specific inputs (for example, further reductions in adult-to-child ratios or increases in qualification levels beyond a certain threshold).
- Interactions and trade-offs between structural inputs, particularly regarding which combinations may deliver improved child outcomes most cost-effectively. There is limited evidence in the studies we reviewed that explicitly examines how different structural factors work together in practice, or what trade-offs might be acceptable under constrained resources.
- Applicability to the New Zealand context: While several studies share relevant characteristics (for example, similar policy settings or mixed delivery systems), relatively few directly examine systems or populations closely aligned with Aotearoa New Zealand. It should also be noted that no New Zealand-specific studies met the search and inclusion criteria set for this review. A focused analysis of contextually similar jurisdictions or local qualitative research could help inform how structural quality reforms might play out in practice.

These gaps highlight the value of complementary qualitative and mixed-methods research to deepen understanding of how structural conditions affect practice, and ultimately, child outcomes.

Key terms used in this report

Teachers and educators

Teachers and educators are the adults responsible for the education and care of children in ECEC settings. In this report, the term "educator" is used inclusively to refer to all adults responsible for the education and care of children in ECEC settings, regardless of their qualification level. This includes both qualified teachers and other adults who contribute to children's learning and wellbeing, whether or not they hold a formal teaching qualification. "Teacher" refers specifically to educators who hold a recognised teaching qualification.

Structural quality inputs

Structural quality inputs are the foundational, regulable features of ECEC settings that support effective teaching and caregiving practices. These include:

- **Qualifications:** The formal education and specialised training of educators and administrators, which influence their ability to deliver developmentally appropriate and responsive education and care.



- Supervisory roles: Leadership and oversight structures that ensure consistent implementation of quality practices, day-to-day education and care, comfort and health and safety of the children.
- Adult-to-child ratios: The number of children per educator, which affects the level of individual attention and responsiveness possible in daily interactions.
- Group sizes: The total number of children in an early childhood setting, influencing the social dynamics and manageability of the environment.

Framing teacher qualifications

This report uses the term qualifications to refer broadly to the formal education and training held by adults responsible for the education and care of children in ECEC settings. However, it is important to note that across the literature the level and nature of qualifications are not always clearly or consistently defined. This may reflect the largely cross-country nature of the studies that were included.

Terms such as *"higher qualifications," "advanced qualifications," "degree-qualified," "baseline qualifications," "moderate qualifications," "lower qualified," "highly trained," "well qualified,"* and others appear frequently, but their specific meanings often vary across studies or are left undefined. For example:

- In some studies, "higher qualifications" may explicitly refer to educators holding a bachelor's degree or above, while in others, the term is used more generally, without reference to a particular qualification level.
- Similarly, phrases like "formal credentials," "initial qualifications," or "advanced education" may reflect different thresholds depending on the context, including diplomas, associate degrees, or teaching certifications that are not always equivalent or comparable across jurisdictions.

Because of this inconsistency, this report does not impose a single, standardised definition of qualification levels. Instead, it uses the terminology of the original studies wherever possible and highlights when qualification categories are defined clearly versus when they are reported in more general or relative terms.

Where the evidence allows, some broad interpretive distinctions are made (for example, studies comparing educators with and without a bachelor's degree), but readers should be aware that definitions may differ significantly depending on the study, country, or policy context.

Ratio standards

The number of children assigned to each educator in a classroom. Lower ratios mean fewer children per adult, enabling more individualised attention and interaction. For consistency, this review uses the term "adult-to-child ratio" to refer to the numerical configuration described in each study, even though the exact numbers and terminology vary across contexts and studies.



Different terms are used in the literature to describe various levels of ratios. Where possible, this report reflects the language of the original study. However, for clarity, the following broad categories are used to interpret and synthesise findings:

- **Regulatory ratios:** Ratios that meet the minimum legal or policy standard for a given country or jurisdiction (sometimes referred to as "standard" or "typical" ratios).
- **Favourable ratios:** Ratios that are better than the minimum regulatory requirement (for example, fewer children per educator than required), sometimes called "low" or "reasonable" ratios depending on the context.
- **Strained or high ratios:** Ratios that approach or exceed the regulatory maximum, where the number of children per educator may hinder responsiveness or individual attention.
- **Ratio floors or ceilings:** Terms used in the literature to indicate lower or upper boundaries for adult-to-child ratios, often in policy modelling or system-level recommendations.

Because studies differ in how they define or apply these terms, and not all studies provide exact numerical definitions, readers should note that descriptions such as "moderate," "high," or "favourable" are relative and may vary based on jurisdiction and study design.

Process quality

Process quality refers to the day-to-day interactions and practices that children directly experience in ECEC settings. This includes the warmth and responsiveness of educators, the stimulation and support during activities, the richness of conversations, and the quality of educator-child and child-child interactions.

High quality ECEC

The term high quality is widely used in the literature but is challenging to define precisely, as it is a multifaceted and sometimes contested concept. In ECEC, "high quality" can refer to both structural features and process features.

This review does not attempt to establish a universal definition of "high quality." Instead, when the term "high quality" is used, it refers strictly to how each particular study has defined it. Definitions may vary across studies and contexts and may be based on different combinations of structural and process indicators. The review acknowledges these variations and uses the term in alignment with the definitions provided in the original research.



Setting the scene

There is widespread agreement that high-quality ECEC is beneficial for children's outcomes

There is a large body of literature of cross-sectional findings demonstrating that children who attend ECEC do better on a range of cognitive and non-cognitive measures than children who do not attend ECEC. A seminal example is the Effective Preschool, Primary and Secondary Education (EPPSE) project, launched in 1997 and funded by the UK government, is a landmark longitudinal study designed to evaluate the impact of preschool attendance on children's academic and social-behavioural outcomes. The study followed nearly 3,000 children who attended English preschools and compared their progress to a control group of 380 children with little or no preschool experience. Major evaluations have revealed strong positive associations between preschool participation and a wide range of outcomes, even after controlling for background characteristics. These findings have led some to conclude that early childhood education not only boosts attainment and progress in the early school years but also sets children on a trajectory of sustained academic success (CESE, 2018).

Research consistently shows that children experience stronger and more lasting positive outcomes when they attend early learning settings that are warm, sensitive, and responsive. In high-quality environments, children are more likely to engage in complex peer interactions, develop stronger language and cognitive skills, and score higher on school readiness assessments. These benefits are not just immediate but can have lasting impacts well into later schooling and adulthood. In contrast, low-quality ECEC settings, especially those lacking intentional teaching practices or emotional support, can result in minimal developmental gains or even negative outcomes (CESE, 2018). The literature also suggests that the benefits of quality ECEC are particularly pronounced for children from disadvantaged backgrounds (Gambaro, Stewart, & Waldfogel, 2024). High-quality provision can serve as a powerful equaliser, offering these children enriched learning experiences and emotional support they might not receive elsewhere. In low-quality settings, however, children may be exposed to poorly structured routines, low educator responsiveness, and limited opportunities for meaningful engagement, all factors that can hinder their development across multiple domains (Melhuish, et al., 2015).

In other words, quality matters. Nurturing adult-child interactions and enriching, stimulating environments during the early years are crucial for children's cognitive, language, and social-emotional development. These foundational experiences set a trajectory for positive educational outcomes, resilience, and long-term wellbeing (Gambaro, Stewart, & Waldfogel, 2024). With the rapid expansion of ECEC provision in many countries, the literature is paying closer attention to the different ways in which design characteristics of early childhood programmes and learning influences child success (Purtell & Ansari, 2018).

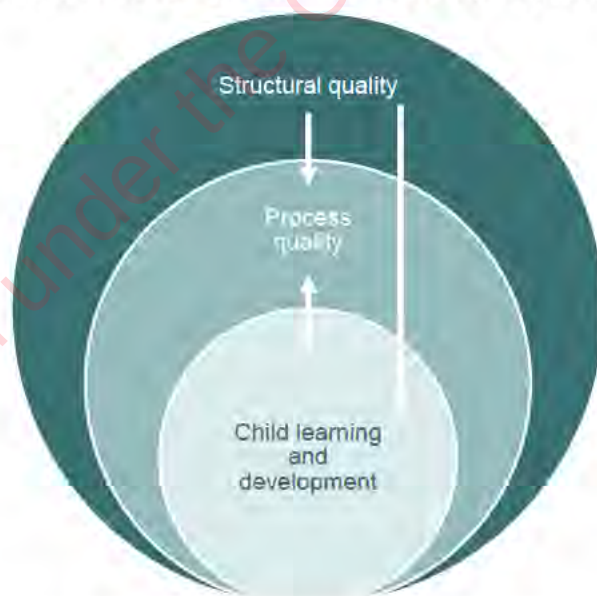


However, as we will go on to demonstrate, there is little agreement about how much quality (and of what type) is required to ensure positive outcomes. Quality in educational settings can be "a relative and sometimes politically contested term". In ECEC specifically, quality has been described as a "slippery and multifaceted construct that requires careful measurement and interpretation" (CESE, 2018).

Quality is commonly defined in terms of structural and process features

Researchers and policymakers usually distinguish between two core dimensions of ECEC quality: structural and process quality. Structural quality refers to the observable, "input" characteristics of a programme that are relatively easy to quantify and regulate, for example, adult-to-child ratios, group sizes, qualifications and training levels, class size, facilities, and materials. These structural features form the basic conditions under which education and care take place. In contrast, process quality denotes the day-to-day interactions and practices that children directly experience. For instance, the warmth and responsiveness of educators, the stimulation and support during activities, the richness of conversations, and the quality of teacher-child and child-child interactions (Slot, Structural characteristics and process quality in early childhood education and care: a literature review, 2018).

Figure 1: OECD adaption of the conceptual model of quality relationships in ECEC



Source: Recreated from (Slot, Structural characteristics and process quality in early childhood education and care: a literature review, 2018)



Importantly, these two dimensions of quality are interrelated. Slot's (2018) conceptual framework, adapted by the OECD, illustrates the relationship between various levels of ECEC quality and child outcomes (Figure 1). Structural factors are widely viewed as an important precondition for good process quality. Enhancements in organisational structures, materials, and facilities foster environments that promote effective teaching and child engagement for development and learning (Deding & Minnaert, 2024). For example, a centre with favourable adult-to-child ratios, small group sizes, and well-trained teachers creates an environment more conducive to rich interactions. An educator who has only a few children to attend to can engage in more individualised and attentive conversations. In this sense, structural quality is often seen as a distant factor that influences children's development indirectly by shaping process quality. By contrast, process quality is argued to have a closer influence as it reflects the immediate experiences that directly impact a child's learning, socio-emotional growth and wellbeing (Sluiter, Fekkink, & Fekkes, 2025).

However, there are challenges associated with defining and measuring quality

Challenges in how quality is defined

Ensuring high quality is not straightforward. As described above, quality has multiple dimensions (structural and process), and even within those broad categories there are many specific aspects. Quality can encompass everything from safety and hygiene to emotional climate to curriculum content. This multifaceted nature makes it hard to capture with a single definition or instrument. For example, despite the adoption of a shared European framework in 2014, the definition of quality remains fragmented, with responsibility for its interpretation left to national or regional authorities. This means what one system calls "high quality" may not exactly match another system's criteria. In the European case, decentralisation leads to fragmentation: local authorities set their own benchmarks, which complicates comparisons and consensus on quality standards. As the author put it, "operationalising and monitoring ECEC quality remains quite challenging due to its inherent multidimensionality" (Motijunaite, 2021).

Limitations in how quality is measured

Another difficulty is the imbalance in measurability between structural and process elements. Structural quality indicators are relatively easy to measure and monitor. It is straightforward to check qualifications, count children per class, or verify the presence of a curriculum. These lend themselves to regulations and checklists. Governments often focus on these because they are concrete targets. In contrast, process quality is more difficult to assess consistently and reliably. It requires skilled observers to sit in a classroom and rate the interactions, or other nuanced approaches like video analysis or teacher self-reflection tools. This is time-consuming and expensive to do at scale. As a result, monitoring systems tend to rely on structural proxies of quality more than direct process assessment. This imbalance in measurability means that process quality is often underemphasised,



despite its critical role in supporting children's learning and development (Cohrssen, de Rosnay, Garvis, & Neilsen-Hewett, 2023).

Several studies highlight the limitations of widely used measurement tools. Popular observational instruments like the Early Childhood Environment Rating Scale (ECERS) or the Classroom Assessment Scoring System (CLASS) have helped standardise quality measurements, but they each have limitations. For example, Perlman et al. demonstrate the limitations of the CLASS tool in their meta-analysis of quality interactions between educators and children. The CLASS tool is widely used to rate teacher-child interactions on dimensions such as Emotional Support and Instructional Support, providing a single set of scores for a classroom. If multiple adults work in the room, CLASS doesn't distinguish their individual contributions, for example, a great assistant and a mediocre lead teacher might average out to a middling score. Conversely, other measures might focus on individual educators but then miss the overall classroom dynamic (Perlman, et al., 2016).

Thorpe et al. (2023) explore whether the metrics that label Australian ECEC teaching as "low quality" accurately reflect the pedagogical practices and values of the sector. Drawing on a review of observational tools such as the CLASS tool, the authors argue that these instruments fail to capture the relational, play-based, and contextually embedded nature of Australian ECEC pedagogy. The findings highlight that such tools oversimplify teaching by reducing it to observable behaviours, overlooking educators' professional judgement, ethical engagement, and nuanced interactions with children. This misalignment risks misrepresenting the quality of teaching and undermines educators' professional identity and morale. The authors call for broader, more context-sensitive approaches to evaluating teaching quality that honour the complexity and cultural specificity of early childhood practice in Australia (Thorpe, Hoven, Rankin, Pattison, & Staton, 2023).

Similarly, Burchinal (2018) critiques widely used global measures such as ECERS and CLASS, which often fail to capture culturally specific and contextually relevant aspects of quality and emphasise structural features over process quality. As a result, they tend to show limited predictive validity for child outcomes. Moreover, their static nature overlooks the dynamic and evolving character of classroom environments, and instructional quality remains difficult to observe and evaluate reliably (Burchinal M., 2018).

The limitations of current measurement tools may help explain why studies often find weak or inconsistent links between observed quality and child outcomes. As one study notes, these differences in what and how we measure may help explain why strong links between quality and child outcomes are hard to detect (Perlman, et al., 2016).

Challenges linking quality to outcomes

Additionally, linking measured quality to child outcomes is methodologically difficult, which ties into why measuring quality itself is hard. Many studies are correlational – they observe quality at a point in time and then see how children fare later. The true impact of quality can be masked by many other variables in a child's life (for example, their family environment or innate abilities). For example, according to the differential susceptibility hypothesis, some children, because of their genetics,



temperament, or other factors are more sensitive to how supportive their environment is. In the context of ECEC, this means a high-quality setting might dramatically benefit certain children, while others would have done OK even in an average setting. However, when researchers look at the average impact across all children, the benefits for these more vulnerable children may get diluted or hidden (Perlman, et al., 2016).

Socio-economic background may also impact the extent to which quality is beneficial or moderated. A UK study sought to investigate whether children from disadvantaged backgrounds in England receive lower quality ECE. It found that while disadvantaged children were more likely to attend maintained nursery classes (typically staffed by qualified teachers or Early Years Professionals) the settings serving these children were less likely to receive top Ofsted quality ratings. The authors suggested this was because Ofsted ratings partly reflect child development levels, which are influenced by home environments and children's starting points. It may be genuinely more challenging to deliver outstanding provision to children facing greater difficulties at home, such as parental stress or poverty-related barriers (Gambaro, Stewart, & Waldfogel, 2024).

Studies like the effective provision of pre-school education (EPPE) study in England have found that what happens at home (in relation to parental engagement in learning, for example) is an even stronger predictor of child outcomes than ECEC quality. But this doesn't diminish the role of ECEC quality; rather, it suggests quality ECEC can be particularly crucial for children who, for various reasons, may not have as enriching a home environment. In EPPE, "disadvantaged children benefit significantly from good quality pre-school experiences, especially where they are with a mixture of children from different social backgrounds". High quality ECEC can thus act as a compensatory mechanism. However, if disadvantaged children end up concentrated in lower-quality centres, that mechanism is undermined (Gambaro, Stewart, & Waldfogel, 2024).

Taken together, the literature highlights the methodological complexity of linking measured ECEC quality to child outcomes. The interplay of individual child characteristics, socio-economic background, and home learning environments means that the impact of quality is not uniform across populations. As one review put it, given the "multitude of factors that impact child development, it is encouraging" to find any significant associations between measured classroom interactions and outcomes (Perlman, et al., 2016).



1. What is the relationship between teacher qualifications and children's outcomes?

High-quality ECEC is widely recognised as crucial for children's development. Among structural quality factors, qualifications (such as formal education level, specialised training, and certification in early childhood) are often assumed to enhance classroom practices and, in turn, improve child outcomes.

Eight articles in our Priority 1: Highly Relevant set had a specific focus on *teacher qualifications and child outcomes*. These articles formed the base evidence for our review. Other sources were used for additional context or supporting points where noted.

Do higher teacher qualifications lead to better child outcomes?

Research to date offers a nuanced picture of whether higher teacher qualifications in ECEC lead to better outcomes for children. Overall, higher levels of formal teacher qualification are modestly associated with improved process quality, that is, the quality of interactions and learning experiences provided in the classroom, which in turn are key drivers of children's developmental outcomes. However, direct associations between teacher education levels and measured child outcomes are more variable across studies. Several large-scale reviews emphasise that teacher qualifications alone have a small positive effect on classroom process quality, and any direct impact on children's cognitive or social outcomes tends to be weak. This reflects the complex interplay of factors outside of qualifications that can support or mediate the impact on child outcomes.

Manning et al. (2019) conducted a meta-analytic review of 48 studies and found that teachers with higher education levels (for example, a bachelor's degree or above) provided significantly higher quality ECEC environments as measured by observational scales – including better organisation, richer language interactions, and more developmentally appropriate activities (Manning M., Wong, Fleming, & Garvis, 2019). In other words, more educated teachers tended to create classrooms with higher overall process quality. This improved process quality is a critical mediator that is expected to eventually translate into better child outcomes. Indeed, positive associations have been noted between having a degree-qualified teacher and aspects of children's experiences such as emotional support and instructional quality, which are predictive of learning and socio-emotional growth (Slot, Leseman, Verhagen, & Mulder, 2015) (Manning M., Wong, Fleming, & Garvis, 2019).

Additionally, Nocita et al. (2020) conducted a meta-analysis focusing on teachers' specialised training in early childhood (as opposed to just any higher education – more on this in the next section) and



similarly found mostly weak or null effects on child outcomes, which aligns with the broader evidence. While not always significant, the consistency in *direction* of effects (often positive) across many studies gives some weight to the qualifications-quality link (Nocita, et al., 2020).

An Australian review of 26 articles completed by Hoq et al. (2025) found mixed evidence of the role of qualifications on children's academic outcomes. Specifically, they refer to a domestic longitudinal data (from the Longitudinal Study of Australian Children), which showed evidence that teachers' pre-service qualifications correlated with children's better academic performance in primary school, and for contrast, a meta-analysis of research conducted in OECD countries that found no clear relationship with children's academic or social behavioural outcomes (Hoq, Power, Swami, Andersson, & Baxter, 2025).

However, another mixed-methods study in South Australia found that qualifications of early childhood educators play a significant role in the quality of children's learning experiences. Centres with more educators holding a bachelor's degree in early childhood education scored higher on the ECERS-R "Activities" subscale, which measures the richness and educational value of activities offered to children. This finding was supported by qualitative interviews with assessors, who described high-quality environments as those where children had access to diverse materials and where educators actively engaged with children through open-ended questions and documented their learning. These interactions were not just about providing materials but involved meaningful teaching, such as encouraging creativity in music or linking activities to real-world experiences. In contrast, centres with less qualified educators tended to offer activities without much educator involvement, which limited the learning potential (Krieg & Curtis, 2015).

There is also case study evidence that higher qualifications may act as a protective factor, enabling educators to maintain higher-quality learning environments even when conditions are more challenging. For example, Purtell and Ansari (2018) explored how the age composition of preschool classrooms in the United States affect children's school readiness, and whether classroom quality factors can buffer potential negative effects. Findings from the study showed that mixed-age classrooms were associated with poorer school readiness outcomes, particularly in lower-quality settings. However, when teachers had an associate's or bachelor's degree, there was no significant association between mixed-age classrooms and children's language and literacy skills, suggesting that education programmes equip teachers with the skills and strategies to construct classroom environments that are more appropriate for mixed-age groups (Purtell & Ansari, 2018).

However, when it comes to direct child outcomes (such as children's test scores or social skills measured at the end of preschool or later in school), the evidence is notably inconsistent. A recent systematic review by Yang et al. (2025) highlighted that some studies do find children in classrooms led by more qualified teachers show modestly better cognitive and academic skills, but other studies detect *no significant differences* in child outcomes based on teacher qualifications (Yang, Rahman, & Syn, 2025).

Similarly, an earlier systematic review and meta-analysis by Falenchuk et al. (2017), which pooled results from 39 studies, concluded that the overall relationship between qualifications and children's



outcomes is "non-existent to very borderline positive". However, their meta-analysis found that teachers' education showed some positive (albeit weak) benefits in a few areas (specifically, marginal gains in young children's language outcomes such as vocabulary and letter recognition) but no significant impact on math skills or broader measures of cognitive development. The authors characterised teacher education as not a key driver of child outcomes within the typical range of qualifications present in ECEC settings (Falenchuk, Perlman, McMullen, Fletcher, & Shah, 2017).

In summary, higher teacher qualifications tend to enhance the quality of ECEC provision (process quality) and are thus *indirectly* linked to better child development, but a clear *direct* causal link to child outcomes is not strongly supported by the literature, likely due to the complexities with isolating its impact.

Box 1

As part of a validation study into North Carolina's Quality Rating and Improvement System (QRIS), Hestenes et al. examined how structural quality factors, including teacher education, relate to observed classroom quality and children's social-emotional outcomes. The study aimed to determine whether high QRIS star ratings corresponded with better classroom environments and child development indicators. They found that higher levels of teacher education were positively and moderately associated with several indicators of classroom quality.

These measures included:

- the ECERS-R, which assesses global classroom quality across areas such as space, routines, and interactions
- the ECERS-E, which focuses on curricular quality in literacy, math, science, and diversity
- CLASS Emotional Support, which evaluates the warmth and responsiveness of teacher-child interactions
- CLASS Classroom Organisation, which measures how well teachers manage behaviour and structure learning time, and
- C5 Positive, which captures children's positive emotional expressions such as enjoyment and engagement.

These associations suggest that teachers with more formal education are better equipped to create emotionality supportive, well-organised learning environments, and to implement curricular strategies that promote child engagement and wellbeing. While the study did not directly link teacher education to child outcomes, these quality measures were themselves predictive of children's social skills, behaviour, and learning self-efficacy, suggesting that teacher education indirectly contributes to improved classroom environments that support child outcomes (Hestenes, et al., 2015).



Strength of the evidence linking qualifications and outcomes

The body of evidence on teacher qualifications and child outcomes is extensive but not uniformly strong; findings are mixed, and effect sizes when positive are generally small. The discrepancies across studies mean that the *overall strength of evidence is moderate*, or enough to suggest there is some relationship, but not strong enough to be deemed conclusive or universally generalisable.

On one hand, multiple meta-analyses and systematic reviews lend credibility to the idea that teacher qualifications matter, at least to some degree. The meta-analytic studies by Manning et al. (2019) and by Falenchuk et al. (2017) were large and systematic, aggregating dozens of independent samples; both provide statistically significant results indicating some positive correlation between teacher education level and desired outcomes (process or child outcomes). For instance, Manning et al. (2019) reported a significant overall correlation between teachers' qualifications and higher classroom quality ratings (Manning M., Wong, Fleming, & Garvis, 2019). Such findings, replicated in various contexts, underscore that the effect is real rather than random.

On the other hand, the magnitude of observed effects is typically very small, and many high-quality studies find null results, which highlights the complexity of the evidence base. For example, when Yang et al. (2025) systematically reviewed recent research (2016–2023), they found roughly an equal split between studies showing benefits of qualifications and studies showing no impact. They attribute this lack of consensus to several factors, including varying definitions of teachers' qualifications, different measurement approaches, and the potential influence of mediating factors such as teacher-child interactions (Yang, Rahman, & Syn, 2025).

Moreover, much of the research establishing links between qualifications and outcomes is correlational. As Falenchuk et al. (2017) noted, studies are often observational and susceptible to bias and confounding variables (for instance, centres with qualified teachers might also have more resources or smaller class sizes, which actually drive the child outcomes (Falenchuk, Perlman, McMullen, Fletcher, & Shah, 2017)). Very few randomised or experimental studies exist that isolate teacher qualifications, since one cannot randomly assign educators that have qualification or not. Thus, causality is inferred rather than proven.

In terms of statistical strength, when positive effects are detected, they are usually *small in size*. For example, Nocita et al. (2020) found effect sizes for the link between having an early-childhood-specialised teacher and child outcomes to be on the order of $r \sim 0.04$ (virtually zero) up to 0.06, which are very minor correlations (Nocita, et al., 2020). Similarly, Falenchuk et al. (2017) reported a correlation of 0.04 for vocabulary outcomes associated with teacher education, which is considered a tiny effect in practical terms. These results suggest that while the relationship is statistically detectable with large samples, its practical significance for children's learning might appear limited (Falenchuk, Perlman, McMullen, Fletcher, & Shah, 2017). However, it is difficult to fully assess the



practical significance from statistical analyses alone, given the complexity of educational environments and the multitude of factors influencing development.

In summary, the evidence that higher teacher qualifications improve child outcomes is neither particularly strong nor uniform. It is best characterised as *mixed evidence with weak positive trends*. There is enough empirical work to assert that teacher qualifications play a role in ECEC quality, but the inconsistency and small effect sizes mean readers should be cautious about assuming that raising qualifications alone will automatically yield major gains for children without considering other complementary factors.

Specific types of qualifications and specific child outcomes

Research has also delved into which aspects of qualifications matter most, and for which child outcomes. Teacher qualifications can encompass different dimensions. For example, the highest degree attained (high school, associate's, bachelor's, master's degree), field of specialisation (whether the teacher's training is specifically in early childhood education or a related field), certifications or credentials, as well as years of teaching experience and in-service training. Different studies have operationalised qualifications in various ways, and this can lead to different findings regarding specific outcomes.

Education level (Degree attainment)

Many studies define teacher qualification primarily by formal education level, such as whether an educator holds a bachelor's degree or not. Overall, teachers with at least a bachelor's degree in ECEC tend to support children's language and cognitive development slightly more effectively than educators with only secondary education or vocational diplomas. Falenchuk et al. (2017) found that, among the child outcomes examined, language outcomes (like vocabulary growth) showed the most noticeable positive association with degree-level qualifications. Specifically, in their meta-analysis, children's vocabulary and early literacy skills (letter-word identification) were slightly higher in classrooms led by teachers with degree-level qualifications (Falenchuk, Perlman, McMullen, Fletcher, & Shah, 2017). This suggests that teachers with degree-level qualifications may be better equipped to provide enriched language interactions, a critical element for literacy development. On the other hand, numeracy outcomes did not significantly differ based on teacher qualifications in that analysis.

Beyond meta-analyses, other studies similarly report that cognitive and pre-academic skills (such as emergent literacy) sometimes show small advantages when teachers have at least a bachelor's degree, whereas social-emotional or behavioural outcomes often show no difference (Slot, 2018). It appears that certain academic outcomes (language especially) are more sensitive to teacher instructional capacity, which bachelor-level qualifications may enhance, while children's social behaviours or executive function might depend more on interpersonal qualities that are not guaranteed by a degree.



Specialisation in ECEC

An important nuance is whether the teacher's qualification is specialised in early childhood. A meta-analysis by Nocita et al. (2020) focused on "early childhood specialisation," defined as teachers having qualifications specifically in ECEC or child development, as opposed to a general education or unrelated field degree. Intuitively, one might expect specialised training to yield better understanding of child development and better practice. However, Nocita et al.'s findings echo the broader trend of mixed and largely non-significant results. They evaluated child outcomes across multiple domains – cognitive, academic, physical, social, emotional, and behavioural – for preschool-aged children. The results showed very few significant differences in child outcomes tied to whether teachers held an ECE-specific qualification. In four categories of cognitive outcomes, the pooled effect sizes ranged from slightly positive to even a tiny negative in one case, and all essentially zero in magnitude (Nocita et al., 2020). Thus, having an early childhood-focused degree or certification, while logically important, has not consistently produced marked advantages in measurable child outcomes either – apart from contributing to overall quality (Nocita, et al., 2020).

That said, some individual studies have found particular qualifications matching with specific outcomes. For example, a study in Denmark cited by Deding and Minnaert (2024) that explored direct and indirect associations between structural and process quality and children's outcomes found that teachers holding a bachelor's degree in ECEC provided better emotional support and classroom organisation, which was linked to improved socio-emotional outcomes for children. (Deding & Minnaert, 2024).

These specific findings illustrate that the type of qualification may enhance process quality elements like emotional and instructional support, which then correlate with better outcomes in those domains (for example, social competence, language learning).

Experience vs. formal education

It is worth noting that some literature points to teaching experience as another facet of qualifications. While experience is not a formal qualification, it often compensates for or complements formal education. Research on experience suggests that experience alone also has a lukewarm relationship with child outcomes – experienced teachers are somewhat better at managing classrooms and may facilitate certain developmental gains, but inexperienced teachers with strong education can sometimes perform just as well (and vice versa) (McMullen, et al., 2020). For instance, a veteran teacher without a degree might be very effective through practical skill, whereas a new teacher with a master's degree might still be learning how to apply knowledge. Many studies find qualifications, specialisation, and years of experience tend to co-occur, making it difficult to discern which is the most important factor (Nocita, et al., 2020).



Nuances and additional insights on the qualifications–outcomes link

Beyond the broad findings above, the literature offers several nuances that deepen our understanding of how teacher qualifications relate to child outcomes and why the relationship is not straightforward. Key considerations include variations in how qualifications are defined, contextual and system-level factors, and the role of process quality as an intermediary. We highlight some of these insights below:

- **Definition and measurement of “Qualification”.** One reason for mixed findings is that studies define teacher qualifications differently. As noted by Yang et al. (2025), the term “teacher qualifications” can encompass education level, field of study, certification status, years of experience, and even in-service professional development. Some studies use a binary measure (for example, degree vs. no degree), others use a continuous variable (years of education), and others include whether the teacher specialised in early childhood (Yang, Rahman, & Syn, 2025).

These varying definitions mean that results are not always comparable. A study might find no effect of a bachelor's degree *versus* an associate degree, but that doesn't mean that specialised training or experience is useless. The heterogeneity in conceptualising qualifications leads to inconsistent evidence. For instance, a few studies bundled teacher qualifications together with other structural features (like ratios and class size) and found an overall weak effect, making it hard to isolate the impact of qualifications alone. The lack of standardisation in measuring teacher qualification was highlighted as a major challenge by Yang et al. (2025), who called for more uniform methods in future research.

- **Process quality as the mediator:** A widely accepted nuance is that teacher qualifications affect children *indirectly* through improving process quality (teacher-child interactions, instructional quality). If higher-qualified teachers engage in more responsive, cognitively stimulating interactions, children are likely to benefit; but if qualified teachers work in poor conditions or do not translate their knowledge to practice then child outcomes won't improve. This mediating role of process quality explains why we often see better classroom ratings with qualified teachers but not always commensurate jumps in child test scores (Manning M. , Wong, Fleming, & Garvis, 2019).
- It could be that the child outcome measures used in research (for example, standardised tests at the end of preschool) are too distal or influenced by many outside factors to pick up the subtle improvements that accrue from better daily interactions. For example, Hu et al.'s (2019) research in Australia provides an illustrative example of how qualifications can translate into higher-quality pedagogy. They investigated how early childhood educators use commanding language to guide infants' behaviour in long day care centres, and whether professional qualifications influence these language choices. They found that educators with university qualifications used significantly fewer commands overall and were more likely to use indirect and suggestive forms when compared with certificate or diploma qualified teachers. This approach creates a more conversational and respectful tone, acknowledging the child's agency and fostering early



experiences with explanation and argumentation. These differences suggest that university-qualified educators create richer language environments that support infants' early language development and familiarity with academic discourse styles, which are crucial for later literacy and learning outcomes (Hu, Torr, Degotardi, & Han, 2019).

Over the long term, consistent exposure to high process quality should yield benefits and some longitudinal studies do find long-term gains, however, short-term studies might not capture it. The implication is that qualifications are important insofar as they lead to better teaching practices; simply employing a teacher with a degree doesn't automatically improve a child's learning or development unless it translates into higher-quality pedagogy.

- **Threshold and diminishing returns.** There is discussion about whether there is a threshold effect for teacher education. Some argue that a minimum level of qualification is necessary for quality (for example, having at least a bachelor's degree ensures a baseline of content knowledge and pedagogy), but beyond that minimum, additional degrees may yield diminishing returns. Research supports this to an extent: the difference in quality between having no post-secondary training and having a college-educated teacher is more pronounced than the difference between a bachelor's versus a master's degree teacher (Early, et al., 2007).

This suggests a plateau effect, where basic teacher education is crucial, but very high qualifications do not linearly increase child benefits. Policymakers often face this nuance: balancing improved qualifications with other investments (like ongoing training or reducing adult-to-child ratios) for the best outcomes.

Most studies considering qualifications look at the level of education or training, and whether it is higher or lower. Only a few consider whether there might need to be a minimum level of qualification to support good quality. The general consensus is that the higher the teacher's level of qualification, the higher the pedagogical quality, which in turn leads to better outcomes. Studies found that degree-qualified teachers are less authoritative, less detached, and more engaged in positive interactions with children, and educators with lower qualifications (diplomas, certificates, or less formal training) were associated with less favourable children's outcomes (Siraj, 2015).

- **Contextual and institutional factors.** It is clear that the impact of teacher qualifications can depend on the context. Quality of the broader system, curriculum, and support for teachers can moderate the effect of qualifications (Yang, Rahman, & Syn, 2025). For example, in a well-resourced preschool programme with a strong curriculum, even educators without qualifications might achieve good child outcomes by following the curriculum, whereas in a less structured environment, a qualified teacher might leverage personal expertise to create learning opportunities. Context may also help to explain differences in results across studies. Yang et al (2025) observe that, for example, studies finding no relationship between qualifications and outcomes often occurred in contexts with strong support systems and resources, while positive relationships were more commonly found in contexts where teacher qualifications might compensate for other systemic limitations.



- **The value of non-degree-qualified educators in supportive teaching roles.** Interestingly, the literature also highlights that the overall composition of the teaching team matters, not every educator needs the same qualification level for quality to be achieved. A team with a mix of qualifications can function effectively. Research by Peeters et al (2017) that described the profiles of ECEC assistants in 15 European countries and their professional opportunities, discusses the need for competent systems (teams and collective roles) rather than just competent individuals. *Less-qualified assistants* who are nevertheless experienced and caring can contribute positively under the guidance of a qualified lead teacher (Peeters, Sharmahd, & Budginaite, 2017).

Some studies reference "collective efficacy", where the presence of at least one qualified teacher in a classroom can elevate practices for everyone, but the assistants (even if not holding degrees) also bring value in terms of additional attention and cultural and community knowledge (for example, see Jacoby, 2021; Paschall et al., 2020) cited by (Weisenfeld, Hodges, & Petig, 2023).

This nuance is important because it implies that the overall ratio of qualified teachers in a programme might matter more than every individual holding a degree.

- **Ongoing professional development.** Another nuance is the role of continuing professional development (CPD). Several meta-analyses show that targeted in-service training and coaching of ECEC teachers can significantly improve teaching practices and sometimes child outcomes (Egert, Fukkink, & Eckhardt, 2018) (Markussen-Brown, et al., 2017). This raises the point that initial qualifications (pre-service) are only part of the professional learning continuum. A teacher might enter the field with minimal qualifications but, through mentoring and training, become highly effective; or a teacher with an advanced degree might stagnate without ongoing development.

The literature suggests that combining strong initial qualifications with continuous training yields the best results for quality improvement and thus child outcomes (Egert, Fukkink, & Eckhardt, 2018). Therefore, we should view teacher qualifications not as a one-time attribute but as one component of teacher quality that interacts with professional growth. It also means some of the benefits we attribute to "having a qualified teacher" could actually be due to correlated factors like those teachers being more likely to engage in professional development, stay in the field longer (lower turnover), or implement evidence-based curricula. CPD is discussed in more detail in a later section of this report.

- **Child age and outcome domain:** It's also worth noting that the impact of teacher qualifications might vary by the age of children and the domain of outcomes. Some research indicates that qualifications may matter more in preschool (3–5 years) than in infant-toddler care (0–2 years) in terms of cognitive outcomes, because preschool teachers directly prepare children for school entry skills, whereas infant educators (often with lower qualifications in many systems) focus on basic care and socio-emotional support. That said, a lack of specialised training for infant and toddler teachers has been identified as a quality gap in some countries (Garvis & Manning, 2015). If infants and toddlers are taught by educators with little child-development training, those children might miss early stimulation opportunities. This nuance suggests the possibility that raising qualifications in the infant-toddler sector could yield benefits that have not yet been fully



measured, as much research has concentrated on preschool-aged children. Additionally, for certain *outcome domains* like health or physical development, teacher qualifications have not been studied extensively; most focus has been on cognitive and socio-emotional outcomes.

- **Teacher attitudes as a factor linking qualifications and outcomes:** The literature suggests that teachers' professional attitudes – such as their commitment, enthusiasm, and beliefs about their role – can influence how much their formal qualifications translate into quality practice and child benefits. In fact, higher qualifications often correlate with more positive job attitudes. For example, one meta-analysis found that preschool teachers with a bachelor's degree showed substantially greater commitment to their work and more positive teaching beliefs compared to teachers with only a high school education (Deding & Minnaert, 2024). They also highlight a study by (Dunst, Hamby, Howse, Wilkie, & Annas, 2019) which indicates that the greater the disparity between the educational degrees being compared, the larger the effect sizes observed in terms of overall quality (cited by (Deding & Minnaert, 2024).

These attitudinal differences (effect size ~ 0.77 for commitment according to (Deding & Minnaert, 2024)) are important because a teacher who is more dedicated, warm, and enthusiastic is likely to create a more nurturing and stimulating classroom climate. Indeed, studies have observed that degree-qualified early educators tend to be less punitive in their interactions with children, reflecting an attitude of professionalism and care that goes hand-in-hand with their training (Hayakawa and Reynolds, 2014, cited by (Bonetti & Brown, 2018)). Such positive attitudes can enhance process quality – for instance, by making teachers more responsive and patient – thereby indirectly improving child outcomes even beyond what their formal training alone would predict. On the other hand, research also indicates that teacher attitudes can moderate the impact of qualifications on practice quality and child outcomes (Jeon, Buettner, & Hur, 2016).

Not all highly educated teachers are equally effective – if a well-qualified teacher has poor job attitudes (for example, low motivation or a rigid mindset), they might not implement what they "know" in ways that benefit children. Conversely, a teacher with fewer qualifications but a growth-oriented, positive attitude may strive to learn and apply best practices, partially compensating for lack of formal credentials. Teachers' job attitudes (like enjoyment of teaching or stress levels) interact with their qualifications and classroom process quality. In their analysis, Jeon et al. (2016) found different "profiles" of teachers: some with high qualifications but mediocre classroom quality, possibly due to less-positive attitudes, and others with average qualifications but very high process quality, potentially driven by exceptional commitment and reflective practice (Jeon, Buettner, & Hur, 2016). This suggests a teacher's mindset and attitude towards teaching can amplify or dampen the effect of formal education on children's experiences.

- **Ethnicity as a factor in teacher qualifications and child outcomes:** Although most of the 29 source articles did not explicitly focus on ethnicity, a few findings highlight how ethnic background (of both teachers and children) can intersect with teacher qualifications to influence ECEC quality and outcomes. For example, in their 2019 meta-analysis, Manning et al used moderator analysis and found a lack of relationship between ECEC quality and teacher qualifications in classrooms that served primarily Latino, Asian, and native American students.



They hypothesised that one explanation for the lack of relationship maybe because educators with lower-level qualification whose cultural backgrounds match their students may draw on other kinds of strengths to create productive classroom environments. The authors stress the importance of this finding as it has implications for many educational programmes where teachers from the communities being served are being replaced by more qualified teachers who may not understand cultural practices (Manning M. , Wong, Fleming, & Garvis, 2019).



2. What is the relationship between professional development and children's outcomes?

Ongoing professional development is widely recognised as crucial for maintaining good practice and incorporating new skills across many professions, including ECEC.

While our literature review did not specifically focus on professional development, it emerged as a highly discussed topic throughout the literature we sourced. We present evidence from the noted sources here; however, insights should be treated with caution as they are not based on a full search of available literature relevant to "professional development".

Ten articles in our Priority 1: Highly Relevant set had a specific focus on *in-service professional development and child outcomes*, as distinct from *pre-service professional development (or qualifications)*. These articles formed the base evidence for our review. Other sources were used for additional context or supporting points where noted.

Impact of professional development on child outcomes

Overall, professional development for ECEC educators is associated with improved outcomes for children, largely through its positive impact on process quality. In general, when teachers engage in PD, their interactions and instructional practices improve, which in turn can benefit children's developmental and academic outcomes (Manning, Wong, & Garvis, 2017).

Indirect effects via process quality

The literature emphasises that PD often works indirectly by enhancing process quality, which then leads to better child outcomes. For example, a comprehensive meta-analysis by Egert et al. (2018) found that in-service training had a medium effect on process quality (mean effect size ~0.68) and a smaller but still statistically significant effect on children's development at the individual level (effect size ~0.14). It showed 53% of the variation in child outcome effects was explained by improvements in process quality, indicating that PD benefits children largely by first improving educators' interactions and teaching behaviours. In practical terms, after PD, educators often provide more responsive, stimulating, and developmentally appropriate interactions (higher process quality), which then foster gains in children's skills (for example, language, social skills) (Egert, Fukkink, & Eckhardt, 2018). This means that PD-driven improvements in educator practices are a proximal outcome that paves the way for distal child benefits.



Direct effects on child outcomes

Other studies have also detected direct positive effects of PD on child outcomes, though typically smaller in magnitude than effects on teacher practice. Brunsek et al. (2020) conducted a large systematic review of 64 studies, 20 of which were included in meta-analyses (over 30,000 children). They reported significant positive associations between PD programmes and child outcomes in 10 out of 13 content-area groupings, with average effect sizes ranging from 0.07 up to 0.26 (small effects) for various child outcomes. These effects were detectable when the PD content aligned with specific child assessments, for example, a PD focusing on literacy yielded improvements in children's literacy-related scores (Brunsek, et al., 2020). Similarly, a meta-analysis of European studies by Jensen and Rasmussen (2019) found an overall positive effect of in-service PD on child outcomes (mean effect size 0.35), which, while modest, indicates that children tend to benefit when their educators receive additional training. Importantly, these improvements in child outcomes are statistically significant and practically meaningful in areas like early language, emergent literacy, and social-emotional development, especially when compared to children whose teachers did not receive the same PD (Jensen & Rasmussen, 2019). These effect sizes, while modest, are comparable to other educational interventions and, when aggregated across an entire population of children, could translate into meaningful developmental gains.

However, it's important to note that the direct impact of PD on child metrics is usually smaller than the impact on educator practices. This suggests that while PD reliably helps educators improve their teaching (a necessary step toward child gains), translating those improvements into measurable child progress can be challenging. PD improves educator-child interaction quality and instructional practices, which then enhances children's learning and development (Manning, Wong, & Garvis, 2017). Some experts argue that changes in teaching must be substantial to produce detectable gains in child outcomes (Egert, Fulkink, & Eckhardt, 2018). In other words, minor improvements in practice might not immediately reflect in test scores or developmental assessments, a reminder that child outcome measures can be influenced by many factors beyond the teacher. Nonetheless, evidence from controlled studies shows that PD can and does lead to statistically significant child improvements, even if the effects are small.

Strength of the evidence linking PD to child outcomes

The strength of evidence for PD effects on child outcomes is moderate to strong, given the number of high-quality studies, including randomised controlled trials (RCTs) and meta-analyses, that have converged on this finding. Over the past decade, researchers have synthesised results from dozens of studies across various countries and contexts, lending confidence to the general conclusions. Key points regarding the evidence base are discussed below.



Multiple meta-analyses

The relationship has been examined in several meta-analyses and systematic reviews, which represent a high level of evidence by aggregating findings across studies. In addition to the Brunsek et al. (2020) and Egert et al. (2018) meta-analyses discussed above, at least two others are noteworthy. Markussen-Brown et al. (2017) conducted a meta-analysis focusing on professional learning interventions in early childhood and similarly found that PD significantly improves teacher practice and, in some cases, child outcomes. However, their results suggested child outcomes improvements were not guaranteed without certain PD features in place, specifically coaching (cited by Schachter et al., 2025). In their Europe-focused study, Jensen et al. (2019) provided further evidence with an aggregate positive effect of PD on children's outcomes. The consistency of positive (if small) effects across meta-analyses strengthens the credibility of the finding that PD can benefit children.

Rigorous individual studies

Underlying these reviews are numerous RCTs and quasi-experiments. For instance, several of the studies in Egert et al.'s 2018 review were RCTs where one group of educators received a PD intervention and the control group did not; these trials often report improvements in classroom interaction quality and sometimes in child outcome measures for the PD group. The presence of controlled experimental designs adds weight to the causal claim that PD (the independent variable) leads to better child outcomes (dependent variable), rather than just being correlated.

Measures and outcomes assessed

The evidence covers a wide range of child outcomes, including cognitive and pre-academic outcomes (language, literacy, math), socio-emotional skills, and even physical activity or health behaviours in some cases. The positive impacts of PD have been documented across multiple domains. For example, Brunsek et al. (2020) performed 13 separate meta-analyses for different outcome categories (for example, language and literacy, social-emotional skills) and found 10 had significant positive effects (as noted). This breadth of outcome coverage suggests the PD-child outcome link is not confined to a narrow aspect of development but is somewhat generalisable (with the caveat that alignment of content is important, as discussed later).

Magnitude of effects

The effect sizes found (often in the 0.10–0.30 range) are considered small by conventional benchmarks.⁴ However, small effect sizes in early education can still be meaningful. For instance, an effect size of 0.2 might translate into several months of developmental progress or a noticeable closing of gaps at entry to school. Moreover, these effect sizes are on par with other scalable educational interventions and should be viewed in light of the complexity of influencing child development (Schachter, et al., 2025). It's also worth noting that improvements in process quality are often larger in size, which shows PD has a strong immediate impact on practice. The smaller child

⁴ Many studies on teacher qualifications and child outcomes report modest effect sizes, typically in the $r = 0.10$ – 0.30 range, which Cohen (1988) categorises as "small," "though potentially meaningful in large-scale educational contexts" (Cohen, 1988).



effects indicate the dilution that occurs when translating practice change into child outcomes, which is expected in multi-step causal chains.

Statistical significance and consistency

The fact that multiple independent analyses report statistically significant improvements (for example, $p < .001$ in Egert et al. 2018 for child outcomes; 10/13 significant meta-analyses in Brunsek et al. 2020) underlines that these are reliable findings, not just random noise. There are, however, some inconsistencies to acknowledge: a few meta-analytic comparisons have found null effects in certain subsets. For example, Brunsek et al. noted 3 of their 13 meta-analytic subgroupings were not significant, and Markussen-Brown et al. did not find significant child gains in some PD programmes they examined (cited by (Schachter, et al., 2025)). These inconsistencies often point to the importance of context or implementation (see later section), rather than undermining the overall conclusion. On balance, the preponderance of evidence favours the conclusion that PD has a positive impact on child outcomes.

Comparative and null findings

To fully appraise the strength of evidence, it's informative to consider studies that did not find an effect, as these help to refine our understanding. One notable example is a meta-analysis by Joo et al. (2020) on "preschool enhancement programmes". This study examined whether adding enhancements (like parent involvement components, new curricula, or extra teacher PD) to early education programmes yields additional benefits for children. Interestingly, Joo et al. found that adding parent training or enriched curricula led to improved child outcomes, but adding a teacher PD component did *not* show a significant incremental effect on children's outcomes on average. In other words, ECEC programmes with additional PD for teachers had outcomes no different from those without that PD component (Joo, Magnuson, Duncan, & Schindler, 2020). This finding suggests that not all PD will automatically translate into child gains, but that effectiveness may depend on how the PD is designed and integrated. Nonetheless, it does not contradict the general evidence that PD can work; rather, it highlights that in some evaluations (particularly older ones between 1960–2007, which Joo et al. analysed), PD interventions may have been too minimal or not well-implemented to move the needle on child outcomes. The overall weight of evidence from more targeted PD interventions (like intensive coaching programmes in specific domains) is more positive.

Specific types of PD and associated outcomes

Not all professional development is alike. The literature sheds light on which types or features of PD are most effective in improving child outcomes (and related process outcomes), and which specific areas of child development benefit most. Key insights include the effectiveness of coaching-based interventions, the importance of content-focused PD, and how factors like PD duration or format influence results.



Coaching and mentoring

A recurring finding is that PD initiatives that incorporate coaching or on-site mentoring tend to produce stronger improvements in teacher practices, and by extension, better child outcomes, compared to more passive forms of PD (like one-time workshops). Coaching involves an expert working with educators regularly (often in the classroom or via video feedback) to model strategies, observe practice, and provide feedback. Several sources highlight coaching's advantages:

- Peleman et al. (2018), in a European systematic review, concluded that long-term, practice-integrated PD interventions, especially those involving pedagogical guidance or coaching in reflection groups, were among the most effective in improving educators' practices. They found this to be true across countries with varying baseline teacher education, suggesting coaching adds value in diverse settings. Notably, PD that was "based on active engagement of practitioners and peer exchanges within a shared framework," essentially coaching or community-of-practice models, had the strongest positive effects on quality (Peleman, Lazzari, Budginaite, & Siarova, 2018).
- Schachter et al. (2025) conducted a dedicated meta-analysis on coaching effectiveness, covering 124 studies of early childhood coaching. They found that overall, coaching has a positive effect on both teachers' practices and children's outcomes (when compared to no coaching). Specifically, coaching improved teacher practice with a large effect (0.58) and had a positive, albeit smaller, effect on child outcomes (0.29) relative to no intervention. This means teachers who received coaching were much more effective in the classroom and their students showed better outcomes than those in a control condition. Moreover, when Schachter et al. compared coaching *plus* other training versus the same training without coaching (isolating the "added" value of coaching), they still found a significant improvement in child outcomes (0.14) due solely to the coaching element. This reinforces the idea that coaching provides a unique contribution.

Interestingly, this meta-analysis also investigated different coaching processes. One finding was that having coaches that model desired teaching practices (demonstrating techniques in the classroom) consistently enhanced the effect of coaching on teacher practice, whereas asking coaches to co-teach alongside the teacher was associated with smaller gains in teacher outcomes (perhaps because co-teaching can undermine the teacher's independent adoption of skills). For child outcomes, however, no specific coaching technique stood out as a moderator, meaning all well-implemented coaching, regardless of specific style, tended to help children about equally.

The overall takeaway is that coaching is an especially effective form of PD, aligning with adult learning principles (ongoing, job-embedded, individualised support) and leading to observable benefits for children (Schachter, et al., 2025). Other literature reviews have also cited individual studies that demonstrate positive associations between coaching and practice, including in relation to the care of infants and toddlers (Banghart, et al., 2020).



Workshops and training sessions

Traditional PD workshops (short-term training sessions or seminars) are very common in ECEC. On their own, one-off workshops have mixed evidence, they can increase teacher knowledge but often yield limited change in day-to-day practice. This is why modern PD models favour supplementing workshops with ongoing support (like coaching or communities of practice). That said, workshops are not entirely ineffective, especially if they are part of a structured sequence and focused on specific skills.

For instance, some of the studies in Brunsek et al. reviewed involved multi-session training courses on a curriculum or teaching approach. They found that shorter PD programmes (which often were more focused trainings) were associated with more positive child outcomes than longer programmes. This somewhat counterintuitive result might mean that concise, targeted trainings can be highly effective at imparting specific techniques that teachers then implement, whereas very lengthy PD programmes might suffer from participant fatigue or dilution of content. The implication is that intensive focus on a particular practice for a limited time can lead to measurable child gains, whereas sprawling multi-year PD might not always maintain its impact without sustained motivation and quality control. Nonetheless, workshops alone, especially if isolated, usually show smaller effects on practice than approaches with application support.

Content focus and alignment

Research strongly indicates that the content of PD and how it aligns with targeted child outcomes is crucial. PD is not monolithic, it can target various domains (literacy, socio-emotional interactions, math, etc.). We have identified several patterns.

PD yields the biggest child benefits in the domains it specifically targets

Brunsek et al. (2020) found clear evidence for this alignment effect: when they grouped studies by the content focus of the PD, positive associations were identified mostly when child outcome measures were conceptually linked to the PD content (for example, a PD programme on language/literacy showed improvement in children's vocabulary or letter recognition). If the PD content and the child outcome domain did not match, effects were often nonsignificant. This suggests that if we want PD to improve, say, children's math skills, the training should explicitly focus on math-related teaching strategies.

Social-emotional and behavioural PD

Brunsek's meta-analysis found notable positive effects in certain social-emotional outcomes. However, it also noted differences within that domain. For example, PD aimed at improving teacher-child relationships showed benefits for outcomes like "child social skills" but might not affect other aspects such as externalising behaviours unless specifically addressed (Brunsek, et al., 2020). This again highlights the importance of content alignment: PD on fostering social skills improved those skills (for example, children's cooperation), but general PD might not reduce behaviour issues unless it trains behaviour management.



Curriculum-based PD

Some PD is tied to the implementation of a specific curriculum or educational approach (for example, a new math curriculum training). These can be effective if the curriculum itself is evidence-based and if PD ensures faithful implementation. For example, in the "My Teaching Partner" program, teachers received curriculum plus coaching, resulting in higher child language and self-regulation scores (Early et al., 2017, *cited by* Schachter et al., 2025). On the other hand, if a curriculum PD is too superficial, teachers may not implement it well, leading to little impact. This might partly explain why Joo et al., 2020 did not find an average effect for PD enhancements, the PD in those older programme evaluations may have been tied to curricula but not sufficiently intensive to change teacher behaviour.

Dosage and duration

The question of how much PD is needed for impact is complex. Intuitively, more hours or sessions would seem better, but findings are mixed:

- Markussen-Brown, et al (2017) reported that interventions with more contact hours and that spanned a longer duration tended to have larger effects on teacher knowledge and practice (up to a point), aligning with the idea that sustained PD allows for practice, reflection, and refinement.
- However, as mentioned earlier, Brunsek et al. (2020) observed shorter PD interventions showing more consistently positive child effects. One interpretation is that shorter interventions were often very focused on one goal and immediately applied, whereas some longer interventions in their sample might have had multiple components or less focus (Brunsek, et al., 2020). Another interpretation is that shorter PD programmes might coincide with the use of researcher-developed outcome measures administered immediately post-intervention, which can inflate apparent effectiveness (related to a nuance about measurement, discussed in a later section). It is possible that an optimal PD duration exists: enough time to implement change (several weeks or months), but not so long that the programme loses momentum.

In summary, the literature suggests PD is most effective when it is ongoing (for example, coaching), interactive, and content-specific. Approaches like coaching, mentoring, and communities of practice are particularly powerful in changing teacher behaviour and can yield measurable benefits for children. One-off workshops or courses can contribute knowledge and minor improvements, but without follow-up support they often have less impact on child outcomes. Aligning PD content with desired child outcomes is critical, targeted PD leads to targeted child gains. We also see that different child outcomes (cognitive, social, etc.) may respond differently to PD, with strong results in literacy and socio-emotional domains when those are explicitly addressed.



Nuances in the PD-child outcomes link

Beyond the broad patterns already discussed, the literature offers several nuances and contextual factors that deepen our understanding of how professional development relates to child outcomes. These nuances help explain variability in findings and guide more effective PD implementation:

- **Quality and implementation of PD:** The effectiveness of PD depends greatly on its quality and how well it is delivered. For example, Schachter et al. (2025) find that coaching helped improve teachers' practices, knowledge, beliefs, and child outcomes, especially when compared to having little or no professional learning. However, when coaching was added to other professional learning programmes, its unique impact was more limited with only modest improvements in child outcomes and stronger effects on teacher practices. Among coaching strategies, only two coaching processes (modelling and co-teaching) showed consistent effects. Research by Weinstock et al. (2012), found that a specific PD programme for infants and toddlers in the US did not have a significant impact on child outcomes, nor did it have a statistically significant impact on programme quality. They hypothesise that this is largely due to educator participation being lower than expected and the coaching dosage ended up low, resulting in no significant quality difference between PD and control classrooms (cited by (Banghart, et al., 2020)).

These findings suggest that coaching is not a one-size-fits-all solution and should be tailored to the goals of the PD programme (Schachter, et al., 2025). Also, the literature highlights that more detailed and consistent research is needed to understand how different coaching strategies work and to improve the design of coaching-based PD interventions (Schachter, et al., 2025).

- **Educator characteristics and baseline:** The impact of PD can also be moderated by who the educators are and their starting point. Some findings suggest diminishing returns for highly qualified teachers. For example, if a teacher has a master's degree and 20 years of experience, a basic PD workshop might not yield noticeable improvements (their practice might already be good). On the other hand, educators without degree-level qualifications or less experience have shown larger gains from PD, since there is more room to grow (Jensen et al., 2015) *cited by* (Jensen & Rasmussen, 2019). Interestingly, Peleman et al. (2018) noted that intensive coaching-based PD was effective "not only in countries with well-established ECEC systems and qualified teachers, but also in countries with lower qualifications requirements" (Peleman, Lazzari, Budginaite, & Siarova, 2018). This indicates PD can elevate practice even when baseline teacher education is low, a hopeful finding for under-resourced contexts.
- **Child population and context:** Nuances also arise regarding which children benefit most. Some studies suggest that PD has especially positive effects for at-risk children or those in lower-quality initial environments, because improving quality in those classrooms can significantly change the trajectory for children who might otherwise receive suboptimal education. There isn't strong evidence that any particular subgroup of children (for example, by gender or income) benefits *differently* from PD. Rather, improvements in teacher practice tend to help all children in the class. However, if PD results in more individualised attention, one could speculate that children



with special needs or behavioural challenges might particularly benefit from teachers utilising new strategies (though specific research on PD impact by child subgroup is limited).

- **Sustainability of effects:** Another nuance is whether the effects of PD are sustained over time or fade out. Most studies measure outcomes in the short term (immediately post-PD or within the same academic year). It is an open question in the literature to what extent a one-time PD intervention leads to lasting changes in teaching practice and child learning. Some longitudinal follow-ups (for example, assessments one year later) suggest that teachers may revert without ongoing support, and children's gains may diminish if not reinforced by continued high quality. This has led to recommendations for continuous professional development rather than one-off PD, essentially viewing PD as an ongoing cycle.
- **Measuring child outcomes – standardised vs. custom measures:** A very important nuance highlighted by Brunsek et al. (2020) and Schachter et al. (2025) is that the choice of measurement instrument can affect whether we detect child outcome gains. Brunsek et al. observed that studies using non-standardised measures often found positive results, whereas those using standardised tests sometimes found smaller or no effects (Brunsek, et al., 2020). Schachter et al. (2025) directly tested this as a moderator in their coaching meta-analysis: they found that coaching had a larger effect on child outcomes when outcomes were measured with non-standardised tools (effect size ~0.49) compared to standardised assessments (effect ~0.24). This suggests that PD might lead to improvements in very specific skills that researchers can capture with tailored assessments, but these improvements might not always register on broad standardised tests (which are less sensitive to specific curriculum or content changes). It doesn't necessarily mean the improvement isn't real; it may mean our general tests aren't picking it up (Schachter, et al., 2025).
- **System and policy context:** The broader system can also influence PD effectiveness. For instance, if an ECEC centre's leadership is supportive and gives teachers time to implement new ideas, PD is more likely to stick. If, conversely, the centre has high teacher turnover or poor morale, PD benefits may evaporate. Organisational support for PD (such as providing coaching as part of the job, or professional learning communities) has been associated with more continuous quality improvement. For example, one study found that centres with explicit PD activities had better classroom quality (Slot, Leseman, Verhagen, & Mulder, 2015).
- **Combining PD with other interventions:** PD is often one piece of a larger puzzle. Some research suggests synergies when PD is combined with other programme enhancements. For example, comprehensive interventions might upgrade curriculum and provide PD, children in such multi-component interventions show big gains. Isolating PD's role in those cases is tricky, but it's likely multiplicative: a great curriculum only works if teachers are trained to use it, and training alone is maximised when there's a strong curriculum content to apply. As previously discussed, Joo et al. (2020) found that PD alone didn't add much in their meta-analysis, but PD alongside a focused curriculum did. This nuance implies that PD should be embedded in a coherent programme (Joo, Magnuson, Duncan, & Schindler, 2020).



- **Future research directions:** The literature notes some gaps. For instance, more research is needed on long-term child outcomes. Also, understanding the threshold or minimum effective dose of PD could help allocate resources efficiently. Another nuance gaining attention is how educator psychosocial factors (stress, mindset) interact with PD. This suggests that supporting educator wellbeing may enhance PD effectiveness, a nuance that PD programmes might consider (for instance, incorporating stress management or mindfulness for teachers as part of PD, so that they are more receptive to new strategies).

These nuances highlight that the link between PD and child outcomes is context-dependent and mediated by multiple factors. Effective PD is not just about the content delivered, but also about how it's delivered, to whom, under what conditions, and how we measure the results.



3. What is the relationship between leadership roles, responsibilities, and children's outcomes?

Research defines ECEC leadership as encompassing two main functions: administrative and pedagogical. Administrative leadership refers, among other things, to tasks related to the management of operations, strategic planning, and staff management. Pedagogical leadership is the leadership required to support pedagogical processes through tasks such as promoting the implementation of curriculum and assessment, creating trusting relationships, and supporting the professional growth of educators (OECD, 2020).

It is likely that this report does not represent a full presentation of the relevant literature related to Leadership Roles, due to limitations of our search terms. We present evidence from the noted sources here, however insights should be treated with caution.

Only three articles in our Priority 1: Highly Relevant set had a specific focus on *leadership roles and child outcomes*. These articles formed the base evidence for our review. Other sources were used for additional context or supporting points where noted.

Does effective leadership result in better child outcomes?

Indirect effects through increased process quality

The evidence suggests that leadership in ECEC does not typically influence child outcomes in a direct or linear way. Instead, its impact (like qualifications) is largely mediated through improvements in process quality. According to the OECD, leadership is key to supporting and sustaining quality in ECEC settings and for creating a stimulating environment for both educators and children. Effective leadership establishes a set of organisational conditions that positively influence process quality, working conditions, and staff engagement in continuous professional learning and growth (OECD, 2020). Thereby, effective leadership fosters children's learning, development, and wellbeing (Douglass, 2019).

Drawing on systems theory frameworks and instructional leadership model (Hallinger & Heck, 2010), leadership is best understood as a *key system-level enabler* that shapes the proximal processes directly experienced by children. For instance, pedagogical leadership guides educators in intentional teaching practices and curriculum decision-making, which in turn affects the quality of educator-child interactions, a well-established predictor of child development outcomes (Slot, 2018). Administrative leadership contributes by securing the resources, routines, and stability necessary for effective



teaching to occur. The OECD highlights that leaders who successfully align these functions, pedagogical, administrative, and relational, are better positioned to cultivate environments that are emotionally supportive, cognitively stimulating, and culturally responsive (OECD, 2020). However, because there have not been large-scale studies of the characteristics of ECEC leaders and leadership structures, it is difficult to accurately portray the strengths and needs of ECEC leaders (Douglass, 2019).

Leadership can also have influence by shaping staff wellbeing and cohesion. According to the TALIS Starting Strong 2018 survey, leadership that prioritises professional learning, collaboration, and staff autonomy is associated with higher educator morale and more reflective pedagogical practice, both indicators of high process quality (OECD, 2020). However, when leaders are overburdened by administrative tasks and lack autonomy over staffing and budgeting decisions, their ability to engage in instructional leadership is compromised. This can result in missed opportunities to support professional growth, ensure continuity of care, or respond effectively to children's developmental needs, factors which may cumulatively impact child outcomes (Biersteker, Dawes, Hendricks, & Tredoux, 2016), (McLean, McIsaac, Mooney, Morris, & Turner, 2023).

Multiple or shared leadership roles

The literature does not support a notion that having more people in leadership (or a particular combination of roles) *per se* causes higher child test scores or developmental gains. Instead, what matters is how leaders carry out their roles. For instance, one review notes that leadership was not a standalone factor in many studies of ECEC quality, but when leadership was effective it was seen as a significant factor enabling other quality elements (Sağlam, et al., 2023). In other words, an engaged leader can leverage structural inputs (like low ratios or good curriculum) to improve processes, whereas a nominal leader who does not influence pedagogical practice is unlikely to produce benefits for children. This aligns with broader findings that structural features by themselves do not guarantee better outcomes unless translated into process quality. Leadership roles are part of that translation mechanism.

Organisational climate and parent engagement

Several sources highlight that ECEC leaders shape the centre's culture and relationships with families, which are intermediate outcomes linked to child well-being (Douglass, 2019). For example, leaders who establish strong partnerships with parents and the community (a key leadership function identified in international surveys) can reinforce children's learning at home and ensure continuity of care, indirectly supporting better social-emotional outcomes. Likewise, a stable and supportive work environment fostered by good leadership is associated with lower staff turnover and less burnout, which helps maintain consistent, emotionally secure care for children (a known predictor of positive outcomes) (Melhuish, et al., 2015).



Direct effects on child outcomes

McLean (2023) et al. undertook a systemic scoping review to understand the key concepts that contribute to ECEC quality in school-based, publicly funded settings. They found that personnel such as administrative staff, teaching assistants, and leadership affect the level of quality in a programme, as these roles provide support for educators and can influence programme features. Leaders who understand ECE, either through formal training or previous experience, seemed to make a difference in the success and quality of preschool programmes. Aligning with the findings of the OECD, both family and community engagement were also recognised as elements of programme quality. When parents, families, and communities are welcome to participate in an early learning setting, educators become more aware of families' perspectives of quality and gain knowledge of the cultural and social contexts of the children in their programmes (McLean, McIsaac, Mooney, Morris, & Turner, 2023).

Research also highlights how more administrative and management-oriented tasks, such as building organisational routines, are at times, equally as important as pedagogical leadership. For example, one study from South Africa found the quality of administrative leadership to be one of the main predictors of quality, before factors such as the adult-to-child ratio or qualifications. The specific aspects of management measured in this study focused on governance practices, policies, staff and child records, planning, and fiscal matters. The authors suggest that administrative leadership can positively influence organisational culture, including opportunities for professional development, fair rewards, and supportive physical environments. Dennis (2010) found that organisational climate significantly correlated to classroom quality scores on the ECERS-R Activities subscale (Biersteker, Dawes, Hendricks, & Tredoux, 2016).

Recent Australian research has sought to identify governance practices that contribute to high-quality ECEC. It examined the relationship between governance practices and workforce quality in Australian Long Day Care (LDC) centres rated as "Exceeding the National Quality Standard," specifically in Quality Area 7: Governance and Leadership. Researchers employed a qualitative multiple case study design, collecting data through observations, educator interviews, and document analysis, which were analysed using thematic analysis. The findings revealed that implementing a leadership approach that involves all staff members in decision-making processes fostered a collaborative work culture and improved service quality. Offering ongoing professional development opportunities enabled educators to enhance their skills, leading to improved educational practices and outcomes for children. Allocating resources to support staff in delivering high-quality ECEC services ensured that educators had the necessary tools and support to perform effectively (Phillips, 2025).

Constraining factors

However, in practice, day-to-day constraints can hinder effective leadership and limit quality. The OECD presents a detailed analysis of leadership in early childhood education and care. Based on a large-scale, cross-national survey (TALIS Starting Strong, 2018), the study draws on data from centre leaders and staff across nine countries, using a stratified two-stage sampling method to ensure representative insights into leadership practices and conditions in diverse ECEC settings. The report presents several key findings. It identifies four core leadership functions commonly performed by



ECEC leaders: administrative leadership, pedagogical leadership, engagement with parents, and involvement with the wider community. Across the nine countries surveyed, leaders report spending the majority of their time on administrative and pedagogical tasks, with administrative duties often taking precedence over the rest of their responsibilities. This administrative burden is particularly pronounced in larger centres, where staff are also more likely to work extended hours (OECD, 2020).

Rouse and Spradbury (2015) examined the implementation of a new policy in Australia requiring each ECEC centre to designate a pedagogical leader. Their small-scale qualitative study found that many leaders perceived the role as poorly defined and reported feeling unprepared and unsupported. Because pedagogical leadership was not established as a dedicated position, leaders were expected to balance this function alongside existing responsibilities, limiting the time and attention they could devote to instructional leadership (Rouse & Spradbury, 2015). Similarly, an international comparative study by Hujala et al. (2016) involving ECEC leaders in Finland, Japan, and Singapore found that leaders across these diverse systems consistently identified pedagogical leadership and human resource management as their most important responsibilities. Yet, they also reported significant difficulty in finding adequate time to engage meaningfully with these core tasks due to the breadth of their role and the diversity of competing demands, though the specific nature of these demands varied across countries (Hujala, Eskelinen, Keskinen, & Chen, 2016).

These findings are echoed in the work of Sims, Waniganayake, and Hadley (2017), who surveyed 164 ECEC leaders in Australia. Their study found that while leaders valued the relational aspects of their work, such as mentoring and supporting staff, they also faced considerable pressure to comply with regulatory and administrative requirements. Respondents reported spending approximately one-third of their time on monitoring and compliance, highlighting a significant time-management challenge that often limited their capacity to focus on leadership practices more directly linked to quality improvement (Sims, Waniganayake, & Hadley, 2017).

The OECD report shows that effective leadership, particularly pedagogical leadership, is positively associated with higher staff morale, more intentional and reflective pedagogical practices, and improved developmental outcomes for children. Conversely, when leaders are constrained by administrative overload and a lack of decision-making authority, their capacity to mentor staff, support professional learning, and implement quality improvements is significantly reduced. As a result, the overall quality of ECEC settings may suffer, with implications for both workforce stability and child development (OECD, 2020).

Autonomy in leadership roles

At the same time, many leaders report having more autonomy over pedagogical decisions rather than resource-related tasks, such as staffing and budgeting. While over 80% of leaders report full autonomy in curriculum-related decisions, only 46% have full control over staff appointments and 35% over budget allocations. Many leaders, particularly in publicly managed centres, express dissatisfaction with their limited influence over staff recruitment in particular. The researchers argue that this lack of autonomy undermines leadership effectiveness and ultimately affects the quality of ECEC provision. For instance, limited input into recruitment and budget decisions prevents leaders from building



cohesive, well-supported teams and from allocating resources strategically to support learning environments (OECD, 2020).

Specific leadership roles or role combinations and associated outcomes

Different types of leadership roles – and how they are configured – can have varying influences on different outcome areas, though detailed evidence is sparse. The literature distinguishes pedagogical leadership, which focuses on teaching and learning, from administrative leadership, which focuses on management and compliance. It is generally assumed that pedagogical leadership will have a more direct impact on classroom practices and thereby on children's learning outcomes (like language, literacy, numeracy), whereas administrative leadership ensures the structural conditions (staffing, safety, resources) that support children's health and socio-emotional well-being.

Pedagogical leadership

Some studies suggest that having a dedicated pedagogical leader (such as an educational coordinator or curriculum supervisor) is associated with higher instructional quality and better child cognitive outcomes. For example, Fonsén et al. (2020) reviewed the relationship between pedagogical leadership and children's well-being in Finnish early education centres, using data collected from 2017 to 2019. It draws on three independent sources: systematic observations of children's activities, staff evaluations of their director's leadership, and directors' self-assessments. The findings show that stronger pedagogical leadership, particularly as evaluated by staff, is associated with higher levels of children's engaged learning, positive emotions, physical activity, and participation. Additionally, staff and director evaluations of leadership were positively correlated, highlighting the importance of director focus on pedagogical leadership and active staff involvement (Fonsén, Lahtinen, Sillman, & Reunamo, 2020).

Administrative leadership

Regarding administrative leadership, there is little direct research tying specific administrative practices to child outcomes. Nevertheless, certain administrative leadership requirements (like director qualifications or experience) have been linked to quality indicators. For instance, one cited study found that centres led by a director with a bachelor's or higher degree in early childhood had higher quality administrative practices (Cassidy & Lower, 2007). If we extrapolate that effective administrative practices can support low staff turnover, ensure adequate materials, and adherence to regulations, they may indirectly contribute to children's physical well-being and emotional security – outcomes that may not show up in test scores but are fundamental (for example, lower accident rates, less stress for children).

Combinations of roles

Some ECEC settings merge the director and pedagogical leader into one multi-functional role (common in smaller centres), while others split them. No rigorous study that we reviewed definitively favours one model over the other in terms of child outcomes, however results from the large, multi-national 'Starting Strong' Survey 2018 (OECD, 2020) indicate that on average, leaders of pre-primary



centres spend more of their time on administrative functions (around 30%) than pedagogical functions (around 20%). And that pedagogical leadership is positively associated with educator attitudes and practices linked to quality in ECEC settings, which underlines the importance of ensuring conditions for ECEC leaders enable them to fulfil their multiple functions.

There is a hypothesis in the literature that distributed leadership (involving multiple staff in leadership tasks) can enhance overall programme quality by leveraging diverse expertise and fostering a shared vision. Distributed leadership might indirectly benefit children by increasing consistency and innovation in practice, for example, teachers taking on leadership in family engagement might improve parent involvement, while others focus on curriculum enrichment. Empirical evidence on distributed leadership in ECEC is mainly qualitative or localised. For example, survey research in Finland has found that ECEC centres with distributed leadership models, have positive associations with teachers' ability to lead professional reflection and team learning. While the evidence is not widely generalisable, these findings suggest that shared leadership structures can in some cases help strengthen teachers' roles in guiding pedagogical development (Heikka, Pitkaniemi, Kettukangas, & Hyttinen, 2021).

Strength of the evidence

Among the studies we reviewed, the overall strength of evidence linking ECEC leadership to child outcomes is moderate to weak, due to limited direct research and methodological challenges. Compared to areas like teacher qualifications or class size, there are relatively few quantitative studies or meta-analyses focused specifically on leadership roles in ECEC. The evidence that does exist is largely correlational or qualitative. For example, case studies and narrative reviews provide illustrative evidence that centres with strong leaders tend to have better classroom climates and higher parent satisfaction, but these designs cannot definitively attribute improved child outcomes to leadership alone (Douglass, 2019).

We did not find any published meta-analysis that isolated "leadership" as a variable for systematic review, which speaks to the thinness of the quantitative evidence. Many of our source articles mention leadership only in passing or not at all. For example, a meta-thematic analysis of stakeholder perspectives on quality observed that leadership was rarely an explicit theme in the included studies, even though stakeholders implicitly viewed it as important for achieving quality goals (Sağlam, et al., 2023). This suggests that leadership's impact is acknowledged conceptually yet remains under-investigated with rigorous methods, or that our search terms were not well tuned for sourcing this literature.

When considering indirect evidence, the strength is somewhat better: leadership is one contributor among many in producing known process quality improvements that benefit children. For instance, effective leadership is often cited as a facilitator of successful professional development (for example, ensuring staff buy-in and implementation fidelity) (Egert, Fukkink, & Eckhardt, 2018). However, these connections are usually argued in discussion sections rather than measured. We find moderate evidence that centres led by qualified or experienced directors tend to score better on quality ratings (for example, ECERS or CLASS assessments), and such process quality, in turn, predicts child outcomes



(Manning, Wong, & Garvis, 2017). But here the chain of influence (leader qualification → process quality → child outcome) has multiple links, each weakening causal inference.

In terms of research design quality, much of the leadership-related evidence comes from cross-sectional studies or programme evaluations. Few randomised or longitudinal studies focus on leadership. In their literature review, Douglass identified just four studies that used experimental or quasi-experimental research design to evaluate the impact of leadership on ECEC quality, indicating that such studies are rare (Douglass, 2019). Correlational findings are much more common.

Overall, the evidence can be characterised as suggestive but not conclusive. Reviews consistently state that leadership is believed to be important for quality, yet also acknowledge that empirical backing is limited. The strength of evidence is therefore weaker than for other structural inputs like class size or teacher education levels, where dozens of studies and several meta-analyses exist. However, as with other structural quality inputs, the lack of strong evidence is not evidence of no effect, but rather reflective of the complexity isolating leadership from other quality inputs and limitations of our sample, which is focused on meta-analyses and systematic reviews over other forms of evidence.

Other nuance and insights in the literature

- **Context matters.** The impact of leadership roles on child outcomes may vary by context, such as country, ECEC setting type, and regulatory environment. It is noted that cultural and policy contexts influence how leadership is enacted and what outcomes are prioritised (Fonsén, Szecsi, Kupila, & Liinamaa, 2022). For example, analysis of the TALIS Starting Strong survey illustrates sometimes wide variation across countries in how leaders report using their time, and the autonomy they have across various domains (OECD, 2020).
- **Engagement with parents.** The literature highlights the vital role of ECEC centre leaders in fostering meaningful engagement with parents or guardians, emphasising their responsibility in promoting inclusive, communicative, and participatory environments. Leaders can support parental involvement by creating a welcoming culture, keeping families informed, and establishing practices that encourage feedback and decision-making collaboration regarding children's experiences. (OECD, 2020). However, there is limited empirical evidence on how leadership specifically supports family partnerships and how this relates to process quality (Douglass, 2019). Despite its importance, an OECD study found parent engagement accounts for the smallest share of leaders' time across most countries (OECD, 2020).
- **Distributed leadership.** The model of distributed leadership has gained increasing attention as a potential response to structural and role-related constraints. Distributed leadership involves the sharing of leadership responsibilities across team members, and has been associated with enhanced collaboration, professional agency, and organisational learning. However, implementing this model effectively is not without challenges, and organisational leaders may play an important role (Douglass, 2019). As Heikka et al. (2013) demonstrate through their



qualitative focus group study of ECEC leaders, teachers, and administrators in Finland, while there is general support for distributed leadership in principle, its application in practice is often limited. Many centres lack the structural mechanisms and cultural conditions, such as shared planning processes, regular collaboration, and mutual trust, necessary to support authentic shared leadership (Heikka & Hujala, 2013).

Results from the more recent TALIS Starting Strong survey reinforce the potential benefits of distributed leadership, showing that educators who perceive leadership as being more distributed in their ECEC centre tend to engage more frequently in professional collaborative practices and report greater satisfaction with their job (OECD, 2020).

- **Working conditions and systemic support.** Leaders' ability to perform effectively is also shaped by their working conditions, including salary, workload, and the level of autonomy they have over staffing, budgeting, and curriculum. Studies have found wide variation across countries in terms of leaders' autonomy of domains, including domains closely related to quality improvement, such as appointing and hiring staff (OECD, 2020). Moreover, excessive administrative burdens often detract from leaders' time and energy for pedagogical work and educator mentoring. ECEC leaders can report feeling overwhelmed by bureaucratic responsibilities and under-supported by higher-level governance structures (Douglass, 2019).



4. What is the relationship between adult-to-child ratios and children's outcomes?

Adult-to-child ratio (also termed staff-to-child, teacher-to-child, caregiver-to-child, educator-to-child ratio; or the reverse) is a key structural quality indicator in ECEC settings. It represents the number of children per adult educator. Lower ratios (fewer children per adult) are theorised to improve the quality of interactions and supervision, which in turn may enhance children's developmental outcomes (Nina T. Dalgaard, 2022). Some Internationally accepted norms suggest that policymakers and professional bodies often assume that smaller ratios are better for children's learning and well-being (Bonetti & Brown, 2018).

Seven articles in our Priority 1: Highly Relevant set and one from our Priority 2: Relevant but not highly generalisable set had a specific focus on *adult-to-child ratios and child outcomes*. These articles formed the base evidence for our review. Other sources were used for additional context or supporting points where noted.

Do lower adult-to-child ratios result in better child outcomes?

Theory and process pathways

In theory, lower adult-to-child ratios are expected to promote better child outcomes, largely by improving process quality in the classroom. When each adult is responsible for fewer children, educators can interact more frequently and more responsively with each child. Educators with smaller groups have been observed to be more sensitive, warm, and responsive, and to engage in more stimulating and developmentally appropriate interactions. In contrast, in classrooms with higher ratios (many children per adult), educators may become more focused on mere supervision and behaviour management rather than enriched interactions. Research confirms that having more educators relative to children facilitates positive engagement: adults talk and play with children more, show less controlling behaviour, and children exhibit more complex play and fewer conflicts when ratios are low. Empirical studies have linked lower ratios to observed benefits like less aggression and anxiety in children and better language skills (Dalgaard, Bondenjerg, Kolkker, Viinholt, & Dietrichson, 2022). These process indicators are strongly related to children's learning and socio-emotional development.

However, it is important to distinguish *process quality outcomes* (immediate classroom interactions and climate) from child developmental outcomes (children's cognitive, language, and socio-emotional gains). The prevailing hypothesis is that lower ratios indirectly benefit child outcomes via improved



process quality (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017). Structural features like ratios promote or impede safe and positive care environments and thereby influence children's experience and learning. Consistent with this, a recent meta-analysis by Bowne et al. (2017) found that structural improvements, including smaller classes and better ratios, were associated with increased programme effect sizes on child outcomes. However, this was only found when those structural features were in a very high-quality range, suggesting an indirect, threshold-based influence (discussed further below). In short, lower adult-to-child ratios tend to improve the process conditions (adult-to-child interactions, individualisation, reduced stress) which are known prerequisites for better child learning and development (Bonetti & Brown, 2018). As one review put it, fewer children per adult "does increase process quality", which should in theory lead to better child outcomes over time (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Direct effects on child outcomes

Despite strong theoretical expectations, empirical evidence for direct improvements in children's developmental outcomes due to lower ratios is varied across the research. Many studies and reviews conclude that simply having a lower ratio does not guarantee measurable gains in children's cognitive or socio-emotional development in isolation. For example, a systematic review and meta-analysis by Perlman et al. (2017) examined 29 studies on preschool ratios and child outcomes. It found few significant associations: across the literature, most child outcome measures (language, cognitive, social, etc.) did not consistently improve with better ratios. The only meta-analysis Perlman et al. could conduct was on children's receptive language (based on three studies), and this yielded a non-significant result. Their qualitative synthesis similarly concluded that "the available literature reveals few, if any, relationships between adult-to-child ratios in preschool ECEC and children's developmental outcomes" (Perlman, et al., 2017).

Large observational studies in the U.S. pre-kindergarten context, such as those by Howes et al. (2008) and Mashburn et al. (2008) have also reported no significant association between class size or ratios and children's outcomes. Similarly, a review by Burchinal, Zaslow, & Tarullo (2016) found many null findings for ratios and class size (Francis & Barnett, 2019). Studies from the NICHD Early Child Care Research Network found only modest associations between child-teacher ratios and outcomes. One analysis reported no clear linear relationship with most outcomes, except for a small positive link to academic skills at 54 months. Another study found slightly fewer behavioural problems and more positive social behaviours in classrooms that met recommended ratio standards (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

In general, many correlational studies failed to find strong effects of ratios on child outcomes once other factors were controlled. Some reported mixed results (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022). These inconsistencies have led researchers to describe the evidence *directly* linking ratios to child outcomes as mixed and largely inconclusive.



Specific ratios associated with better outcomes

A key question for policymakers is whether research pinpoints “magic numbers,” or specific ratio thresholds that yield better results. Several studies have explored threshold effects rather than assuming a linear relationship. The clearest finding in this regard comes from the meta-analysis by Bowne et al. (2017). They analysed 38 high-quality programme evaluations (mostly in the US, for children ages 3–5) and found nonlinear associations: benefits appeared only beyond certain quality thresholds. In particular:

- Child-teacher ratios of approximately 7.5:1 or lower were associated with significantly better cognitive and achievement outcomes for children aged 3–5. For programmes in that range, making the ratio even smaller by one child per teacher was predicted to increase effect sizes by a small amount (~0.22 standard deviations).

Bowne et al.'s finding implies that only very low ratios (around 1:7 or better for 3–5-year-olds) and small group sizes (~15 or below) are linked to measurably better child outcomes (Bowne et al, 2017, and concluded by Dalgaard et al, 2022). These outcomes were observed in cognitive domains (language, pre-academics) rather than socio-emotional, as the data on social outcomes was too limited to detect patterns. The magnitude of benefits at those thresholds was modest but meaningful (an effect size of 0.2 translates to a few months of developmental gain).

This threshold (1:7.5) aligns reasonably well with professional guidelines. For instance, the National Association for the Education of Young Children (NAEYC) recommended about 1:8 for 4-year-olds and 1:6–1:7 for 3-year-olds when overall group size is also at the lower end (Perlman et al, 2017), and the American Academy of Paediatrics suggested ~1:7 for 3-year-olds and ~1:8 for 4-year-olds as high-quality standards.⁵ These standards were informed in part by research like Ruopp's experiment and others that hinted at benefits in small classes (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

Outside of Bowne et al., other literature also hints at specific ratio thresholds or contexts:

- **Ruopp et al. (1979)** compared ratios in a controlled experiment (described by Bowne et al., 2017). They found that moving from ~1:10 (with 20+ kids) to ~1:7 (with 14 kids) led to better language and social outcomes for 3–4-year-olds (specifically, better receptive language, general knowledge, cooperation, verbal initiations, and less hostility and conflict). Interestingly, Ruopp's study varied ratio in tandem with class size (both smaller in the best condition), highlighting that a very low ratio might not show effect unless group size also drops.

Ruopp concluded that class size itself might be the driving factor (since all low-ratio classes were also small groups). He gave greatest credit to classes of 14 vs. classes of 18+, implying roughly that a 1:7–1:8 ratio in a group of ~14 was significantly more effective than a 1:9–1:10 ratio in a group of ~20 for 3–4-year-olds. This provides a concrete point of reference often cited in policy debates

⁵ Based on most up to date guidance as at 2017.



(for example, many states in America cap pre-K standards classes at 20 and ratio 1:10, partly due to such evidence).

- **Younger children:** While our 29 source articles mostly focus on preschool-age (3–5), it is widely believed that ratios are even more crucial for infants and toddlers. Guidelines set much lower ratios for younger ages, often 1:3 or 1:4 for infants, and 1:4 or 1:5 for 2 years olds (Perlman et al, 2017). Empirical research on under-3s is limited, but some studies suggest that smaller groups and better ratios mean higher-quality experiences for the youngest in centres (see examples summarised by (Cadima, Nata, Barros, Coelho, & Barata, 2020)).

However, Dalgaard et al. (2022) highlight that no high-quality study has isolated ratio effects for children under 2, which is a gap in the research. Thus, while we infer that a 1:3 or 1:4 ratio is beneficial for infants (and this is enshrined in regulations in many countries), research evidence is mostly extrapolated or based on process quality measures rather than direct infant outcome measures (Dalgaard, Bondenjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Citing others, Bonetti and Brown (2018) assert "a critical cut-off point, above which children are harmed by their experience or gain nothing from it is not clear but looks to be around 6-7:1 for infants...". So while specific child outcome data (for example, infant language scores) are not abundant, it is reasonable to conclude that for infants and toddlers, very low ratios (around 1:3–1:4 for infants, 1:4–1:6 for 2-year-olds) are associated with better interactions and likely better developmental outcomes (Bonetti & Brown, 2018). This is consistent with international norms.

- **At-risk children:** Some studies have examined whether smaller ratios particularly benefit certain groups of children, for example, those from low-income or minority backgrounds. The theory is that children who might have fewer learning opportunities at home could gain more from increased adult attention in ECEC. However, the evidence is not extensive.

Historically, many effective early intervention programmes for disadvantaged children (like the Perry Preschool or Abecedarian Project) had very low ratios (often 1:5 or 1:6) and those programmes yielded big outcomes. This has "contributed to a belief that class size is related to effectiveness" (Francis & Barnett, 2019). So, while not definitive, it is plausible that children with greater needs benefit more noticeably from lower ratios. In contrast, recent meta-analyses that looked at the relationship between ECEC quality (of which ratio is one indicator) and child outcomes found that associations were not influenced by the percentage of ethnic-minority children in a study nor by the percentage of children from a low-income family background in a study (von Suchodoletz, Lee, Henry, Premachandra, & Yoshikawa, 2022).

- **Other contexts:** A recent meta-analysis of global ECEC quality by von Suchodoletz et al. (2023) included structural quality factors (qualifications, ratios, etc.) in predicting child outcomes. The authors noted that overall associations between ECEC quality and child outcomes are modest and sometimes hard to detect due to limited variation in structural indicators in some contexts. This implies that in countries or centres where ratios are universally low (for example, all centres follow a strict 1:8 standard), there will not be any outcome difference because there is no "high-ratio" group for comparison. By contrast, in contexts with variability, one might detect that the



few centres with very low ratio have slightly better outcomes (von Suchodoletz, Lee, Henry, Premachandra, & Yoshikawa, 2022).

In summary, research suggests specific ratio benchmarks for positive outcomes in preschoolers: approximately 1:7 (or better) seem to be associated with improved cognitive outcomes. Ratios above about 1:10 for preschool (or 1:8 in toddler rooms) have not shown benefits when reduced slightly; they may need to be reduced substantially (into the "very low" zone) to see an effect. For infants, although not quantitatively pinpointed by outcomes research in our sources, a 1:3–1:4 ratio is generally considered important for quality, and anything higher may jeopardise child safety and the quality of care. It is also worth noting that lowering ratios is expensive and without clear evidence on *how low is low enough* to yield benefits, policymakers face difficult trade-offs (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Strength of the evidence base

Limited experimental evidence

A 2022 Campbell systematic review by Dalgaard et al. screened over 14,000 records but found that only 31 studies met the inclusion criteria for examining child-teacher ratios, and just 12 of these (representing 8 distinct samples) had sufficiently rigorous designs to be included in outcome synthesis. The authors note that this is a surprisingly small evidence base, and many of the studies are outdated, with the average publication year of 1992. At the time of their review, no recent randomised trials on ratios or group size were identified, and overall study quality was low, with most studies carrying a high risk of bias (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Due to this limited pool of high-quality evidence, the reviewers were unable to isolate the effects of ratio from group size in their analysis, there simply weren't enough well-designed studies to make that distinction. As a result, they concluded that "it is not possible to draw any definitive conclusions" about the impact of ratios on child outcomes based on current evidence. Statistically, the meta-analysis found no significant overall effect of changing ratios on children's language and literacy outcomes (average effect size: -0.04), and only a small, marginally significant positive effect on process quality (effect size: 0.10), based on a very limited number of studies. Overall, the findings highlight a weak evidence base. Dalgaard et al. explicitly call for more high-quality, contemporary research to better understand the role of ratios in ECEC (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Similarly, Perlman et al. (2017) highlighted significant methodological challenges in research on adult-child ratios. Many studies in this field are correlational, use diverse outcome measures, and apply varying analytical approaches, making it difficult to synthesise findings in a robust statistical way. For example, only one child outcome variable (vocabulary) was reported frequently enough to be meta-analysed across at least three studies. They also noted that many studies drew on overlapping datasets, such as multiple papers analysing the same large-scale study, which limits the breadth of truly independent evidence. In their qualitative synthesis of 29 studies, only a handful reported



significant benefits of improved ratios, and where effects were found, they were typically small or limited to a specific domain of development (Perlman, et al., 2017). Taken together, the findings suggest that while improved ratios may support quality in certain contexts, the strength and consistency of their direct impact on child outcomes remains difficult to isolate.

Understanding ratios direct impact

In practice, ratios rarely vary in isolation. They are intertwined with other structural factors, like qualifications, group size, or classroom resources. As a result, *"it is often difficult to isolate the impact of ratios from the impact of these other factors"* (Bonetti & Brown, 2018). Many studies statistically control for multiple variables, which can wash out ratio effects if those variables covary with ratio (for example, centres with better ratios may also have better-trained teachers). Moreover, in some large studies virtually all classrooms met a decent ratio standard, leaving little variation to detect effects. For example, in Howes et al., (2008) Multi-State Pre-K study, >80% of classes already had "small" size and low ratios by regulation, so ratio effects were hard to observe using the high-low dichotomy their study had adopted (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017). This restricted range can limit any observed associations, potentially masking real effects.

On the other hand, a few rigorous studies do bolster the case that extremely low ratios can have benefits. Notably, Ruopp et al.'s 1979 study discussed above. This study is frequently cited as empirical support for small group sizes and low ratios, but it stands almost alone as an RCT in this area and its findings have influenced policy for decades (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

Apart from the Ruopp study, most of the available evidence on adult-to-child ratios comes from quasi-experimental or observational research, which tends to yield inconsistent results. As such, the overall strength of evidence linking ratios directly to child outcomes when considered in isolation from other structural features is best described as limited to moderate. While there is strong theoretical justification for the value of lower ratios, and some suggestive findings in the literature, meta-analytic reviews have generally found only small effects, and often under specific or constrained conditions.

Multiple reviews stress the lack of causal evidence and note that current research does not provide clear guidance on what ratio levels are more effective, and for different age groups (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022). While lower ratios are widely seen to be beneficial, the empirical evidence directly linking them to improvements in child outcomes remains modest. However, this is reflective of the current state of the evidence and should not imply that low ratios do not support child outcomes. Rather it reflects the need for more rigorous and up-to-date studies to clarify the conditions under which ratios matter most and how they interact with other elements of quality to inform policy.

Impact on process quality

In classrooms with fewer children per adult, the research shows that educators engage in more frequent and responsive interactions, exhibiting greater warmth and sensitivity. Multiple observational studies and reviews have found that teachers with smaller groups are less detached and more



positively engaged, leading to richer instructional conversations and a calmer classroom climate (Munton, et al., 2002). Overall, the evidence linking ratios to process quality is moderately strong: it is one of the more consistent findings in the literature, although the effect size is generally modest and at times not statistically significant (Dalgaard, Bondenjerg, Kolkker, Viinholt, & Dietrichson, 2022). This suggests that while lower ratios support higher-quality interactions, the strength of the effect is limited and based on a relatively small number of rigorous studies. Nonetheless, the direction of the findings is consistently positive: lower ratios tend to create conditions that support more developmentally responsive educator–child interactions in ECEC settings.

Other nuances and insights in the literature

Beyond the primary findings, the literature offers several nuances that deepen our understanding of how adult–child ratios relate to child outcomes:

- **Adult-to-child ratio and group size are interrelated structural features.** A classroom of 20 children with 2 teachers has the same ratio (1:10) as a classroom of 10 children with 1 teacher (1:10), but the group dynamics differ. Some research suggests group size might independently affect children, through peer interactions and noise or stimulation level, regardless of ratio. Group size is discussed further in the following section of this report.

The literature often considers ratio and group size together. Dalgaard et al. (2022) attempted to examine both and concluded that due to limited data they could not disentangle the two. They offer that both fewer children per adult *and* smaller group sizes likely contribute to better process quality, based on the meta-analyses and a systematic review of qualitative studies (Dalgaard, Bondenjerg, Kolkker, Viinholt, & Dietrichson, 2022). Bowne et al. (2017) found parallel threshold effects for ratio ($\leq 7.5:1$) and class size (≤ 15), implying each matters up to a point. This means, that when interpreting ratio research, one should also consider group size. A low ratio achieved by adding more educators to a large class may not have the same effect as a low ratio achieved by keeping the group small (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

- **Interactions with teacher quality:** A nuance raised by Bowne et al. (2017) is that teacher skill level can moderate ratio effects. In less skilled hands, a low ratio might not automatically yield rich interactions (for example, an untrained teacher might not take advantage of having fewer kids). Conversely, a very skilled teacher might manage a slightly larger group without loss of quality. Bowne et al. mention that if individual teachers vary greatly in skill, simply adding another teacher or reducing children might not realise potential benefits. This suggests structural quality and educator competency work hand in hand. Some studies in our source set focused on teacher qualifications (for example, Manning et al., 2017), while not directly about ratio, they collectively indicate that qualified teachers produce better child outcomes, and such educators might mitigate or exacerbate the challenges of certain ratios.

In practical terms, low ratios are likely most effective when educators are prepared to engage in high-quality interactions; without that, reducing ratio could be a costly change with little payoff.



This nuance helps explain variability in study findings: some null findings might occur in systems with generally capable educators (so even higher ratios were handled well), whereas in systems with less qualified educators, or limited professional development opportunities, ratios might show up as more critical.

- **Importance for process quality vs. direct effect on children's outcomes:** The literature strongly indicates that the main impact of ratios is on process quality (Dalgaard, Bondebjerg, & Svinth, 2023). For example, a study by Slot et al. (2015) in the Netherlands found that structural features (including ratios) did not significantly explain differences in observed emotional or educational process quality between classrooms (Slot, Leseman, Verhagen, & Mulder, 2015). This was somewhat surprising (and contrary to many US findings) and might be due to homogeneously good structural conditions in that context. But generally, many sources (including policy reviews) assert that having more adults enables more sensitive and less detached teaching and caregiving, supporting improved process quality.

Child outcomes are influenced by many factors beyond the classroom. This helps clarify why we see stronger evidence for ratios' effect on process indicators (like CLASS or ECERS ratings, or child engagement) than on standardised child assessments. In Dalgaard et al.'s meta-analysis, they did find a small favourable effect of lower ratios on process quality measures (composite interaction ratings). They interpret this as tentative support that *"fewer children per adult... beneficially influence process quality"*, even though child outcome evidence was inconclusive (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

From a practical standpoint, improving process quality is valuable in itself and generally predictive of child gains in the future. It also means that if we only measure children's outcomes at one point, we might underestimate the value of lower ratios, since some benefits might be subtle or longer-term (for example, better socialisation that only shows up later). Hestene et al.'s (2005) validation study of the QRIS in North Carolina also found that better adult-to-child ratios were positively and moderately associated with several quality measures, including ECERS-R, all three CLASS domains (emotional support, classroom organisation, and instructional support) and lower scores of C5 negative (reflecting less negative emotional expression among children). These findings support the idea that smaller ratios enable teachers to engage more positively and responsively with children, contributing to a higher quality classroom environment.

- **Contextual and systemic factors:** The effect of ratios can depend on context. In countries or states with very high regulatory standards, there may be a "ceiling effect." Nearly all centres operate with low ratios, so research might conclude ratios "don't matter" because there's no comparison to poor ratios. Conversely, in under-resourced contexts, ratios might vary widely (some classrooms extremely overcrowded, and educators extremely oversubscribed); in such cases, differences might be stark and very meaningful (for example, a class of 50 with 1 teacher versus one of 25 with 1 teacher would presumably show outcome differences). Our sources mostly cover developed countries (US, Canada, Europe, Australia, etc.), where ratios are typically within a moderate range. Even so, Dalgaard et al. (2022) noted that many studies were old (average year 1992), and ratios in those studies ranged from 5:1 up to 14:1 in preschool settings.



It's possible that in more recent years, typical ratios have improved, reducing variation. Also, cultural context matters and some cultures or education systems that emphasise group learning might help to mitigate some negative impacts of larger ratios.

- **Regulation vs. reality:** Another nuance is that reported ratios (especially in large datasets) may not capture the dynamic reality in which those studies were conducted. For instance, an official ratio might be 1:8, but if one teacher goes on break, the ratio temporarily is 1:16. Regulations in some contexts will be set to prevent this eventuality (such as in New Zealand). However, it is not always clear whether this was accounted for in studies conducted across different and often historical contexts. Some studies used average ratio over time or in a day, some used observed momentary ratios. These measurement differences could affect findings (Perlman et al., 2017 discuss how ratios were operationalised differently across studies). In this way, nuances like how ratios are measured across the literature (for example, child: teacher count vs. child: educators including aides) and maintained could influence outcomes detected in research as well as actual outcomes.
- **Cost and feasibility considerations:** While not an outcome per se, a point made in the literature (Dalgaard, Bondenjerg, Kolkker, Viinholt, & Dietrichson, 2022) is that lowering ratios is costly for providers and governments because it means hiring more educators or serving fewer children per adult. Thus, there is an implicit cost-benefit question: *How low do ratios need to be to yield meaningful benefit worth the cost?* Dalgaard et al. lament that research "provides little guidance on what the appropriate adult-to-child ratios and group sizes are". This nuance is important: it's possible that going from a 1:5 to 1:4 ratio has more benefit than going from 1:12 to 1:11, for example. The diminishing returns at higher end noted by Bowne et al. suggests that investments to make already small classes even smaller may yield only tiny improvements. Some economists (for example, Chingos, 2013) argue that funds might be better spent on teacher training or curriculum, which could have larger effects than pushing ratios below an already reasonable level (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017). This doesn't negate ratio effects but highlights that ratio is one of multiple levers for quality.
- **Quality rating systems:** Many quality rating and improvement systems (QRIS) include ratio as a rating element. The literature notes this widespread policy use, implying an assumption that ratio correlates with quality. However, if ratios have only weak links to child outcomes, one nuance is whether its emphasis in the QRIS is justified. Some researchers (for example, Burchinal et al., 2016) have even suggested that structural standards (like ratios) alone might be insufficient markers of quality for the purposes of research, and that a focus on process measures could be more directly tied to outcomes. As such, the field is grappling with how much to rely on structural indicators (easy to regulate) versus process indicators (harder to measure but closer to child experience). Ratios fall in the structural camp, valued in part because they are measurable and enforceable. The evidence base, as reviewed above, suggests that while necessary, good ratios are not *sufficient* for high quality or strong child outcomes.



In conclusion, the nuances highlight that the link between adult-to-child ratios and child outcomes is indirect and conditional. Lower ratios contribute to a better classroom process environment, which is essential for children's development, but simply lowering ratios without considering group size, instructional quality, and overall context may not automatically produce large gains. The literature encourages a balanced view: ratios are an important foundation for quality (and extreme deviations, like very high ratios, clearly undermine quality), but moderate improvements in ratio alone yield modest returns. A holistic approach, improving multiple dimensions of quality alongside maintaining adequate ratios, is seen as the best path to improving child outcomes.



5. What is the relationship between group size and children's outcomes?

Group size, or the number of children in an ECEC classroom or group is considered a key structural quality factor in ECEC. It is closely related to adult-to-child ratios. Smaller group sizes and lower ratios are theorised to improve the quality of interactions and individual attention children receive, potentially leading to better developmental outcomes (Dalgaard et al, 2022).

Eleven articles in our Priority 1: Highly Relevant set had a specific focus on *group size and child outcomes*. These articles formed the base evidence for our review. Other sources were used for additional context or supporting points where noted.

Does lower group size result in better outcomes for children?

Process quality improvements

Research broadly suggests that smaller group sizes can improve children's experiences in ECEC, primarily by enhancing process quality (the quality of interactions and learning processes in the classroom). In theory, a teacher responsible for fewer children can provide more individualised attention, respond sensitively, and engage in richer conversations, which support child development (Dalgaard, Bondebjerg, & Svinth, 2023). Indeed, numerous studies have found that lower adult-to-child ratios and smaller classes are associated with more positive caregiving behaviours: educators in such settings show greater warmth, sensitivity, and cognitive stimulation in interactions (Dalgaard, Bondebjerg, & Svinth, 2023). Conversely, when group sizes are large and each educator has many children, teachers tend to engage in more controlling or custodial behaviours (issuing commands, managing misbehaviour) and fewer positive interactions. Qualitative observations in Scandinavian preschools similarly report that with fewer educators or larger child groups, educators become focused on *managing and controlling* children rather than interacting meaningfully (Dalgaard, Bondebjerg, & Svinth, 2023). The authors noted only a single study in their systematic review of qualitative studies (Rosenqvist, 2014) that suggests there may be some situations in which a group becomes too small. In this example, the smaller group was observed to potentially limit children's ability to relate meaningfully to their peers if the choice of who to form friendships and play with is limited.

These improvements are important because process quality is a proximal determinant of children's learning and socio-emotional growth. Positive, responsive interactions can foster language development, social skills, and secure attachments. Therefore, if smaller groups enhance process



quality, they are expected to lead to better child outcomes indirectly (through that improved interaction quality).

Several sources support this indirect link. A recent Campbell systematic review (Dalgaard et al., 2022) concluded that while definitive causal evidence is scarce, the available studies "tentatively suggest" that reducing group size (and ratios) improves process quality – characterised by more positive adult-child and child-child interactions, less educator stress, and more prosocial child behaviour. In that review, settings with smaller groups tended to exhibit less aggressive behaviour among children and less harsh or coercive behaviour from adults, indicating a more supportive socio-emotional climate (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022). Similarly, an OECD literature review found that smaller group sizes were generally associated with higher process quality in ECEC classrooms across many studies (Slot, 2018). Improved process quality, in turn, is linked to gains in children's cognitive and social development in the long run (Eadie, et al., 2024).

Direct impact of group size on child outcomes

However, the direct relationship between group size and child outcome measures (like test scores or behaviour assessments) is less straightforward. A few studies have reported better outcomes for children in smaller groups. Notably, Bowne et al. (2017) conducted a meta-analysis of early education programme evaluations from 1960–2007 and found a nonlinear but positive effect of smaller classes on children's outcomes. In that analysis, programmes with very small classes showed significantly larger gains in children's cognitive and academic skills than programmes with larger classes. Specifically, for class sizes up to about 15 children, each reduction of one child was associated with an increase in programme effect size on cognition by ~0.10 standard deviations.

These findings suggest that very low group sizes can enhance children's learning outcomes, presumably through intensive individual attention. However, Bowne et al. found no discernible benefit for small reductions in the number of children in classes with more than 15 children, indicating a threshold effect: below the threshold, smaller is better, but above it, small reductions yield little gain. These findings may have been influenced by a few seminal studies that fall at the low end of the spectrum and relate to very targeted programmes (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

Other research supports the idea that extremely small group sizes, as seen in model interventions, contribute to positive outcomes. The classic "Perry Preschool" and "Abecedarian" programmes (often cited as exemplars of high-quality ECE) had very low ratios and small classes, and they yielded strong long-term child outcomes (Schweinhart et al., 2005; Campbell et al., 2002). The seminal study by Ruopp et al. (1979) (one of very few randomised trials on preschool class size) found that children assigned to smaller classes (with ~15 or fewer children, vs. classes twice as large) made significantly larger gains in language, general knowledge, and social behaviour over the year (Francis & Barnett, 2019). This evidence indicates that, under some conditions, reducing group size can directly benefit children's learning and social development.



One notable example contradicts the generally held belief that smaller is better in group size. In their systematic review of qualitative studies, Delgaard et al (2023) refer to a single study that suggests that there may be some situations in which a group becomes too small. In this example, the smaller group was observed to potentially limit children's ability to relate meaningfully to their peers if the choice of who to form friendships and play with is limited (Delgaard, Bondebjerg, & Svinth, 2023).

Yet, many non-experimental studies have failed to find direct effects of routine variations in group size on child outcomes. Large observational studies and recent meta-analyses often report null or very modest associations between group size and children's measured outcomes, after adjusting for other factors (Francis and Barnett, 2019, cite examples including Burchinal et al., 2016, Howes et al. 2008, and Mashburn et al, 2008). In sum, beyond very small class conditions, the direct impact of incremental changes in group size on children's measured outcomes appears limited or hard to detect in many studies. This might be due to compensating factors (for example, effective teachers can still achieve good outcomes in larger classes, or poor instruction can negate the advantages of a small class), or because most studies operate within a relatively narrow range of legally acceptable group sizes, limiting variability.

How strong is the evidence linking group size to child outcomes?

Limited contemporary studies

Many publications highlight that the effects of group size in ECEC have not been studied with the rigor or volume seen in other areas of education research (Dalgaard et al, 2022). The Campbell review by Dalgaard et al. (2022) provides a comprehensive assessment: they identified only 12 studies (out of thousands screened) that met high-quality standards for examining group size or ratio effects on child outcomes. Of those, merely two were randomised controlled trials. The Campbell review explicitly states that surprisingly few high-quality studies have addressed this topic and that no definitive conclusions can be drawn due to the limited and often dated evidence. Most research available is correlational or quasi-experimental, which makes it challenging to isolate group size effects from confounding variables (like teacher quality or family background) (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022).

Moreover, the existing studies are quite old on average. Dalgaard et al. note the bulk of rigorous studies were conducted in the 1970s–1990s. This weakens confidence in applicability to today's contexts, as ECEC programmes and populations have changed over time. They also found no high-quality studies at all for children under 2, and none on long-term effects. This indicates significant gaps in the research base.

Meta-analyses that do exist often aggregate a small number of studies. For example, Bowne et al. (2017) relied on historical programme evaluation data (1960–2007) and a meta-analytic model that assumed a certain functional form (threshold effects). Perlman et al. (2017) could only meta-analyse



three studies quantitatively, reflecting how sparse consistent data were on any single child outcome measure. The results of these meta-analyses must therefore be interpreted with caution given the small sample of studies included (Perlman et al. call their findings preliminary insights due to this limitation).

Evidence supporting process quality links

On the other hand, the consistency of some findings across different reviews lends a degree of confidence to certain conclusions. For instance, every major review that covers structural quality (for example, Slot, 2018; Egert et al., 2018; Eadie et al., 2022) tends to converge on the idea that group size and ratios correlates with process quality positively (Slot, 2018). That correlation is supported by decades of observational studies across various countries, giving it a solid empirical footing (though correlation does not equal causation).

However, when it comes to causal evidence of child outcome improvements, the evidence is not strong. We have a few notable studies (like the Ruopp experiment, NICHD's early analyses, Bowne's regression-based meta findings) that support causality in certain conditions, but we also have many large-scale studies finding null results. This inconsistency lowers the overall strength of evidence. Reviewers often point out that results are "mixed" or "inconsistent".

In sum, the evidence base is limited and not unequivocal. The overall weight of evidence suggests small beneficial effects of reduced group size, but because many studies do not show statistically significant benefits, the confidence in a strong causal relationship is low. Policy bodies like the Campbell Collaboration explicitly warn that current research provides little guidance on optimal group size and that findings must be interpreted cautiously due to overall low quality of evidence (Dalgaard et al, 2022). Therefore, the strength of evidence is moderate at best (for process quality improvements) and weak or inconclusive (for direct child outcomes). More robust, contemporary studies are needed to strengthen causal claims.

Which specific group sizes are associated with better outcomes?

Research does not point to a single "magic number," but it does highlight approximate thresholds and differences by age group and outcome type. Key findings are discussed below.

Thresholds in ECEC

As noted above, Bowne et al. (2017) identified class size of ~15 (with about 2 teachers, yielding ~7.5:1 ratio) as a threshold below which cognitive/achievement outcomes improved significantly with each child reduction. In classes larger than 15, they found no added benefit to making them slightly smaller. This aligns with many professional standards: for instance, the National Association for the Education of Young Children (NAEYC) has recommended maximum class sizes around 20 for 4-year-olds and



smaller for younger ages; Bowne's evidence suggests even tighter groups (closer to 15) yield measurable gains in learning (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017).

Age of child

Infants and toddlers

For younger children (under 3 years), smaller group sizes are widely believed to be crucial, and evidence (though less abundant) supports this. Regulatory standards in many countries mandate much smaller groups for infants (for example, group size of 6–8 infants with 2 educators, roughly 1:3–1:4 ratio). While Dalgaard et al. (2022) noted a lack of recent experiments for under-2-year-olds, earlier research cited in reviews suggests clear benefits. For example, a study of 89 African American children attending ECEC in classrooms with the suggested ratios in infancy showed higher receptive and expressive language scores through age 3 than those in larger groups (Bonetti & Brown, 2018).

It's worth noting that no high-quality study has pinpointed an exact optimal group size for infants, but consensus guidelines (in the US, for instance) suggest no more than eight infants together with two educators (1:4), and for toddlers (ages ~18–36 months) around 10–12 children with two educators (1:5 or 1:6).

Older preschoolers

For children aged 4–5, slightly larger groups can be managed without negative effects, if other quality elements are strong. Research shows that as children approach school age, they can benefit from peer interactions in a group, and a competent teacher or educator can handle a moderately larger class. For instance, some state pre-K evaluations found no outcome differences between classes of 18 vs. 20, suggesting that beyond a point the teacher's effectiveness and curriculum quality play a bigger role than a difference of a couple of children in group size (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017). The evidence generally supports group sizes in the mid-to-high teens (15–20) as acceptable for 4-year-olds, which is why many standards cap preschool class size around 20. Bowne's threshold of 15 (under which small reductions in size yield benefits, and above which they don't) indicates that if one's goal is maximising cognitive gains, aiming for up to 15 might yield an extra boost, but practical considerations often set the limit a bit higher (due to cost).



Box 2: A counter view on group size

As part of their validation study of North Carolina's QRIS, Hestenes et al. examined how group size relates to observed curricular quality on the Early Childhood Environment Rating Scale – Extension, which focuses on curricular quality in areas such as literacy, math, science, and diversity. While group size was examined as a structural variable in relation to classroom quality, the study did not include group size as a predictor of child outcomes. Instead, child outcomes were linked indirectly to the quality measure scores (discussed more below).

An unexpected finding in the study was the positive relationship between classroom group size and scores on the ECERS-E. While larger group sizes are typically viewed as a potential challenge to individualised instruction and child engagement, the authors speculate that having more children in a classroom may create more opportunities for teachers to demonstrate a wider range of teaching strategies and curricular activities. This suggests that group size may not uniformly detract from quality and, in some contexts, could enhance the visibility of instructional practices. However, they also note that this interpretation requires further investigation and replication to better understand the dynamics between group size and curricular quality in early childhood settings (Hestenes, et al., 2015).

Different child characteristics

Another nuance is whether certain children benefit more from small groups. Some evidence (though not uniform) indicates that children from disadvantaged backgrounds or with special needs might gain more from smaller class settings, as they may require more individualised support. For instance, a qualitative finding from Scandinavian research is that educators feel large groups make it hardest to meet the needs of children with developmental challenges, implying those children might particularly benefit from smaller group settings (Delgaard, Bondebjerg, & Svinth, 2023). On the quantitative side, a few studies have explored interactions, for instance, whether low-income children's outcomes are more strongly related to class size than high-income peers. Overall, there isn't robust evidence pinpointing differential effects by subgroup, but it stands to reason that children requiring more adult attention (due to disabilities, very young age, or language delays) stand to gain the most from smaller group sizes and ratios. Likely, this would require further qualitative inquiry to evidence this in practice and in context.

Differences in culture and context

Optimal group size may also depend on context. In countries where group sizes are traditionally large but with multiple educators (for example, some European ECECs might have 25 children with three educators), the dynamics could differ. The Scandinavian context, for example, often features mixed-age groups and a pedagogy emphasising free play. Some Scandinavian studies suggest that even there, both educators and parents perceive smaller groups as conducive to better child well-being



and learning (children can be "seen" and heard better in groups under ~15, per Swedish preschool teachers surveyed) (Delgaard, Bondebjerg, & Svinth, 2023). In contrast, in an environment with highly structured teacher-led activity (like some East Asian preschool classrooms), one might manage a larger group without as much chaos, though individualisation would suffer. The literature doesn't provide firm "by country" recommendations, but it recognises that what counts as a large or small group can vary.

Additional nuances and considerations

Beyond direct effects and simple correlations, the literature offers several nuances that deepen our understanding of how group size interacts with child outcomes:

- **Interplay with teacher quality and training:** Group size does not operate in isolation. A consistent theme is that structural quality factors (like group size) and quality factors (like qualifications, training, and pedagogical skill) interact. This suggests that simply lowering group size, without ensuring educator competency, may not yield benefits. For example, a poorly trained educator may not take advantage of a small group to enhance interactions. Conversely, a very skilled teacher might mitigate some negatives of a larger group by effectively organising activities and differentiating attention (to a point). Thus, an optimal scenario is having both well-trained teachers and manageable group sizes; neither alone guarantees quality.
- **Process quality as mediator:** Several studies indicate that any impact of group size on child outcomes is mediated by process quality. In statistical terms, group size leads to improved process quality, which in turn, supports child outcomes. Therefore, one nuance is that to see child outcome gains from smaller groups, one should also observe improvements in interaction quality or teaching practices. If a programme reduces class size but teachers do not change their behaviour (for instance, a teacher might simply supervise the same activities with fewer children without providing extra stimulation), child outcomes might not improve. This highlights the importance of integrated quality improvements.
- **Diminishing returns and cost-benefit:** From a policy perspective, reducing group size is resource-intensive, as it requires either more classrooms or more educators. Several sources highlight the issue of diminishing returns, meaning that beyond a certain point, further reductions may yield only minimal benefits. Dalgaard et al. (2022) explicitly caution that, in the absence of clear evidence on optimal group size and given that improvements are not guaranteed, significantly lowering ratios or group size may not be the most efficient use of resources. As such, group size should be considered in conjunction with other quality levers. Extreme reductions may only be justifiable when addressing specific needs, for instance, in classrooms for children with special needs, where intentionally low group sizes are often used because the benefits in those contexts are more substantial.
- **Contextual and cultural expectations:** As seen in the Scandinavian debate described by Dalgaard et al. (2023) what is considered an "appropriate" group size can depend on stakeholder



expectations and existing norms. In cultures where ECEC is viewed more as a socialisation environment, a slightly larger peer group might be valued for diversity of interaction. By contrast, in contexts prioritising academic readiness for very young children, smaller instructional groups might be advocated.

These differences don't change children's fundamental needs, but they do influence how research is interpreted. For instance, in Denmark, a parent movement ("Hvor er der en voksen?" meaning "Is there an adult somewhere?") arose due to perceptions that *actual* adult-to-child ratios were worse than official figures, pushing for minimum requirements (Delgaard, Bondebjerg, & Svinth, 2023). Such advocacy is driven by the belief (backed by some evidence) that group sizes were too large to ensure each child's well-being. This led to new legislated minimum ratios in Denmark. The nuance here is that public perception and tolerance of group size matter, and research can feed into policy when communities demand changes for quality reasons.

- **Measure and definition issues:** Another nuance is how group size (and ratio) are measured in studies. Some research uses teacher-reported group size, which might not reflect actual day-to-day experience (for example, during naps or activity centres, group subdivisions occur). If measurement is coarse, true effects could be masked. The Nordic studies pointed out how official statistics might overestimate educator availability (for example by counting staff who aren't directly in classroom roles) complicating comparisons (Delgaard, Bondebjerg, & Svinth, 2023).
- **Long-term versus short-term outcomes:** Most studies look at outcomes at the end of preschool or shortly after. It remains an open question whether having a smaller group in early childhood yields long-term advantages (for instance, better academic trajectory or socio-emotional well-being years later). The absence of long-term studies was noted as a gap (Dalgaard, Bondenbjerg, Kolkker, Viinholt, & Dietrichson, 2022). Indirect evidence from iconic longitudinal studies (Perry Preschool's small classes correlating with life outcomes) suggests potential lasting benefits, but those programmes differed in many ways besides group size. A nuance here is that immediate outcome measures (like a vocabulary test at end of preschool) might not capture all the benefits of a less stressful early environment. Some argue we should also consider child wellbeing and stress levels as outcomes; smaller group size might reduce cortisol stress responses in young children. If so, even if test scores don't budge, there could be mental health or attachment benefits that manifest later. This is purely speculative but a reason why absence of evidence in test scores isn't taken to mean group size doesn't matter at all.



6. What other factors did the literature explore?

Some additional themes emerged in the research that are discussed below. We include them here for interest, however, readers should note that because these topics were not the primary focus of our review, there is likely to be additional literature that may provide further insights on these topics.

The importance of quality ECEC for child outcomes

A central theme is that better child outcomes are linked to higher ECEC quality. Extensive research indicates that children who attend higher-quality early learning programmes show stronger cognitive and social development than those in lower-quality setting (CESE, 2018). In a review of research on ECEC effects, the authors stress that the benefits of early education “cannot be assumed to entail unless the service provision is of sufficient quality” (CESE, 2018). High quality in this context includes a safe, stimulating environment and positive teacher–child interactions. A recent meta-analysis by von Suchodoletz et al. (2023) reinforces this theme: it found that higher observed ECEC quality was significantly associated with better academic and language outcomes in children, albeit with modest effect sizes (von Suchodoletz, Lee, Henry, Premachandra, & Yoshikawa, 2022).

Notably, the gains from quality ECEC are especially pronounced for disadvantaged children, for whom enriching early experiences can help narrow developmental gaps (Melhuish, et al., 2015). These findings underscore that quality has real implications for children’s learning trajectories.

Evidence regarding ‘centre quality’ and children’s outcomes

Hestenes et al. investigate whether centre ratings accurately reflect differences in classroom quality and predict child development outcomes. They find that in North Carolina, the Quality Rating and Improvement System (QRIS), higher star ratings generally reflect better classroom quality with some caveats. Specifically, programmes rated with five stars consistently show stronger performance on observational quality measures. However, the difference between 4-star and 5-star programmes is minimal. Additionally, some 2-star programmes scored similarly to 5-star programmes on certain measures, including the quality of teacher-child interactions across emotional support, classroom organisation, and instructional support,⁶ and children’s emotional experiences in the classroom.⁷

⁶ Classroom Assessment Scoring System – Pre Kindergarten, or CLASS measure.

⁷ Contentedness and Comfort of Children in Child Care Scale, or C5 measure.



This suggests that not all lower-rated programmes are of poor quality. Though, the authors reflect that this may be because many 2-star programmes opt out of voluntary assessments required for higher ratings, meaning their lower rating may reflect non-participation rather than actual quality deficits.

The findings highlight the need to refine QRIS criteria to better distinguish between quality levels. This includes reassessing how individual components contribute to overall ratings and ensuring that each level meaningfully reflects differences in programme quality. Child outcome data showed small but statistically significant links between star ratings and externalising behaviours and learned self-efficacy, indicating that higher-rated programmes may support better developmental outcomes (Hestenes, et al., 2015).

Evidence relating 'process quality' to children's outcomes

The literature strongly indicates that positive educator–child interactions are a critical driver of child outcomes, and there is some evidence indicating that process quality has been found to be more predictive of child outcomes than structural indicators of quality (Vermeer, van IJendoorn, Ca'rcamo, & Harrison, 2016).

High process quality has been linked with gains in children's language, early literacy, and social skills. Egert et al. (2018) note that there is consensus that the quality of ECEC classrooms contributes substantially to children's learning and development (Egert, Fukkink, & Eckhardt, 2018). Longitudinal studies have shown that children who experience more stimulating and responsive interactions in preschool go on to have better academic and behavioural outcomes in later years. In fact, the meta-analysis provides causal evidence that when teachers were trained to improve their interactive skills, classroom process quality improved significantly, and this in turn led to small but measurable improvements in children's outcomes. They conclude that quality improvement is a key mechanism to accelerate children's development. In other words, better interactions yield better learning (Egert, Fukkink, & Eckhardt, 2018).

Consistent with this, a recent Australian review (Ha et al., 2024) found that settings with higher process quality (for example, more emotionally supportive and instructionally effective interactions) were associated with more positive child outcomes (Ha, Tham, & Hurley, 2024). It is noteworthy that process quality often mediates the influence of other factors: for example, smaller class sizes or teacher qualifications benefit children mainly if they translate into better interactions (Slot, 2018).

In their meta-analysis, Sluiter et al. (2025) synthesised data from 31 publications based on 16 longitudinal studies, encompassing 17,913 children aged 2.5 to 18 years. The study sought to statistically assess the relationship between process quality in early childhood education and care and socio-emotional development over time. They found a small but statistically significant effect, indicating that higher process quality in ECEC settings is associated with better social-emotional development over time. This effect was shown to persist up to age 18, suggesting the early experiences in care settings have long-term implications for emotional and social wellbeing. However,



the strength of this relationship varied. It was more pronounced in centre-based care than in home-based care, and stronger when outcomes were reported by educators or external assessors compared to parents or children themselves (Sluiter, Fekkink, & Fekkes, 2025).

Evidence from the EPPE study points to process quality as a strong predictor of later child outcomes. The study following 3,000 children enrolled in a variety of settings between 1998 and 1999. Children who attended settings with higher ECERS scores performed better on cognitive and social behavioural measures at age 5, 7, and 11 (Gambaro, Stewart, & Waldfogel, 2024).

Overall, this evidence indicates that what educators do with children each day, talking, playing, scaffolding learning, makes a pivotal difference. Besides the home environment, some authors argue that ECEC process quality is the primary driver of children's development (Melhuish, et al., 2015).



Stating the limitations of this research

Context for interpretation

While this review synthesises a substantial body of international evidence on the relationship between ECEC structural quality and children's outcomes, several important limitations and gaps remain. These limitations have direct implications for policy development and highlight opportunities for strengthening the evidence base. Areas where evidence is limited include:

- International qualitative studies. Many robust studies may have been excluded under the literature review's search and inclusion criteria. These often provide insights into equity, what quality looks like, and its relationship to outcomes for underserved communities.
- Contextually relevant New Zealand research. There is limited work explicitly examining ECEC quality factors and outcomes within Aotearoa's cultural, social, and policy context. Combining quantitative and qualitative approaches is important to capture both measurable inputs and nuanced process quality.
- Longitudinal evidence. Few studies track children's development over time or use large-scale datasets to understand sustained impacts of ECEC quality in New Zealand.

Readers are advised to interpret these findings alongside insights from these additional three evidence bases to develop a more comprehensive understanding of ECEC quality and its implications.



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