



Curriculum and Quality Analysis and Impact Review  
of European Early Childhood Education and Care



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CARE

Curriculum Quality Analysis and Impact Review of European ECEC

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*Early childhood education and care: promoting quality for individual, social and economic benefits*

D4.2:

Effects of ECEC on academic outcomes in literacy and mathematics:  
Meta-analysis of European longitudinal studies

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„As educational researchers, we find ourselves in the mildly embarrassing position of knowing less than we have proven. The proofs reside in a vast literature that is often superciliously scorned and insufficiently respected. Extracting knowledge from accumulated studies is a complex and important methodological problem to which I commend your attention.“

(Glass, 1976, S. 8)

Title: D4.2: Effects of ECEC on academic outcomes in literacy and mathematics:  
Meta-analysis of European longitudinal studies

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## Executive summary

Early Childhood Education and Care (ECEC) increasingly receives attention in Europe. One main public interest lies in the potential beneficial effects of ECEC on children's development and later educational careers, especially for vulnerable children and children who grow up in disadvantaged families. We present the results of a meta-analysis of longitudinal studies in Europe regarding the relative impact of variations in ECEC experience and outcomes in two central academic domains: mathematics and literacy. Our meta-analysis adds additional evidence to previous research syntheses in the field. It picks up various shortcomings of previous analyses. By creating a compressed knowledge basis about evidence on the developmental impact of European ECEC, this report aims at contributing to the overall objective of CARE to create an evidence-based and culture-sensitive framework of European ECEC.

This report aggregates findings four core aspects, commonly used to describe ECEC experiences across countries, across types of ECEC, across different programmes and across pedagogical approaches. *ECEC quantity* refers to variations in children's exposure to ECEC (the "dose") and can be further categorized into the comparison of no ECEC vs. some ECEC experience (i.e., the absolute effect of ECEC quantity), as well as differences in duration, intensity and age of entry (i.e., the relative effect of ECEC quantity). *Structural quality* refers to aspects such as class size, teacher-child ratio, formal staff qualifications, and group size in the setting. Structural quality can be subject to regulation by policy and funding. It is the concept of process quality that describes the nature of the interactions between preschool teachers and children, the interactions among children and the interaction of children with space and materials. Different conceptualizations of process quality include *global process quality* (such as warm climate or child-appropriate behaviour, commonly assessed by observational measures like ECERS-R, CIS or CLASS) as well as the extent of *pre-academic promotion* relating to the promotion of learning in areas such as literacy, emerging mathematics and science. It is hypothesized that process quality has direct effects on children's learning and development, while structural quality has indirect effects through its influences on process quality.

After a thorough and systematic search, selection and coding procedure, we included 226 separate findings of 22 European longitudinal studies, thereby, gathering knowledge about the developmental impact of ECEC on developmental outcomes for over 43,000 children in Europe. Evidence spans different phases of the educational career from pre-school to secondary school. Using three-level longitudinal meta-analysis, we aggregated findings to four overall effects (i.e., global process quality, extent of pre-academic promotion, structural quality, and quantity). The included studies differ, for example, in location and its ECEC system, in design and sample characteristics, or in the assessment measures for outcomes and ECEC. Besides an overview of important study characteristics, this report investigated if findings varied within and between studies. Differences in study characteristics are expected to be linked to variations in findings, which was tested for some important study characteristics with mixed-effects model. This moderator analysis studied if ECEC effects varied between the two outcome domains (literacy or mathematics), if effects were persistent across ages and different phases of the academic career, and if different measures of ECEC vary in their effects. Additionally, we reviewed existing European longitudinal evidence on differential effects for disadvantage children.

Our meta-analysis confirmed the claim of other meta-analyses and reviews in the field of ECEC: the different experiences children gather within childcare are important and they have developmental impact on academic outcomes. To our knowledge, this meta-analysis is the first synthesis which studied systematically if ECEC effects differ between literacy and mathematics. Our overall results imply that children benefit from higher global process quality ( $ES = .11$ ), more pre-academic promotion ( $ES = .10$ ), and from a greater amount of ECEC experience ( $ES = .12$ ). Transforming our correlational measures into the commonly used measure of effect size, Cohen's  $d$ , results in effect sizes in the range .20 to .24. Surprisingly, these transformed aggregated results comparing variation in ECEC are only slightly lower than results of other meta-analyses that entail findings for specific ECEC interventions, and contrasts for outcomes for children with and without ECEC experience.

Observed overall effects vary substantially between and within studies, and variations can partly be explained by different moderators. All of the quality effects vary by outcome domain and by the measure of ECEC. Global process quality seems to be more strongly related to literacy outcomes, whereas pre-academic promotion is more strongly related to mathematics outcomes. We did not find indications for a decline of ECEC effects with age, except that quantity had a stronger association with outcomes measured in the ECEC period than to outcomes in a later phase of children's educational career. The available research uses various measures to assess the four ECEC aspects, and the moderator analysis suggests that the choice of measure relates to the strength of observed relationships to child outcomes. Interaction-focused measures tend to be more strongly associated to child outcomes than those including an evaluation of material surroundings in overall quality ratings. Also for structural quality, we found only the variations in staff qualification, and not variations in environmental arrangements, to relate to child outcomes. No differences between absolute effects of ECEC versus effects of relative variations in ECEC quantity were apparent.

A review of differential findings for disadvantaged children reveals that research evidence is sparse in Europe, and studies address this question in different ways. Overall findings show that disadvantaged children benefit from earlier enrolment and higher quality of educational processes, but that they need additional and specific support for themselves as well as for their families to exploit learning opportunities in ECEC, if they are to catch up with their peers.

Our results imply that substantial gains are to be expected by improving the quality and quantity of regular ECEC provision in Europe. Enhancing quality and quantity of regular ECEC is beneficial for all children, including the disadvantaged. Effects are persistent across different ages and phases of the academic career. Conclusions about the benefits of improving structural quality are less straightforward; except for the benefit of higher staff qualifications. Structural quality has an impact on child development through process quality and its effect depends on the interaction of different structural aspects and its influence on the quality of processes. Furthermore, though important for outcomes in both domains, variations in ECEC quality differ in their effects for outcomes in literacy and mathematics. Focusing on interactions when measuring process quality may be more efficient in order to assess ECEC's potential to foster academic development. Thus far existing staff questionnaires seem to capture less of the relevant aspects of ECEC processes than observational measures do.

## Recommendations

- 1) Enhancing the quality of pedagogical processes and providing an extended ECEC service can be an effective and sustainable approach to increase academic benefits for children of various backgrounds across countries and across varying ECEC systems.
- 2) To assure that promotion and stimulation in *various* academic domains happens on a regular basis is one of the main challenges in regular provision
- 3) Regulations of structural quality which address environmental arrangements are necessary prerequisites for high process quality, but investments in better environmental arrangements are not sufficient to foster children's learning.
- 4) Improvements to staff qualifications and efforts to enhance the professional skills of teachers and thus improve pedagogical practice are more promising. Staff qualifications and professional development are key components of structural quality for improving process quality, and thereby, child outcomes.
- 5) Quality monitoring should focus on pedagogical interactions and processes.
- 6) Measuring interactions captures beneficial pedagogical processes, measuring material surroundings captures the pedagogical opportunity structure.
- 7) The effects of ECEC quantity are also a question of relative amount (not just absolute effect).
- 8) Disadvantaged children need intensive and high quality support, including parental support.
- 9) Decisions on research funding should be based on considerations regarding the proposed research design including: reliability and validity of measures for child outcomes and ECEC aspects, balanced research questions with regards to effects of quantity and quality and their interactions, representativeness and size of the sample, consideration of family and child characteristics in studying ECEC effects, potential to study differential effects for disadvantaged children.