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A quasi-experimental study into the relations between families' social and cultural background and children's crèche experience on global cognitive competence in primary school

Kaspar Burger

Abstract: This study analysed the role of both sociocultural background and exposure to a crèche on children's development of cognitive competence in Switzerland. Data were derived from a survey on children's cognitive proficiency after enrolment to primary school. Correlations and multiple linear regressions indicate that crèche experience was not related to children's cognitive proficiency when sociocultural background characteristics were held constant, irrespective of duration and intensity of exposure. However, social and cultural background variables were related significantly to children's competence, suggesting that sociocultural disparities begin to affect children's skills early in life. The results are contextualised within the field of early childhood care and education research and a number of explanations concerning the absence of effects of crèche are discussed. The findings are discussed in terms of implications for policy. They might encourage policymakers to supply socially disadvantaged children growing up in impoverished learning environments with enriched services and special interventions.

Keywords: sociocultural background; crèche; duration and intensity of non-parental care; effectiveness; cognitive competence; early childhood care and education

Introduction

Studies investigating the effects of institutional extra-familial care and education experiences in the first years of life have shown that early childhood care and education can raise cognitive skills and academic performance at school entry (e.g., Caughy, DiPietro, & Strobino, 1994; EPPE, 2008; Gullo & Burton, 1992; Magnuson, Ruhm, & Waldfogel, 2007a, 2007b; Marjanovi Umek, Kranjc, Fekonja, & Bajc, 2008; Rumberger & Tran, 2006). An increasing number of studies provide evidence for positive effects of exposure to early centre-based care and education on children's cognitive skills mainly in the short-term, thereby highlighting that children from socially disadvantaged backgrounds frequently benefit to a special degree compared to children from more privileged milieus (Barnett, 1995; Burger, 2010; Currie, 2001; Fontaine, Torre, & Grafwallner, 2006). However, the influence of duration and intensity of exposure on cognitive measures has been analysed less to date. This paper extends recent work by Burger (2012) to consider the effects of crèche as well as those of varying duration and intensity of crèche experience in the years prior to kindergarten on a global cognitive competence measure after enrolment in primary school. By taking into account families' social and cultural background characteristics, it intends to determine the extent to which alternative factors may contribute to the variance in the cognitive outcome measure. Disparities in crèche participation between children from different sociocultural backgrounds were assessed in a previous analysis (Burger, 2012) and found to be comparable with the findings of other studies which demonstrated that children from socially deprived backgrounds are less likely to attend centre-based care and education than their more privileged counterparts (e.g., Hofferth, West, Henke, & Kaufman, 1994). However, the effect of crèche experience on children's general cognitive skill levels has not been analysed yet.

Related studies examined general cognitive competence as an indicator of children's overall cognitive profile (e.g., Goodman & Sianesi, 2005; Osborn & Milbank, 1987). It is

acknowledged that diverse measures of cognitive abilities—including, for instance, verbal ability and memory—correlate considerably with each other, and general cognitive ability is what these measures have in common (e.g., Plomin, 1999). Elementary cognitive tasks can therefore be combined to an aggregate index of cognitive competence which in turn can be considered as an indicator for cognitive development. The present paper will estimate the effects of families' sociocultural backgrounds and exposure to a crèche—as well as the effects of varying duration and intensity of crèche—on a general cognitive competence score by drawing on sequential linear regression models.

Rationale of the analysis

The study is based on data from a survey of children's proficiency levels in the first grade of primary school which was conducted in the Swiss canton of Zurich, the canton with the largest population in Switzerland (Moser, Stamm, & Hollenweger, 2005). It draws on a cross-sectional design, estimating the effects of crèche and sociocultural background on cognitive competence at school entry retrospectively. Data were sourced when children entered the first grade. The lack of pre-test data may entail a selection effect, witnessing the effects of more intensive parent support instead of the effects of crèche attendance itself because in theory parents who use a crèche for their child might be those parents who are particularly concerned about the circumstances under which their child can grow up and develop its capacities. However, this effect is reduced as social and cultural background variables typically related to parents' educational aspirations and utilisation of early care and education services (e.g., Bridges, Fuller, Rumberger, & Tran, 2004; Magnuson, Meyers, Ruhm, & Waldfogel, 2004) are controlled for. This analytic approach corresponds to the estimation methods of previous studies in the same field of research (e.g., Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Spiess, Büchel, & Wagner, 2003). As the original study did not collect data about the quality of the learning environments in families and crèches, the present study cannot examine effects of quality. Yet typically, the quality of child care has effects on child outcomes (Campbell, Lamb, Hwang, 2000; Lamb, 1996). The study seeks to overcome this limitation by including families' social and cultural background characteristics which have been found to be indirect estimates of the conditions for children's learning and developmental processes (e.g., Bradley et al., 2001; Feinstein, 2003). In general, the most distinct evidence of the efficacy of early childhood care and education is derived from high-quality model programmes such as the High/Scope Perry Preschool (Schweinhart et al., 2005). Typically, such programmes are carried out on a small scale mostly with socioeconomically deprived children who are at risk of unfavourable development. Frequently, teachers in these programmes are highly trained and child-to-staff ratios are low compared to more typical programmes without any particular admission criteria. However, while the use of such programmes is indisputable, it is still important to analyse how more regular out-of-home care and education affects child development. For this reason, the present study will analyse the effects of crèche experiences which mirror children's real-world experiences and are therefore more generalisable to other children and larger-scale public programmes.

Definition of critical terms

The term early childhood care and education will be used as a collective term to designate all types of licensed centre-based (non-parental) services for children before official school

enrolment which aim to support children's physical, emotional, cognitive, and social development as well as their learning capabilities, irrespective of curricula, regulatory systems, or operating and funding bodies. As in other studies, this rather lengthy term will be substituted frequently by the terms 'early care and education' and 'early childhood programme' which also denote centre-based services as opposed to informal care by parents, relatives, nannies, or babysitters.

The term *crèche* refers to an institution that provides early care and education to children prior to kindergarten age, that is, typically from birth to four years. In Switzerland, *crèche* is a generic term that covers care and education establishments providing various types of pedagogical services in the absence of parents. It largely corresponds to the terms day nursery, day-care facility, early childhood service, and centre-based care and education in related analyses.

Previous studies and analytic framework

Early care and education and cognitive skill development

Recent reviews of the empirical evidence suggest that the majority of early childhood programmes have positive effects on children's cognitive development and school performance most consistently in the short term (Anderson et al., 2003; Barnett, 1995; Burger, 2010, Currie, 2001; Karoly, Kilburn, & Cannon, 2005). They corroborate the assumption that cognitive achievement test outcomes, IQ scores, school attainment and graduation as well as literacy and numeracy skills can be improved through appropriate stimulation in early childhood programmes although the evidence in support of favourable long-term effects of large-scale programmes is less conclusive than the evidence from small-scale quality programmes. However, research reviews may be biased toward statistically significant results, that is, positive findings might be overestimated because studies which do not find any significant results may tend to be published less systematically. Some original research studies into the effects of early care and education, for instance, merely yielded minor favourable effects (e.g., Becker & Tremel, 2006) or no effects at all (Driessen, 2004; for a review on lacking effects of early schooling, see also Dollase, 2007). Other studies indicate that positive effects can be sustainable only if subsequent classroom experiences including class size and levels of academic instruction are favourable (Magnuson et al., 2007a). Thus, the effects of early childhood care and education rely on a number of context characteristics and cannot be summarised in a general overall conclusion. According to a review by Ramey and Ramey (1998), for instance, programmes for children from economically impoverished families and those for children with biological and psychosocial risk factors or developmental disabilities need to be long-lasting and intensive in order to boost cognitive development successfully (measured by number of hours per day, days per week, and weeks per year). Hence it is essential to consider the effects of duration and intensity when investigating early childhood care and education programmes.

Duration of programmes

The Socio-Economic Panel in Germany provided evidence for a positive effect of a longer duration of attendance in an early childhood care and education centre before compulsory schooling on the likelihood of attending a school with extended requirements on the secondary level (grades 5 to 10). Drawing on a representative sample from the Early

Childhood Longitudinal Study, a recent U.S. American study identified greater academic benefits for children who begin attending centre-based care and education between two and three years of age rather than at younger or older ages (Loeb et al., 2007). A study based on the Child Parent Centre Program with low-income Black children drew on a longer period of examination and suggested amongst others that two-year participants began and ended kindergarten more proficient than one-year participants in reading comprehension, mathematics achievement, and rates of grade retention. However, the academic differences soon faded out so that through elementary grades the two groups of children did not differ significantly from one another anymore (Reynolds, 1995). This result is in line with the findings of studies based on the Effective Provision and Primary Education project in Europe which detected a positive impact of duration (number of months of exposure) on academic development at the beginning of primary school (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2008) and a washing out of this effect during primary school years to the effect that at eleven years of age, the effects of duration could not be confirmed anymore (Sammons et al., 2008). Finally, the NICHD Early Child Care Research Network (2007) found that the effect of age of entry to kindergarten on children's academic achievement in elementary school were small and overshadowed by other variables concerning family and child care experiences, indicating that duration of attendance in an early care and education centre might be less important to determine children's later development than family background variables and experience in child care in the first four and a half years of life (see also NICHD, 2000).

Intensity of programmes

A number of studies focused on the effects of varying intensity of early childhood programmes on development. Some of them indicate a cognitive advantage for more intensive programmes (e.g., Cryan, Sheehan, Wiechel, & Bandy-Hedden, 1992). In a study contrasting an 8-hour per day, 45-week programme with a 3-hour per day, 41-week programme, larger gains were identified in children's vocabulary and early math skills scores until the end of grade one for children who had attended the more intensive programme (Robin, Frede, & Barnett, 2006). A similar study corroborated this finding, suggesting that the number of hours of centre-based care yielded reading and math advantages in kindergarten (Loeb et al., 2007). Yet this evidence does not allow for the conclusion that more intensive programmes are systematically superior. The High/Scope Perry preschool programme, a high-quality two-year preschool education programme for 3- and 4-year-olds living in low-income families, for instance, is among the more effective programmes although with its 2 ½-hour classes it delivered relatively few hours per day (Schweinhart et al., 2005).

Programme quality

It seems plausible to suspect that controversial findings of different studies into the effects of duration and intensity of early childhood programmes can be traced to variations in the structural and process dimensions of the quality of programmes. Studies conducted in the United States evidenced that children enrolled in pre-kindergarten attained larger gains in academic outcomes over the pre-kindergarten year when they experienced higher-quality instruction or closer teacher-child relationships (Burchinal et al., 2008; Howes et al., 2008). Other studies confirmed this result by demonstrating longer-term influences of the quality of

early childhood care environments on developmental trajectories through elementary grades (Broberg, Wessels, Lamb, Hwang, 1997; Glantz & Layzer, 2000; Peisner-Feinberg et al., 2001). Thus children display stronger cognitive growth when caregivers are more responsive and sensitive (Loeb, Fuller, Kagan, & Carrol, 2004).

Cognitive competence and school readiness

There is no universal consensus about the analytic conceptualisation of cognitive competence. However, early childhood research sometimes distinguishes between measures of cognitive functioning/development and measures of school readiness. According to the NICHD early child care research network (2005b), for instance, typical aspects of cognitive functioning and development include attention (i.e., the capacity to focus on relevant information and to sustain concentration over time), memory (e.g., the coordination of information in memory), and planning (i.e., organizing and sequencing future-oriented behavior). Some studies have assessed cognitive development by means of composite scores that include aspects of memory as well as vocabulary, mathematics, and language skills (e.g., NICHD, 2003). Overall, different analyses of cognitive development have drawn on a wide variety of analytic measures (Burger, 2010). Yet commonly these measures are defined more narrowly than complex school readiness measures which consist of indicators of cognitive abilities, health and physical development, emotional well-being and social competence, approaches to learning, communicative skills, and general knowledge (e.g., Bierman et al., 2008; Bierman, Torres, Domitrovich, Welsh, & Gest, 2009; Carlton & Winsler, 1999; Duncan et al., 2007; Fontaine, Torre, & Grafwallner, 2006; Saluja, Scott-Little, & Clifford, 2000). In addition, more recently, the concept of school readiness has been extended beyond the proficiency levels of children. School readiness is no longer considered exclusively as a function of children's maturity but also as an index of the extent to which communities have served children through their preschool years, as a means to analyse how social policies, early childhood programs, and parental support have contributed to children's development (NSW, 2003). That is, operational definitions of school readiness begin to encompass both children's readiness for school and schools' readiness to receive children.

Somewhat simpler concepts of school readiness, however, merely focus on various dimensions of cognition (e.g., Gormley, Phillips, & Gayer, 2008; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; Marjanovic et al., 2008). The global cognitive competence score used in the present study is related to such measures of cognitive abilities in previous studies. It is a composite measure evaluating reading, vocabulary, and mathematical skills. Although the global cognitive competence score in the present study is not a comprehensive school readiness measure, the results of the present study will be comparable to findings of analyses that drew on simple concepts of school readiness.

Provision, regulatory standards, funding, and use of crèches in Switzerland

Any study contrasting results from different countries faces the problem that simple comparisons across national contexts are delicate since findings may depend on country-specific policy, regulatory, and practice contexts (Bensel, 1994). For this reason, the following section outlines information about provision, regulation, funding and utilisation of crèches in Switzerland.

Provision of crèches

Crèches are provided to children not yet four years of age. They deliver early out-of-home care and education to children before the commencement of kindergarten which in turn forms the first stage of the administrative system of public education (ISCED 0) and is attended by the vast majority of children at five and six years of age (EDK, 2010). While kindergartens are provided and funded by the state and thus relatively homogeneous in respect of their scopes and aims (Wolter et al., 2007), crèches typically are not subsidised by the state and there is a lack of provision which causes high workloads for existing institutions and likely minimises process-related quality aspects of everyday services. In the canton of Zurich, no more than 4.1 crèches are available for 1.000 children before official school entry age (Wolter et al., 2007).

Legal framework for crèches

The federal decree on foster children (PAVO, 1977) defines the legal regulations for crèches. As compared to the international standards of the European Commission Network on Childcare (1996), the requirements in Switzerland are relatively severe.

Regulations of the federal association of early childhood services

The guidelines of the federal association define minimum quality standards and stipulate that crèches offer an environment which allows children to acquire social and cognitive competences in a playful way (Kitas, 2008). Care, education, and integration of children are to be part of each crèche's pedagogical approach. Officially, academic skills are not to be taught before the beginning of primary school. In many instances, however, their acquisition is fostered in crèches prior to school enrolment. The federal association does not license or accredit early childhood services officially. Thus, institutions can be opened and operated independently and their quality does not necessarily meet the association's standards. However, roughly 70% of the existing early childhood care and education institutions in Switzerland adhere to the guidelines of the federal association of early childhood services (Stamm et al., 2009).

Quality determinants

Process-related quality determinants of early childhood care and education include care-giving quality such as caregivers' relationship with children and group settings whereas structural quality determinants comprise appropriate staff-to-child ratios and group sizes, staff training and experience, stability of interpersonal relationships, hygiene, room equipment, and pedagogical structuring of care and education processes (Committee on Early Childhood, Adoption, and Dependent Care, 2005; EDK, 2005; NICHD, 2002a; Palermo, Hanish, Martin, Fabes, & Reiser, 2007). In Switzerland, the guidelines of the federal association of early childhood services stipulate norms concerning structural quality indicators: A maximum group size of ten to twelve children should not be exceeded (younger children are weighted with factors greater than one), a minimum of two caregivers should attend to one group, and 50% of caregivers should have obtained a federally accredited diploma. The resulting staff-to-child ratios roughly correspond to the recommendations of the European Commission Network on Childcare (1996) and the Committee on Early Childhood, Adoption, and

Dependent Care of the American Academy of Pediatrics (2005). In Switzerland, 57% of the staff in day-care facilities has an official degree as professional educators (BSV, 2010).

Funding of crèches

In Switzerland, public funds provide about 0.2% of the gross domestic product for the early childhood care and education sector (Wolter et al., 2007). Public funding in the vast majority of other OECD countries exceeds the investments in Switzerland: investments range between 0.3% in Poland, 0.4% in the United States, and 2.0% in Denmark (OECD, 2006).

Crèche utilisation rates

In 2006, participation rates of children from three to five years in formal care and education services amounted to 48.0% in Switzerland (OECD, 2010). This figure concerns all types of formal services. Thus, it includes enrolment in crèche but may include enrolment in other formal care and education services too. It compares to an average participation rate of 75.4% in the OECD countries where enrolment rates ranged between 16.0% in Turkey, 58.4% in the U.S., and 100% in France. In half of all OECD member states, at least 80% of children were enrolled. In Switzerland, of those families who used early care and education services for their children, approximately 20% used them for one day, about 33% for two days, and about 20% for three days per week. Around 64% of the children spent all day and 33% spent half a day in a formal early childhood care and education establishment (BSV, 2010).

Research objectives and questions

While the body of research into the effects of early childhood care and education is increasing in many countries—as evidenced by a number of recent review studies (Barnett, 2008; Burger, 2010; Currie, 2001; Karoly et al., 1998, 2005; Shonkoff & Meisels, 2006; Waldfogel, 2002; Yoshikawa, 1995)—research in Switzerland has lagged behind so far. This study adds to the only two studies that have evaluated effects of out-of-home care and education in Switzerland: The findings of an analysis of children at the age of five indicate cognitive and behavioural benefits of early childhood care and education as compared to children without any experience in similar institutions (Stamm, 2010). An analysis by Lanfranchi (2002) further suggests that extra-familial care and education experience contributed to a less problematic transition to primary school. While Lanfranchi's analysis was based on teacher-reported information about children's skills, the present analysis uses direct measures of children's cognitive skills at the age of six or seven. It aims to determine the effects of crèche experience and those of varying duration and intensity of crèche on global cognitive competence as assessed in the first grade of primary school, thereby taking into account social and cultural background factors including parental education, housing situation, number of books in the household, native country, and language spoken at home since previous studies have shown that such variables play a decisive role in the development of children's skills (e.g., Lee, Brooks-Gunn, Schnur, & Liaw, 1990; Melhuish et al., 2008b; Niles, Reynolds, & Roe-Sepowitz, 2008). Further predictive factors such as family and home learning environment (Brooks-Gunn, Klebanov, & Duncan, 1996; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991) are not considered in the analyses since no information concerning the quality of learning environments was collected in the original survey.

Research Questions

This study analyses three questions. (1) Do sociocultural background variables affect children's cognitive competence? (2) Does crèche experience have an effect on children's global cognitive competence? (3) Do estimated effects on this competence vary by duration and intensity of crèche experience?

Method

Design

Using data from an investigation of primary school children's skills in the canton of Zurich (Moser et al., 2005), the present study assesses the effects of crèche experience by comparing children who were exposed to crèche with children who were not exposed to any comparable facility, thereby controlling for child and family characteristics. Assessment of children's cognitive competence took place during direct face-to-face testing sessions in German language shortly after children entered primary school. Social and cultural background information as well as information about a child's crèche experience was collected through a parent questionnaire during the same period. Children were not assigned randomly to a crèche intervention or a control group. In a quasi-experimental design of this kind, self-selection into the crèche group cannot be ruled out entirely as a menace to the validity of results and causal inferences are not justified as in experimental longitudinal studies. Thus, the results must be interpreted carefully as children's achievements in the cognitive test could be traced theoretically to the fact that parents who used crèche for their children fostered children's development more intensely or cared more for their children's well-being than parents who did not use crèche for their children. Yet in practice, there are different reasons why families do not send their children to a crèche, including that economically underprivileged families cannot afford it. Furthermore, the risk of assessing confounding effects is minimised by controlling for variables which are associated with parental aspirations and use of services for their children: Multiple linear regression analysis is applied to hold confounding variables constant.

Kindergarten experience can be another confounding variable. For this reason, its influence is controlled for by including only children with comparable kindergarten experiences in the analysis. In Switzerland, kindergarten is run by the government. Thus, both its curricula and its opening hours are homogeneous in most institutions. However, as duration of kindergarten attendance can vary for different children, only children who attended kindergarten for two years are included in the analysis. This corresponds largely to the mean duration of kindergarten attendance in Switzerland which is somewhat below two years (Wolter et al., 2007). It has to be noted that the children analysed here might have experienced informal care by relatives or babysitters in addition to crèche but they did not attend other formal care and education facilities.

Sample

The sample used for the present analysis consisted of 1.623 children who either attended both crèche and kindergarten (test group) or only kindergarten (comparison group). That is 14.6% of the overall population of 11.118 children who were enrolled in primary school in 2003. All children in this sample attended kindergarten for two years. Within the sample, 50.5% of

children were male. Major social and cultural background characteristics as well as patterns of crèche utilisation are summarised hereafter.

Home language

As German is the official language in the canton of Zurich, a distinction was made between children who always spoke (Swiss or High) German in their families (73.3%) and those who never or only sometimes spoke (Swiss or High) German at home (26.7%). Swiss and High German are comparable languages. They are therefore grouped together and separated from all other, foreign languages.

Country of birth

Considering native countries, 13.3% of children had a native country other than Switzerland while 44.1% of mothers and 44.9% of fathers came from a foreign country. The share of parents who were born abroad was higher than in the general population which consisted, in 2001, of 22.7% of people from 15 years upwards who were not born in Switzerland (Bundesamt für Statistik, 2002).

Educational background

The parents' educational background tended to be lower than the average educational background of the resident population between 25 and 64 years in 2003 (Bundesamt für Statistik, 2009). 38.1% of mothers and 28.1% of fathers had completed merely nine years of compulsory schooling (as opposed to 19.9% and 11.0% in the resident population) and none of the parents held a university degree (in contrast to 12.4% of women and 22.5% of men with a university degree in the general population). However, some parents might have obtained higher degrees after the investigation was completed.

Socioeconomic background

The number of books at home was examined as an indicator of social background since this variable is frequently associated with parental income and education (Ammermueller & Pischke, 2006; Bradley, Corwyn, McAdoo, & Coll, 2001). While 65.2% of children had up to 200 books at home, 33.7% had more than 200 books in their households (1.0% missing values). Furthermore, housing conditions have been considered as indicators of socioeconomic background (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006). The number of rooms per person in each family's household was therefore assessed. On average, the families had 1.14 rooms per person at home ($SD = 0.35$).

Disparities between test and comparison group

Table 1 outlines how crèche attendees and non-attendees differed in respect of a number of social and cultural background characteristics. The sexes were evenly distributed between the test group of crèche attendees and the comparison group of non-attendees. The two groups did not differ significantly in terms of their country of birth, with 91.7% and 91.6% of children being born in Switzerland, respectively. However, while 69.3% of crèche attendees always spoke German at home, 75.9% of non-attendees always spoke German in their families. Relative to the comparison group, a significantly greater proportion of crèche attendees lived in households with more than 200 books as compared to fewer than 200 books (44.0% vs.

30.6%). Moreover, the parents of crèche attendees had completed significantly more years of education: the mean number of years of maternal education amounted to 12.52 and that of paternal education to 13.27 (as opposed to 10.85 and 12.46 in the comparison group, respectively). Finally, crèche attendees had significantly more rooms per person at home (1.24 vs. 1.13).

Table 1. Characteristics of crèche attendees and non-attendees

<i>Child and background variables</i>	Crèche attendees (<i>n</i> = 423)		Crèche non-attendees (<i>n</i> = 1200)		Test statistics		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	²	<i>df</i>	
Sex					0.004	1	.951
<i>Female</i>	209	49.4	595	49.6			
<i>Male</i>	214	50.6	605	50.4			
Country of birth					0.007	1	.934
<i>Switzerland</i>	378	91.7	1071	91.6			
<i>Other</i>	34	8.3	98	8.4			
Home language German					6.437	1	.011
<i>Always spoken</i>	269	69.3	831	75.9			
<i>Never or sometimes spoken</i>	119	30.7	264	24.1			
Number of books at home					24.956	1	.000
<i>0-200</i>	234	56.0	825	69.4			
<i>>200</i>	184	44.0	363	30.6			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	
Years of mothers' education	12.52	3.70	10.85	3.53	-7.990	685.917	.000
Years of fathers' education	13.27	3.99	12.46	4.04	-3.391	1528	.001
Rooms per person at home	1.238	0.41	1.126	0.32	-5.054	599.411	.000

Note: Missing values exist where counts do not sum up to the total number of participants. Percentages are presented for a column total of 100%. *T*-Tests were computed for metric variables, Pearson ²-tests were carried out for categorical variables. This is an adapted version of a table that was published in Burger (2012).

Patterns of crèche utilisation

Within the test group, 51.5% had attended crèche for one to two years whereas 44.9% had attended crèche for more than two years before entering kindergarten (3.5% of missing values). Thereby, 68.1% of children had been in crèche for one to three days per week and 29.1% of children had been in crèche for more than three days per week (2.8% missing values).

Cognitive measure, variables, and estimation models

Cognitive Measure

Children's global cognitive competence was evaluated by means of a cognitive test developed by Moser, Berweger, and Tresch (2003). This test shares essential characteristics with measures of related studies. Like the British Ability Scales II (Elliott, Smith, & McCulloch, 1997; Hill, 2005), it consists of subscales that can be combined to a general cognitive competence score. Specifically, the higher order cognitive competence score is derived from the outcomes of six scales assessing language and four scales assessing mathematics skills. The vocabulary scale, in turn, is an adaption of the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). The subscales of the test explored children's ability to read and understand letters, syllables, words, and sentences as well as mathematical concepts including quantities,

series, numbers, and simple addition and subtraction. Items were presented both in a written format (reading and mathematics) and as pictures (vocabulary and mathematics). The testing sessions were conducted in Swiss German for native speakers and in High German for non-native speakers. Children's answers were encoded as wrong (0) when letters, syllables, objects, and activities were named incorrectly or mathematical concepts were not understood precisely, and the answers were encoded as correct (1) when they were accurate, showing that the child understood the concepts in question properly. An aggregate index was established to evaluate the number of items a child solved correctly.

Independent variables

The predictors used in the regression analyses are defined in table 2. Three predictors are defined as metric variables: maternal and paternal education—as measured by the number of years of completed schooling—and the number of rooms per person at home. The other six variables are defined as categorical (0/1) variables: the number of books at home (0-200 vs. more than 200); whether a child lived in Switzerland since birth (vs. 'not since birth'); whether a child always spoke Swiss German or High German at home (vs. 'sometimes or never'); whether a child did or did not attend a crèche; duration of exposure to a crèche (1-2 years vs. more than 2 years); and finally, intensity of exposure to a crèche (1-3 days/week vs. more than 3 days/week).

As potential effects of crèche experience on children's cognitive skills might interact with the educational background of the parents, a set of product terms are added to each regression model in order to evaluate whether effects of crèche vary with families' educational backgrounds (crèche x maternal education, crèche x paternal education).

Table 2. Independent variables

Variable	Operationalisation	
<i>Social background</i>		
Maternal education	Years of schooling	
Paternal education	Years of schooling	
Rooms per person	Number of rooms per person at home	
Books at home	0: 0-200 books	1: > 200 books
<i>Cultural background</i>		
Child has lived in Switzerland	0: not since birth	1: since birth
Swiss or High German	0: sometimes or never spoken at home	1: always spoken at home
<i>Crèche experience</i>		
Crèche attendance	0: no	1: yes
Duration of crèche	0: 1-2 years	1: > 2 years
Intensity of crèche	0: 1-3 days/week	1: > 3 days/week

Dependent variable

The dependent variable is a summary index score derived from the ten scales of the test measuring specific cognitive abilities: naming letters (20 items) and syllables (16 items), reading words (10 items) and sentences (8 items), vocabulary (nouns: 10 items, verbs: 10 items), cardinal number concept (12 items, determining the number of objects), ordinal number concept (10 items, determining the rank of an object within a series of objects), reading Arabic numerals (12 items), and simple mathematical operations (12 items). The summary coefficient measuring global cognitive competence consists of 120 items. It is transformed to indicate the proportion of tasks a child solved accurately so that it eventually

ranged between zero and one with a mean of .483 and an internal consistency (Cronbach α) reliability of .970.

A confirmatory factor analysis was performed to determine the loadings of the ten scales on the global cognitive competence factor. Table 3 shows that the ‘naming syllables’ and the ‘reading words’ scales were the best indicators of global cognitive competence (.872 and .854, respectively) while the vocabulary knowledge scales’ loadings were the lowest and amounted to .417 (nouns) and .420 (verbs).

Table 3. Factor loadings of confirmatory factor analysis of global cognitive competence

Subscales	Global cognitive competence
Naming letters	.844
Naming syllables	.872
Reading words	.854
Reading sentences	.786
Vocabulary: Nouns	.417
Vocabulary: Verbs	.420
Cardinal number concept	.500
Knowledge of numbers	.744
Ordinal number concept	.659
Mathematical operations	.725

A test of sampling adequacy was undertaken and displayed a satisfactory result with a Kaiser-Meyer-Olkin-criterion of .806. Bartlett’s test of sphericity rejected the hypothesis that the scales are uncorrelated, that is, that the correlation matrix is an identity matrix without significant correlations, at $p < .001$. The 10 scales with a total of 120 items formed a cognitive power test. As 95.1% of the children in the sample also completed the first two subscales of the German version of the Culture Fair Intelligence Test (CFT) Scale 1 (Weiss & Osterland, 1997), correlations between the summary coefficient of the test measuring global cognitive competence and the two CFT speed test scales were determined, $r = .277, p < .001$ and $r = .233, p < .001$. The relatively low correlations are not surprising given the fact that the two CFT subscales focus on perceptual speed while the test measuring global cognitive competence is based on tasks that assess knowledge and comprehension of language and mathematical concepts. However, the significance of the correlations suggests that perceptual speed is related to achievement in cognitive domains including reading and mathematics (Mather & Wendling, 2003).

Estimation models

Sequential linear regression models are performed which allow for the inclusion of covariates and thus control for potential confounding variables. Here, sociocultural background are held constant, that is, parental education, number of books and number of rooms per person at home, language spoken in the family, and native country. Frequently, these factors are linked not only with children’s developmental progress, but also with parents’ educational aspirations and use of early childhood care and education facilities (e.g., Bainbridge, Meyers, Tanaka, & Waldfogel, 2005; Becker & Lauterbach, 2007; Bridges et al., 2004; Hofferth et al., 1994; Magnuson et al., 2004). In accordance with other studies into the effects of early care and education (e.g., Bornstein, Hahn, Gist, & Haynes, 2006; Marjanovi Umek et al., 2008;

Niles et al., 2008), a quasi-experimental research design is adopted, comparing children who had crèche experience prior to kindergarten with children lacking this crèche experience.

Three regression models are calculated:

$$\begin{aligned} \text{Model 1: } Y_i &= \beta_0 + \beta_1 SB + \beta_2 CB + \beta_3 C + \beta_4 CxPE + \epsilon_i \\ \text{Model 2: } Y_i &= \beta_0 + \beta_1 SB + \beta_2 CB + \beta_3 DC + \beta_4 DCxPE + \epsilon_i \\ \text{Model 3: } Y_i &= \beta_0 + \beta_1 SB + \beta_2 CB + \beta_3 IC + \beta_4 ICxPE + \epsilon_i \end{aligned}$$

According to model 1, the global cognitive competence (Y) of child (i) is a function of social background (SB) and cultural background (CB) of the child's family, crèche attendance (C), a potential interaction effect between crèche attendance and parental education (C x PE), and a random and normally distributed error term (ϵ). In contrast to model 1 which is based on the whole sample, models 2 and 3 are based on the subsample of children who had crèche experience. They aim to determine whether the duration and intensity of crèche experience influence children's global cognitive competence in primary school. While model 2 includes social and cultural background factors, the duration of crèche experience (DC), and a product term assessing interaction effects between duration of crèche experience and parental education, model 3 analyses the effects of social and cultural background along with the intensity of crèche experience (IC) and interaction variables.

The sequential regression models are computed with increasing numbers of predicting variables which are inserted into the models according to the entrance criteria $PIN = .05$ and $POUT = .10$ in the order in which they naturally appear in a child's life. In a first step, the effect of social background on children's cognitive competence is analysed. The second step entails the analysis of cultural background factors in addition to the social background variables. Thirdly, the crèche experience variables are added to the model. Thus, regression model 1 analyses crèche attendees in comparison to non-attendees, model 2 analyses the duration of crèche and model 3 analyses the intensity of crèche experience. In a fourth step, eventually, the product terms are included in the models to determine whether potential effects of crèche experience depend on the parents' educational background. Sociocultural background characteristics are entered prior to the crèche variables because they preceded the children's crèche experience. The effects of each block of variables on children's global cognitive competence are evaluated by the increase in the variance explained.

In all three models, the lowest tolerance values were found consistently for the interaction term Crèche x Maternal Education (.483, .340, .415, respectively), revealing that the correlations of this predictor with all the other predictors are higher than the inter-correlations between the other predictors. As these values are above the critical threshold of .10 (Urban & Mayerl, 2006), there were no serious multicollinearity problems.

Results

Bivariate associations between predictors and global cognitive competence

Bivariate correlations can be first indicators of the strength of a relationship between two variables although in complex study designs correlations are usually not the most reliable measures of associations between variables as they may indicate spurious relationships and give an impression of a link between two variables which cannot be confirmed when further (lurking) variables are included in a multivariate analysis. In particular, causal interpretations

of correlations are typically unwarranted. Yet it is interesting to see how associations between variables change depending on whether bivariate or multivariate relationships are considered. For this reason, correlations are computed to establish the bivariate associations. Their coefficients are shown in table 4. While all of the social and cultural background variables correlate significantly with the global cognitive competence score, crèche attendance does not correlate with global cognitive competence. Considering only the group of children who attended a crèche, the correlation between the duration of crèche attendance and global cognitive competence is not significant. However, the intensity of attendance correlates negatively with the cognitive outcome, suggesting that children who attended a crèche for more than three days per week were more likely to obtain a lower test score than their counterparts who attended a crèche for less than three days per week.

Table 4. Correlations between the predictors and global cognitive competence

<i>Predictors</i>	Global cognitive competence		<i>M</i>	<i>SD</i>
	<i>r</i>	<i>n</i>		
Maternal education	.193***	1540	11.17	3.681
Paternal education	.202***	1473	12.60	4.056
Rooms per person	.201***	1547	1.144	0.349
	<i>r_{pb}</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Number of books at home	.231***	1545	.330	.471
Child in Switzerland	.096***	1521	.910	.286
German at home	.229***	1414	.74	.208
Crèche attendance	.021	1483	.257	.437
Duration of crèche	.075	390	.458	.499
Intensity of crèche	-.170**	393	.304	.461
<i>M</i>	.483			
<i>SD</i>	.197			

Note: *r* = Pearson correlations; *r_{pb}* = Point-biserial correlations; *n* = number of cases; ** $p < .01$, *** $p < .001$.

Multivariate associations between predictors and global cognitive competence

Multiple regression analyses reveal whether bivariate relations remain valid when examined along with potentially confounding factors. Children's global cognitive competence is predicted from six social and cultural background variables, crèche experience variables, and interaction terms. Regression analysis further measures the alteration in the global cognitive competence score when any one of the predictors is varied while the other predictors are held constant. It determines the associations between predictors and competence scores as well as the degree of these associations. Table 5 displays the coefficients of the regressions of global cognitive competence on sociocultural background and crèche experience variables. It illustrates the standardised regression coefficients (β)—measuring the change in the global cognitive competence score that results from a one-standard-deviation change in the predictors—and the change in the explained variance (R^2) when additional blocks of predictors are entered into the three regression models. Furthermore, the constant, R^2 , the *F*-value, and adjusted R^2 are reported for the overall model with all four blocks of predictors inserted. In the sequential regression employed, four groups of predictors entered the equation. Each set of predictors is evaluated in terms of what it added to the equation at its

point of entry. The significance of the increase in the explained variance can be assessed for each set of predictors individually, providing a measure of the degree of confidence that the estimated relationship in the model is close to the true relationship under real-world circumstances. Inclusion of additional predictors may entail a change in the regression coefficients and alter the overall explanatory power of the model. All regression models examine the effects of social and cultural background variables. In addition to these effects, model 1 analyses the impact of crèche attendance (no / yes), model 2 investigates the impact of duration of crèche attendance (1-2 years vs. > 2 years), and model 3 investigates the impact of intensity of crèche attendance (1-3 days vs. > 3 days per week) on children's global cognitive competence scores.

Table 5. Hierarchical multiple regression analyses predicting global cognitive competence in the first grade from social background, cultural background, crèche experience, and interaction terms

Predictor	Model 1 <i>R</i> ²	Model 2 <i>R</i> ²	Model 3 <i>R</i> ²
<i>Social background</i>	.077***	.091***	.091***
Maternal education		-.001	.103
Paternal education		.017	.098
No. of rooms per person		.073*	.046
Number of books at home		.104***	.072
<i>Cultural background</i>	.018***	.018*	.018*
Child in Switzerland		.043	.084
Swiss or High German at home		.133***	.110 ⁺
<i>Crèche experience</i>	.000	.000	.005
Crèche attendance		-.023	
Crèche duration			-.026
Crèche intensity			
<i>Interaction terms</i>	.001	.001	.001
Crèche x Maternal educ.		.091	
Crèche x Paternal educ.		.035	
Crèche dur. x Maternal ed.			.059
Crèche dur. x Paternal ed.			-.016
Crèche int. x Maternal ed.			
Crèche int. x Paternal ed.			-.038
(Constant)	.340	.225	.234
<i>R</i> ²	.097	.111	.115
<i>F</i>	16.561***	4.752***	5.010***
<i>Adjusted R</i> ²	.091	.088	.092
<i>Number of cases</i>	1402	352	355

Note: Missing values were excluded pairwise. *R*²: change in amount of variance explained (*R*²), : standardised coefficients; ⁺ *p* < .10, * *p* < .05, ** *p* < .01, *** *p* < .001. Constant, *F*-values, and coefficients are reported for the complete model with all predictors entered.

Model 1

The regression coefficients of model 1 show that the number of rooms per person and the number of books at home as well as the fact that German was always spoken at home significantly predicted the outcome scores whereas other background variables, crèche attendance, and the interaction terms did not yield a significant increase in the variance explained. The set of social background variables accounted for most of the variance, *R*² = .077, *p* < .001. A slight increase in the explained variance was ascertained when the set of

cultural background variables was entered into the model, $R^2 = .018, p < .001$. The crèche attendance and interaction variables, on the other hand, did not increase the explained variance in the global cognitive competence score significantly. Thus, on average, children with crèche experience obtained the same competence scores as children without any crèche experience. The significant standardised regression coefficients can be interpreted as follows: For a one-standard-deviation increase in the number of rooms per person in a family's household, a .073 standard deviation increase in the global cognitive competence score is estimated at $p < .05$. That is, when all other predictors are held fixed, any additional room per person is related to a significantly higher global cognitive competence. Standardised coefficients can be used to compare the size of the coefficients across the predictors. Model 1 reveals that the most distinct effect was produced by the language spoken at home, $\beta = .133, p < .001$. Relative to children who never or only sometimes spoke German at home, children who always spoke German in their families achieved better results in the cognitive test. Finally, the predictive value of the overall model was evaluated, using the determination coefficient R^2 to estimate the proportion of variance in the outcome score accounted for by all four sets of predictors. The overall model explained 9.7% of variance (R^2).

Model 2

Model 2 analysed how duration of crèche attendance influenced global cognitive competence. Unlike model 1 which focuses on the whole sample, it draws on data of the group of children who attended a crèche ($n = 352$). The block of social background variables and the block of cultural background variables contribute significantly to the prediction of the outcome, explaining 9.1% and 1.8% of variance in the cognitive test score, respectively. Although it may be hypothesised that stronger cognitive benefits are enjoyed by children who were exposed to crèche for a longer duration of time, the results of this analysis indicate that global cognitive competence did not rely on the duration of crèche experience, nor were there any interaction effects between duration of crèche and parental education. Considering individual independent variables, it can be noted that the language spoken at home tended to be related positively to higher cognitive scores. Overall, model 2 accounted for 11.1% of variance in the global cognitive competence score.

Model 3

The effect of crèche intensity is determined in model 3. The findings suggest that additional days per week spent in a crèche were not associated with any particular gains in global cognitive competence. As in the first two models, the two blocks of social and cultural background covariates proved to be statistically significant. An increase of one standard deviation in maternal education—which was the strongest predictor in model 3—was linked with a .149 standard deviation increase in the cognitive competence score, $p < .05$. Altogether, the variance explained was 11.5%.

Brief summary of findings

The pattern of results suggests that children's global cognitive competence score at the beginning of primary school varied with social and cultural background characteristics. Statistically, whether children had attended a crèche did not play a role in terms of their cognitive test achievements. Thus crèche experience per se did not yield significant cognitive

benefits in the present sample. Within the group of crèche attendees, neither duration nor intensity of crèche was found to influence the test scores. Generally, as a large proportion of variance was not explained by the variables in the regression models, it can be deduced that a range of other factors affect cognitive competence in addition to those of the present analysis.

Discussion

An increasing body of research focused on studying early childhood care and education has shared a particular purpose: to examine the influence of particular programmes on children's developmental trajectory. Methodologically, a majority of studies have compared a group of children who participated in an early childhood care and education programme with sociodemographically equivalent children who did not. However, questions relating to the effects of varying duration and intensity of early childhood programmes have frequently been omitted. In addition, while the empirical evidence on the effectiveness of programmes is growing primarily for the United States or the United Kingdom, quantitative research for Switzerland is lacking for the most part so far. The present study therefore aimed to analyse the effects of crèche attendance as well as those of duration and intensity of attendance on a cognitive competence measure in the canton of Zurich. Although the study is based on a rich set of data that stem from direct child assessments, the results are restricted in four main respects. These limitations are to be recognized before the results are discussed in detail.

Limitations of the Analytic Framework

First, the analysis draws on a cross-sectional rather than a longitudinal design which would be more suited to test process models. The estimates may therefore be biased as a selection effect cannot be excluded completely. Second, the quality of crèches and home learning environments was not evaluated in the original study and could not be included as covariate in the regression models. The social and cultural background factors taken into account in the analysis can merely be considered as rough estimates of the conditions for children's learning processes and developmental progress (cf., Bradley et al., 2001; Brooks-Gunn, Guo, & Furstenberg, 1993). They are not direct proxies of the quality of an early family and informal learning environment although research suggests that such background factors are related to the acquisition of cognitive skills (Biedinger, 2009; Feinstein, 2003; Hoff, 2006; Lee & Burkam, 2002). Third, the sample differed from the general population in terms of level of parental education. Finally, the assessment of duration and intensity of crèche experience would have been more accurate if the original survey had provided data about more specific units such as hours per week and exact number of months of crèche attendance.

Does sociocultural background influence global cognitive competence?

All social and cultural background variables correlate significantly with the cognitive outcome as evaluated in the first grade of primary school, implying that the social origin of a child has a vital impact on the acquisition of early cognitive skills. The correlations consistently indicate that children from socially more privileged families achieved better results than their more disadvantaged counterparts. This result is confirmed for the most part by the regression analyses which provide evidence that social and cultural variables—in particular the number of books available and the German language spoken at home—are important predictors of global cognitive competence. It corroborates a pattern of findings

relating to the detrimental effects of a poor social background on children's emergent proficiency (Duncan, Brooks-Gunn, & Klebanov, 1994; Karoly et al., 1998; Ramey & Ramey, 2004; Votruba-Drzal, 2003). Furthermore, the result is in line with the assumption that family risk status, as indicated by socioeconomic disadvantage, impacts negatively on children's development (McLoyd, 1998). However, these conclusions must be drawn cautiously as they are substantiated only indirectly by the significant main effects of the proxy variables 'number of rooms per person' and 'number of books at home.' That is, although the block of social background variables taken as a whole accounted for a significant proportion of variance in the global cognitive competence measure, the effects of maternal and paternal education per se were not significant nor were the interactions between crèche experience and parental education significant. This is contradictory to the finding that low parental education levels are associated with low intellectual achievement of children (Mercy & Steelman, 1982). It therefore needs to be discussed specifically hereafter.

Effects of parental education

It has been widely assumed that the level of parental education may partially reflect the degree of academic stimulation which parents are capable to offer and that parent's education is thus related to whether they would put emphasis on teaching and providing learning facilities to children. Accordingly, parental education has been regarded as an indicator of a stimulating learning climate in the family. Davis-Kean (2005) highlighted that parental education relates indirectly to children's academic achievement through parent's beliefs such as educational and achievement expectations and stimulating home behaviours including reading, play, and affective behaviours. Thus it could be linked with an increased ability of parents to adjust the home environment to meet the children's needs in matters related to school (see Hoover-Dempsey & Sandler, 1997). Given these findings about the connections between parental education and children's academic attainment, it might be unexpected that the present study did not yield significant effects of the number of years of parents' schooling on children's cognitive proficiency. Theoretically, three reasons can be put forward: First, the effects of parental education might not have been meaningful because the parents' educational level in the sample did not accurately represent the population's educational background. As it tended to be lower than the educational background of the Swiss resident population, its variance might have been too small to distinguish clearly between different educational levels. Second, although educational background has been operationalised through the number of years of schooling required for the highest degree obtained in previous studies (Spiess et al., 2003), this might not be the most precise indicator of educational because a given number of years of formal education can lead to degrees at different educational levels in some instances.¹ Third, it is well established that parental educational aspirations—that is, parents'

¹ In the present study, nine different levels of schooling were distinguished, yet five out of these nine levels required the same number of years of schooling: primary school (requiring 5 years), three different levels of secondary school ('Oberschule,' 'Realschule,' 'Sekundarschule,' all requiring 9 years), extended secondary school (12 years), academic high school (13 years), teacher education (17 years), technical college (17 years), and university (18 to 19 years). In order to test whether the operationalisation through the number of years of schooling affected the cognitive competence outcome, the variable parental education was recoded into different levels of educational attainment through dummy coding. Sequential regression analysis with dummy variables in fact explained slightly more variance in the cognitive outcome, $R^2 = .113$, Adjusted $R^2 = .100$, $F = 8.335^{***}$, $n = 1324$.

expectations as to the academic achievement of their children—can predict children’s educational pathways (e.g., Neuenschwander & Malti, 2009). It may therefore be hypothesised that educational aspirations are related to the home learning environments which in turn can influence the development of children’s cognitive proficiency (Goodman & Gregg, 2010; Melhuish et al., 2008a). Although parents’ aspirations were not assessed in this study, a number of analyses indicate contradictory findings as to the relation between social status and parental aspirations, supporting the hypotheses that low social status can be related to both unambitious and demanding parental aspirations (see Siraj-Blatchford, 2009; Stamm, 2005). Insofar, it is conceivable that in the present sample socially privileged as well as deprived families had high educational aspirations for their children, which might have attenuated potential effects of educational background on children’s cognitive competence.

Socioeconomic background and child development

A poor socioeconomic background does not inevitably exert an injurious influence on children. Rather, this analysis presented support for the idea that the impact of socioeconomic status on children’s skills is mediated by the child’s environment (Mercy & Steelman, 1982). Thus poor socioeconomic background is more likely to be detrimental to child development when combined with poor-quality learning experiences in socially and intellectually uninspiring milieus (Melhuish et al., 2008a). Although poverty factors were identified to have a significant effect on the quality of the home environment (Garrett, Ng’andu, & Ferron, 1994), there is wide variability in what children experience within each socioeconomic level. Moreover, the association between socioeconomic background and child development varies, for instance, as a function of society and culture (Heyneman, 1976). For a given child from a socioeconomically deprived family, the mechanisms leading to poorer developmental outcomes could be linked with covariates of socioeconomic background such as minority status or single parenthood or other social risk factors including exposure to violence (Foster, Lambert, Abbott-Shim, McCarty, & Franze, 2005). Furthermore, children may lack access to important resources and cognitive learning materials which can mediate the connection between socioeconomic background and children’s intellectual achievement from infancy through adolescence (Bradley, 1994). But the relation between socioeconomic background variables and child development can be mediated by teacher expectations and attitudes as well. According to McLoyd (1998), teachers may perceive pupils from poor socioeconomic backgrounds more negatively (e.g., as having less maturity and self-regulatory skills) and may tend to have poorer achievement expectations for them, amongst others by reason of considerations which do not concern children’s cognitive performance (e.g., speech patterns or clothing). Further studies demonstrated that low socioeconomic status is related to lower cognitive capabilities of children via parenting quality including parental responsiveness, time spent reading to the child, and the number of other children in the household (Berger, Paxson, & Waldfogel, 2005; Paxson & Schady, 2007). Bradley and Corwyn (2002) also emphasise the importance of considering community-level socioeconomic status because neighborhood of residence can be linked with achievement outcomes even when individual-level income and education are controlled. For instance, living in a high socioeconomic status neighborhood may have a positive influence on school readiness and school achievement (Leventhal & Brooks-Gunn, 2000). In a study by Kohen, Leventhal, Dahinten, and McIntosh (2008), associations between neighborhood structural disadvantage and young children’s

development operated through both neighborhood and family processes. Specifically, neighborhood disadvantage manifested its effect via lower neighborhood cohesion. This related to maternal depression and family dysfunction which, in turn, was linked with less consistent, less stimulating, and more punitive parenting behaviours and, ultimately, poorer child outcomes. Thus, in summary, it must be pointed out that numerous mechanisms relate socioeconomic background to child development.

Cultural background and child development

It is widely acknowledged that cognitive development has cultural origins which shape a child's thinking (Gauvain, 1998; Luria, 1984) since human cognition develops within culturally organised forms of activity. Under the influence of adult speech, for instance, children incorporate language into their mental schemes, which results in a reorganisation of their cognitive structures. In this respect, empirical evidence offers support of the notion of cultural influences on children's cognitive development (Michael, 2003). Thus acquaintance with the cultural background of a given society is considered to be a central aspect of cognitive development. Esser (2006) demonstrated, for instance, that children's command of a society's language was related to their school achievement and educational attainment. Similarly, the present findings indicate that children who spoke the official German language at home scored higher in the cognitive test. As a whole, the block of cultural background variables accounted for a significant fraction of the variance in the global cognitive competence measure. On the one hand, this result can be interpreted as further evidence suggesting that children from immigrant families often do not attain the same cognitive proficiency as their native counterparts on standardised tests measuring cognitive skills (Dubowy, Ebert, von Maurice, & Weinert, 2008). On the other hand, the result could be attributed to the fact that the test was administered via the official German language and that, as a result, the test was not culture-fair insofar as it might have ascertained cognitive competence by relying on knowledge which is specific to the Swiss culture. Referring to the question of the test's culture-fairness, a previous analysis of the same data set proved that while children's vocabulary depended on familiarity with the mainstream cultural background, mathematics did not (Burger, 2012). That is, a family's home language influenced children's vocabulary but did not affect their mathematics competences. This result may indicate the importance of the language of test administration although it does not prove that the test language was responsible for differences in the test outcomes between native speakers and non-native speakers (two out of three outcomes, reading and mathematics, were not reliant on children's home language). In general, however, the assumption that non-native speakers consistently perform poorer in cognitive assessments is not justified as shown by an Australian evaluation of a programme with a relatively high rate of non-native speaking children demonstrating that, after accounting for the effects of type of programme and family characteristics, literacy and numeracy skills at age 4 and 5 were higher for children who spoke a language other than English at home (Harrison et al., 2009).

Does exposure to a crèche improve global cognitive competence?

Effects of crèche experience

According to the results of hierarchical multiple regression, children's global cognitive competence levels, as measured by a test including language and mathematics tasks, were not

improved by crèche experience in itself. Given the growing body of research that provides evidence for positive effects of early childhood care and education on cognitive development (e.g., Andersson, 1992; Barnett & Belfield, 2006; Wong, Cook, Barnett, & Jung, 2008), this finding might be contrary to expectations. Yet three alternative explanations for the lack of positive results can be put forward: First, children with crèche experience came from socially more privileged families as indicated by parental education, housing conditions, and number of books at home. However, generally, effects might be larger for children from more disadvantaged backgrounds (Niles et al., 2008). Thus, sociocultural disparities between the test group and the comparison group might account for the lack of positive effects on global cognitive competence. Second, the effectiveness of early childhood care and education depends on structural and process-related quality determinants (Burchinal et al., 2000; Early et al., 2007; ECCE, 1999; Lamb, 2000; NICHD, 2002a; Vandell, Henderson, & Wilson, 1988). Although the quality of crèches was not analysed here, the poor crèche supply in the canton of Zurich might have caused disproportionate utilisation of crèches and, as a consequence, insufficient quality of care and education processes in crèches. In this case, the present result could be traced theoretically to problems related to the quality of the learning environments in crèches. Third, the efficacy of early childhood care and education relies on the timing, breadth, and flexibility (Bos et al., 2007; Caille, 2001; Sheridan, 2007) as well as on the specific curricular and pedagogical approach of programmes (Schweinhart & Weikart, 1988, 1997, 1998; Walsh et al., 2006). For instance, programmes with a preventive rather than a remedial focus providing health and social services as well as parent training over and above a child-focused programme may enhance children's skill development more efficiently than programmes with more restricted scopes (Ramey & Ramey, 1998, 2004). Hence comprehensive consideration of the type of programme as well as of a family's life circumstances is undeniably vital for adequate planning and implementation of early childhood care and education programmes. For instance, cognitive advantages can result if parents and early childhood programme providers develop a collaborative relationship focused around the child's needs (Brooks-Gunn, Berlin, & Sidle Fuligni, 2006; Henrich & Blackman-Jones, 2006). Future studies into the effects of crèche experience will therefore provide more precise results, the more detailed information about crèche and the home learning environments as well as their interrelationship will be included.

Effects of crèche duration

A study by Gullo and Burton (1992) highlighted that the number of years children participate in an early childhood programme can account for a significant amount of variance in children's first-grade readiness and a study by Reynolds (1995) found that children enrolled for two years in a Head Start-type programme at age three or four began and ended kindergarten more academically competent than one-year participants. The present study, however, does not confirm the finding that a longer duration of enrolment necessarily benefits children's cognitive development. Neither the correlation nor the regression coefficients indicated that children who attended a crèche for more than two years obtained better results in the cognitive test than their counterparts with a shorter duration of attendance. Thus time spent in an early childhood programme is not synonymous with achievement (Karweit, 1988) and it may predict learning outcomes at a more modest level than might be expected on the basis of other studies (e.g., Campbell & Ramey, 1994). More generally, however, studies at

different educational levels using precise indicators of time spent on specific tasks as well as content-specific outcome measures find stronger associations (Fredrick & Walberg, 1980). Consequently, the non-significance in this analysis might be due to the fact that the prediction of child outcomes by means of a categorical variable (more or less than two years of crèche attendance) is less accurate and produces less variance than prediction through more specific units of time such as number of months.

Effects of crèche intensity

Intensity of crèche attendance was correlated negatively with global cognitive competence. Intensity must be viewed as more than a simple matter of days of services per week. For instance, intensity can be provided by small group sizes and numerous child-teacher interactions, low teacher turnover, or home visiting in addition to a centre-based programme. Nevertheless, this result is in line with other studies which evidenced that high-intensity non-parental child care may be detrimental for child outcomes even though these studies mainly focused on social outcome variables such as externalizing problem behaviour and conflict with adults (NICHD, 2003) or negative kindergarten adjustment including aggressiveness or internalizing behaviours (Bates et al., 1994; Belsky, 2006). Studies investigating the effects of intensity of early non-parental care on both social and cognitive outcomes found domain-specific risks as well as benefits. The amount of time spent in centre care was identified to be related to more conflictual relationships, poorer work habits (such as following classroom procedures, working neatly and carefully, and keeping materials organised) and poorer social skills, but also to better memory (NICHD, 2005a) and better language skills (NICHD, 2002b). In a study by Loeb et al. (2007), higher intensity of institutional care entailed negative socio-behavioural outcomes together with math and reading benefits at the beginning of kindergarten. In this respect, the negative relation between intensity and cognitive competence in the present analysis may be unexpected. However, this relation vanished in the regression analysis where controls for sociocultural background were included. No information was given about the precise age of the children at the time when they attended a crèche. Yet, in theory, it might be speculated that the above-mentioned association did not remain negative in the regression analysis because crèche attendance might have begun after the first year of life for a considerable number of children, that is, after a period when intense out-of-home care can be particularly harmful for children's development (Belsky, 2001, 2006).

Concluding remarks

While exposure to a crèche per se did not impact on children's global cognitive competence in the first grade of primary school, social and cultural background variables both had a significant effect in this regard. Likewise, in the subsample of children who attended a crèche, duration and intensity of attendance did not influence children's competence whereas social and cultural background variables did. This systematic pattern of results suggests that sociocultural disparities account for a significant proportion of differences in the cognitive proficiency of children at the beginning of their school career. In contrast to studies by Magnuson et al. (2004, 2007b), the effects were comparatively small. This might be explained best by the fact that the present regression models included fewer predictors than the models employed by Magnuson et al. which relied on a large number of predictors including home learning environment characteristics, family size and structure, income-to-needs ratios, race

and ethnicity, or quality of the child's neighborhood and school environment. Consequently, these models explained a greater proportion of variance in child outcomes. Typically, the most positive effects are found in small-scale, high-quality model programmes targeting at-risk children (e.g., Karoly et al., 2005; Schweinhart et al., 2005). The present study demonstrated that these results cannot be generalised directly to larger-scale programmes. Rather, they are in line with the findings of another large-scale study that detected weak associations between early childhood care and education and children's competences which disappeared when pertinent background characteristics of the parents were taken into account (Driessen, 2004). Thus the effectiveness of early childhood care and education is not given a priori and under any circumstances. For this reason, it is important to consider characteristics such as quality, breadth, and flexibility of services when early care and education programmes are implemented (Ramey & Ramey, 1998) because beneficial outcomes become unlikely if programmes are construed carelessly and unaware of the findings from scientific research.

References

- American Academy of Pediatrics (2005). Quality early education and child care from birth to kindergarten. *Pediatrics*, *115*(1), 187–191.
- Ammermueller, A., & Pischke, J. S. (April 2006). *Peer effects in European primary schools: Evidence from PIRLS* (NBER working paper 12180). National Bureau of Economic Research. Retrieved August 28, 2010, from www.nber.org/papers/w12180.pdf.
- Anderson, L. M., Shinn, C., Fullilove, M. T., Scrimshaw, S. C., Fielding, J. E., Normand, J., et al. (2003). The effectiveness of early childhood development programs. *American Journal of Preventive Medicine*, *24*, 32–46.
- Andersson, B. E. (1992). Effects of day-care on cognitive and socioemotional competence of thirteen-year-old Swedish schoolchildren. *Child Development*, *63*(1), 20–36.
- Bainbridge, J., Meyers, M. K., Tanaka, S., & Waldfogel, J. (2005). Who gets an early education? Family income and the enrolment of three- to five-year-olds from 1968 to 2000. *Social Science Quarterly*, *86*(3), 724–745.
- Barnett, W. S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *The Future of Children*, *5*(3), 25–50.
- Barnett, W. S. (2008). *Preschool education and its lasting effects: Research and policy implications* (EPRU Policy Brief). Boulder and Tempe: Education and the Public Interest Centre & Education and Policy Research Unit.
- Barnett, W. S., & Belfield, C. R. (2006). Early childhood development and social mobility. *The Future of Children*, *16*(2), 73–98.
- Bates, J. E., Marvinney, D., Kelly, T., Dodge K. A., Bennett, D. S., & Pettit, G. S. (1994). Child-care history and kindergarten adjustment. *Developmental Psychology*, *30*(5), 690–700.
- Becker, R., & Lauterbach, W. (2007). Vom Nutzen vorschulischer Erziehung und Elementarbildung: Bessere Chancen für Arbeiterkinder? [On the benefit of preschool and elementary education: Better chances for working-class children?] In R. Becker & W. Lauterbach (Eds.), *Bildung als Privileg. Erklärungen und Befunde zu den Ursachen der Bildungsungleichheit* (2nd ed., pp. 125–156). Wiesbaden: VS Verlag für Sozialwissenschaften.
- Becker, R., & Tremel, P. (2006). Auswirkungen vorschulischer Kinderbetreuung auf die

- Bildungschancen von Migrantenkindern [Effects of preschool care on educational opportunities of migrant children]. *Soziale Welt*, 57, 397–418.
- Becker, G. S., & Tomes, N. (1986). Human capital and the rise and fall of families. *Journal of Labor Economics*, 4(3/2), S1-S39.
- Belsky, J. (2001). Emanuel Miller lecture: Developmental risks (still) associated with early child care. *Journal of Child Psychology and Psychiatry*, 42(7), 845–859.
- Belsky, J. (2006). Early child care and early child development: Major findings of the NICHD study of early child care. *European Journal of Developmental Psychology*, 3(1), 95–110.
- Bensel, J. (1994). Ist die Tagesbetreuung in Krippen ein Risiko? Eine kritische Beurteilung der internationalen Krippenforschung. *Zeitschrift für Pädagogik*, 40(2), 303–326.
- Berger, L. M., Paxson, C., & Waldfogel, J. (2005). *Income and child development* (Working paper # 05-16-FF). Princeton University: Centre for Research on Child Wellbeing.
- Biedinger, N. (2009). Der Einfluss von elterlichen Investitionen auf die Entwicklung deutscher und türkischer Kinder [The influence of parental investments on the development of German and Turkish children in Germany]. *Berliner Journal für Soziologie*, 19(2), 268–294.
- Bierman, K. L., Domitrovich, C. E., Nix, R. L., Gest, S. D., Welsh, J. A., Greenberg, M. T., et al. (2008). Promoting academic and socio-emotional school readiness: The Head Start REDI program. *Child Development*, 79(6), 1802–1817.
- Bierman, K. L., Torres, M. M., Domitrovich, C. E., Welsh, J. A., & Gest, S. D. (2009). Behavioral and cognitive readiness for school: Cross-domain associations for children attending Head Start. *Social Development*, 18(2), 305–323.
- Bornstein, M. H., Hahn, C. S., Gist, N. F., & Haynes, O. M. (2006). Long-term cumulative effects of childcare on children's mental development and socioemotional adjustment in a non-risk sample: the moderating effects of gender. *Early Child Development and Care*, 176(2), 129–156.
- Bos, W., Hornberg, S., Arnold, K.-H., Faust, G., Fried, L., Lankes, et al. (2007). *IGLU 2006. Lesekompetenzen von Grundschulkindern in Deutschland im internationalen Vergleich* [IGLU 2006. Reading skills of elementary school children in Germany in an international comparison]. Münster: Waxmann.
- Bradley, R. H. (1994). The HOME inventory: review and reflections. In H. Reese (Ed.), *Advances in child development and behaviour* (pp. 241–288). San Diego: Academic.
- Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, 53(371-399).
- Bradley, R. H., Corwyn, R. F., McAdoo, P. H., & Coll, C. G. (2001). The home environments of children in the United States part I: Variations by age, ethnicity, and poverty status. *Child Development*, 72(6), 1844–1867.
- Bridges, M., Fuller, B., Rumberger, R., & Tran L. (2004). *Preschool for California's children: Promising benefits, unequal access* (Policy Brief 04-3). Santa Barbara, CA: PACE and UC Linguistic Minority Research Institute.
- Broberg, A. G., Wessels, H., Lamb, M. E., & Hwang, C. P. (1997). Effects of day care on the development of cognitive abilities in 8-year-olds: A longitudinal study. *Developmental Psychology*, 33(1), 62–69.
- Brooks-Gunn, J., Berlin, L. J., & Sidle Fuligni, A. (2006). Early childhood intervention

- programs: What about the family? In J. P. Shonkoff & S. J. Meisels (Eds.), *Handbook of early childhood intervention* (2nd ed., pp. 549–588). Cambridge, UK: Cambridge Univ. Press.
- Brooks-Gunn, J., Guo, G., & Furstenberg, F. F. (1993). Who drops out of and who continues beyond high school? A 20-year follow-up of black urban youth. *Journal of Research on Adolescence*, 3(3), 271–294.
- Brooks-Gunn, J., Klebanov, P., & Duncan, G. J. (1996). Ethnic differences in children's intelligence test scores: Role of economic deprivation, home environment, and maternal characteristics. *Child Development*, 67(2), 396–408.
- BSV. (2010). *Finanzhilfen für familienergänzende Kinderbetreuung: Bilanz nach sieben Jahren* [Financial subsidies for extra-familial child care: balance after seven years]. Bern: Bundesamt für Sozialversicherungen. Retrieved July 8, 2010, from <http://www.bsv.admin.ch/praxis/kinderbetreuung/00112/index.html?lang=de>
- Bundesamt für Statistik. (2002). *Bevölkerung* [Population] (Pressemitteilung Nr. 0350-0209-60). Neuchâtel: Bundesamt für Statistik. Retrieved July 29, 2010, from www.bfs.admin.ch/bfs/portal/de/index/themen/01/22/press.Document.24677.pdf.
- Bundesamt für Statistik. (2009). *Bildungsstand der Wohnbevölkerung: Höchste abgeschlossene Ausbildung, 2003, 25-64-jährige Wohnbevölkerung* [Educational background of the resident population: Highest degree obtained, 2003, 25- to 64-year-olds]. Retrieved from www.bfs.admin.ch/bfs/portal/de/index/themen/15/02/key/ind5.indicator.51131.511.html?open=1#1
- Burchinal, M., Howes, C., Pianta, R., Bryant, D., Early, D., Clifford, R., et al. (2008). Predicting child outcomes at the end of kindergarten from the quality of pre-kindergarten teacher-child interactions and instruction. *Applied Developmental Science*, 12(3), 140–153.
- Burchinal, M. R., Roberts, J. E., Riggins, R., Zeisel, S. A., Neebe, E., Bryant, D. (2000). Relating quality of centre-based child care to early cognitive and language development longitudinally. *Child Development*, 71(2), 339-357.
- Burger, K. (2010). How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. *Early Childhood Research Quarterly*, 25(2), 140-165.
- Burger, K. (2012). Do effects of center-based care and education on vocabulary and mathematical skills vary with children's sociocultural background? Disparities in the use of and effects of early childhood services. *International Research in Early Childhood Education*, 3(1), 17–40.
- Caille, J.-P. (2001). *Scolarisation à 2 ans et réussite de la carrière scolaire au début de l'école élémentaire* [School enrolment at 2 years and school success at the beginning of elementary school]. *Éducation & formations*, 60, 7-18.
- Campbell, J. J., Lamb, M. E., & Hwang, C. P. (2000). Early child-care experiences and children's social competence between 1 1/2 and 15 years of age. *Applied Developmental Science*, 4(3), 166–175.
- Campbell, F. A., & Ramey, C. T. (1994). Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families.

- Child Development*, 65(2), 684–698.
- Carlton, M. P., & Winsler, A. (1999). School readiness: The need for a paradigm shift. *School Psychology Review*, 28(3), 338–352.
- Caughy, M. O., DiPietro, J. A., & Strobino, D. M. (1994). Day-care participation as a protective factor in the cognitive development of low-income children. *Child Development*, 65(2), 457–471.
- Clarke, A. M., & Clarke, A. D. B. (1989). The later cognitive effects of early intervention. *Intelligence*, 13, 289–297.
- Committee on Early Childhood, Adoption, and Dependent Care. (2005). Quality early education and child care from birth to kindergarten. *Pediatrics*, 115(1), 187–191.
- Cryan, J. R., Sheehan, R., Wiechel, J., & Bandy-Hedden, I. G. (1992). Success outcomes of full-day kindergarten: More positive behavior and increased achievement in the years after. *Early Childhood Research Quarterly*, 7, 187–203.
- Currie, J. (2001). Early childhood education programs. *Journal of Economic Perspectives*, 15(2), 213–238.
- Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: The indirect role of parent expectations and the home environment. *Journal of Family Psychology*, 19(2), 294–304.
- Dollase, R. (2007). Bildung im Kindergarten und Früheinschulung: Ein Fall von Ignoranz und Forschungsamnesie [Learning in kindergarten and preschool: A case of ignorance and forgotten results]. *Zeitschrift für Pädagogische Psychologie*, 21(1), 5–10.
- Driessen, G. W. J. M. (2004). A large-scale longitudinal study of the utilisation and effects of early childhood education and care in the Netherlands. *Early Child Development and Care*, 174(7-8), 667–689.
- Dubowy, M., Ebert, S., von Maurice, J., & Weinert, S. (2008). Sprachlich-kognitive Kompetenzen beim Eintritt in den Kindergarten: Ein Vergleich von Kindern mit und ohne Migrationshintergrund [Linguistic-cognitive competencies at entry to kindergarten: A comparison between children with and without migration background]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 40(3), 124–134.
- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development*, 65(2), 296–318.
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428–1446.
- Dunn, L. M., & Dunn, D. M. (1997). *Peabody Picture Vocabulary Test - third edition (PPVT-III)*. Circle Pines, MN: AGS Publishing.
- Early, D. M., Maxwell, K. L., Burchinal, M., Bender, R. H., Ebanks, C., Henry, G. T., et al. (2007). Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. *Child Development*, 78(2), 558–580.
- ECCE. (1999). *European child care and education study. School-age assessment of child development: Long-term impact of pre-school experiences on school success, and family-school relationships* (Report submitted to European Union DG XII: Science,

- Research and Development). RTD Action: Targeted Socio-Economic Research.
- EDK. (2005). *Educare: betreuen – erziehen – bilden* [Educare: care – nurture – educate] (conference proceedings). Bern: Schweizerische Konferenz der kantonalen Erziehungsdirektoren. Retrieved June 29, 2010, from <http://edudoc.ch/record/455/files/StuB24A.pdf?ln=de>
- EDK. (2010). *Effektive Besuchsdauer (Vorschule)* [Effective duration of attendance (preschool)]. Bern: Schweizerische Konferenz der kantonalen Erziehungsdirektoren. Retrieved July 8, 2010, from: <http://www.ides.ch/dyn/15332.php>
- Elliott, C. D., Smith, P., & McCulloch, K. (1997). *Technical manual British Ability Scales II*. Windsor, Berkshire: NFER-NELSON Publishing Company.
- EPPE. (2008). *Influences on Children's Attainment and Progress in Key Stage 2: Cognitive Outcomes in Year 6* (Research Report DCSF-RR048). London: Department for Children, Schools and Families.
- Esser, H. (2006). *Migration, Sprache und Integration* [Migration, language, and integration] (AKI-Forschungsbilanz 4). Berlin: Arbeitsstelle Interkulturelle Konflikte und gesellschaftliche Integration (AKI), Wissenschaftszentrum Berlin für Sozialforschung (WZB).
- Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica*, 70(277), 73–97.
- Fontaine, N. S., Torre, D. L., & Grafwallner, R. (2006). Effects of quality early care on school readiness skills of children at risk. *Early Child Development and Care*, 176(1), 99–109.
- Foster, M. A., Lambert, R., Abbott-Shim, M., McCarty, F., & Franze, S. (2005). A model of home learning environment and social risk factors in relation to children's emergent literacy and social outcomes. *Early Childhood Research Quarterly*, 20(1), 13–36.
- Fredrick, W. C., & Walberg, H. J. (1980). Learning as a function of time. *Journal of Educational Research*, 73, 183–194.
- Galobardes, B., Shaw, M., Lawlor, D. A., Lynch, J. W., & Smith, G. D. (2006). Indicators of socioeconomic position (part 1). *Journal of Epidemiology and Community Health*, 60, 7–12.
- Garrett, P., Ng'andu, N., & Ferron, J. (1994). Poverty experiences of young children and the quality of their home environments. *Child Development*, 65(2), 331–345.
- Gauvain, M. (1998). Thinking in niches: sociocultural influences on cognitive development. In D. Faulkner, K. Littleton, & M. Woodhead (Eds.), *Learning relationships in the classroom* (pp. 67–90). London: Routledge.
- Glantz, F. B., & Layzer, J. (2000). *The cost, quality and child outcomes study: A critique* (Final report). Cambridge, MA: Abt Associates Inc.
- Goodman, A., & Gregg, P. (Eds.) (2010). *Poorer children's educational attainment: How important are attitudes and behaviour?* York: Joseph Rowntree Foundation.
- Goodman, A., & Sianesi B. (2005). Early education and children's outcomes: How long do the impacts last? *Fiscal Studies*, 26(4), 513–548.
- Gormley, W. T., J.R., Phillips D., & Gayer T. (2008). Preschool Programs Can Boost School Readiness. *Science*, 320, 1723–1724.
- Gullo, D. F., & Burton, C. B. (1992). Age of entry, preschool experience, and sex as antecedents of academic readiness in

- kindergarten. *Early Childhood Research Quarterly*, 7(2), 175–186.
- Harrison, L. J., Ungerer, J. A., Smith, G. J., Zubrick, S. R., Wise, S., Press, F., et al. (2009). *Child care and early education in Australia: The longitudinal study of Australian children* (Social Policy Research Paper No. 40). Canberra: Australian Government Department of Families, Housing, Community Services and Indigenous Affairs. Retrieved August 4, 2010, from www.fahcsia.gov.au/about/publicationsarticles/research/socialpolicy/Documents/prp40/sprp_40.pdf.
- Henrich, C. C., & Blackman-Jones, R. (2006). Parent involvement in preschool. In E. Zigler, W. S. Gilliam, & S. M. Jones (Eds.), *A vision for universal preschool education* (pp. 149–168). Cambridge, UK: Cambridge Univ. Press.
- Heyneman, S. P. (1976). Influences on academic achievement: A comparison of results from Uganda and more industrialized societies. *Sociology of Education*, 49, 200–211.
- Hill, V. (2005). Through the past darkly: A review of the British Ability Scales Second Edition. *Child and Adolescent Mental Health*, 10(2), 87–98.
- Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review*, 26(1), 55–88.
- Hofferth, S. L., West, J., Henke, R., & Kaufman, P. (1994). *Access to early childhood programs for children at risk* (National Household Education Survey). Washington, D.C.: U.S. Department of Education.
- Hoover-Dempsey, K. V., & Sandler, H. M. (1997). Why do parents become involved in their children's education? *Review of Educational Research*, 67(1), 3–42.
- Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., et al. (2008). Ready to learn? Children's pre-academic achievement in pre-kindergarten programs. *Early Childhood Research Quarterly*, 23, 27–50.
- Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to language input and gender. *Developmental Psychology*, 27(2), 236–248.
- European Commission Network on Childcare and Other Measures to Reconcile Employment and Family Responsibilities of Men and Women. (1996). *Quality targets in services for young children* (Proposals for a ten year action programme - paper 3). University of Toronto: Childcare Resources and Research Unit. Retrieved July 3, 2010, from <http://childcarecanada.org/pubs/other/quality/Qualitypaperthree.pdf>
- Kagan, S. L. (1991). Early care and education: Beyond the schoolhouse doors. In B. Persky & L. H. Golubchick (Eds.), *Early childhood education* (2nd ed., pp. 33–45). Lanham, Maryland: University Press of America.
- Karweit, N. (1988). Quality and quantity of learning time in preprimary programs. *The Elementary School Journal*, 89(2), 118–133.
- KiTaS. (2008). KiTaS-Richtlinien [KiTaS-guidelines]. Zürich: Verband Kindertagesstätten der Schweiz. Retrieved September 14, 2009, from http://www.kitas.ch/fileadmin/user_upload/intranetdokumente/geschaeftsstelle/KiTaS_RL_2008_01.pdf
- Kohen, D. E., Leventhal, T., Dahinten, V. S., & McIntosh, C. N. (2008). Neighborhood disadvantage: Pathways of effects for young children. *Child Development*, 79(1), 156–169.

- Lamb, M. E. (1996). Effects of nonparental child care on child development: An update. *Canadian Journal of Psychiatry, 41*(6), 330–342.
- Lamb, M. E. (2000). The effects of quality of care on child development. *Applied Developmental Science, 4*(3), 112–115.
- Lanfranchi, A. (2002). *Schulerfolg von Migrationskindern* [School success of migrant children]. Opladen: Leske + Budrich.
- Lee, V. E., Brooks-Gunn, J., Schnur, E., & Liaw, F. R. (1990). Are Head Start effects sustained? A longitudinal follow-up comparison of disadvantaged children attending Head Start, no preschool, and other preschool programs. *Child Development, 61*(2), 495–507.
- Lee, V. E., & Burkam, D. T. (2002). *Inequality at the starting gate: Social background differences in achievement as children begin school*. Washington, DC: EPI book.
- Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin, 126*(2), 309–337.
- Loeb, S., Bridges, M., Bassok, D., Fuller, B., & Rumberger, R. W. (2007). How much is too much? The influence of preschool centres on children's social and cognitive development. *Economics of Education Review, 26*, 52–66.
- Loeb, S., Fuller, B., Kagan, S. L., & Carrol, B. (2004). Child care in poor communities: Early learning effects of type, quality, and stability. *Child Development, 75*(1), 47–65.
- Luria, A. R. (1984). *Cognitive development: Its cultural and social foundations* (8th ed.). Cambridge, MA: Harvard Univ. Press.
- Magnuson, K. A., Meyers, M. K., Ruhm, C. J., & Waldfogel, J. (2004). Inequality in preschool education and school readiness. *American Educational Research Journal, 41*(1), 115–157.
- Magnuson, K. A., Ruhm, C., & Waldfogel, J. (2007a). The persistence of preschool effects: Do subsequent classroom experiences matter? *Early Childhood Research Quarterly, 22*, 18–38.
- Magnuson, K. A., Ruhm, C., & Waldfogel, J. (2007b). Does prekindergarten improve school preparation and performance? *Economics of Education Review, 26*(1), 33–51.
- Marjanovi Umek, L., Kranjc, S., Fekonja, U., & Bajc, K. (2008). The effect of preschool on children's school readiness. *Early Child Development and Care, 178*(6), 569–588.
- Mather, N., & Wendling, B. J. (2003). Instructional implications from the Woodcock-Johnson III. In F. A. Schrank & D. P. Flanagan (Eds.), *WJ III clinical use and interpretation. Scientist-practitioner perspectives* (pp. 94–125). San Diego: Academic Press.
- McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist, 53*(2), 185–204.
- Melhuish, E., Phan, M. B., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2008a). Effects of the home learning environment and preschool centre experience upon literacy and numeracy development in early primary school. *Journal of Social Issues, 64*(1), 95–114.
- Melhuish, E., Sylva, K., Sammons, P., Siraj-Blatchford, I., Taggart, B., Phan, M. B., et al. (2008b). Preschool influences on mathematics achievement. *Science, 321*, 1161–1162.
- Mercy, J. A., & Steelman, L. C. (1982). Familial influence on the intellectual attainment of

- children. *American Sociological Review*, 47(4), 532–542.
- Moser, U., Berweger, S., & Tresch, S. (2003). Sprache und Mathematik bei Schuleintritt [Language and mathematics at entry to school]. Zürich: Kompetenzzentrum für Bildungsevaluation und Leistungsmessung an der Universität Zürich.
- Moser, U., Stamm, M., & Hollenweger, J. (2005). *Für die Schule bereit? Lesen, Wortschatz, Mathematik und soziale Kompetenzen beim Schuleintritt* [Ready for school? Reading, vocabulary, mathematics, and social competencies at school entry]. Oberentfelden: Sauerländer.
- Neuenschwander, M. P., & Malti, T. (2009). Selektionsprozesse beim Übergang in die Sekundarstufe I und II [Selection processes in the transition to lower and upper secondary education]. *Zeitschrift für Erziehungswissenschaft*, 12(2), 216–232.
- NICHD Early Child Care Research Network (1997). The effects of infant child care on infant-mother attachment security: Results of the NICHD study of early child care. *Child Development*, 68(5), 860–879.
- NICHD Early Child Care Research Network (2000). The interaction of child care and family risk in relation to child development at 24 and 36 months. *Applied Developmental Science*, 6(3), 144–156.
- NICHD Early Child Care Research Network (2002a). Child-care structure, process, outcome: Direct and indirect effects of child-care quality on young children's development. *Psychological Science*, 13(3), 199–206.
- NICHD Early Child Care Research Network (2002b). Early child care and children's development prior to school entry: Results from the NICHD study of early child care. *American Educational Research Journal*, 39(1), 133–164.
- NICHD Early Child Care Research Network (2003). Does amount of time spent in child care predict socioemotional adjustment during the transition to kindergarten? *Child Development*, 74(4), 976–1005.
- NICHD Early Child Care Research Network, & Duncan, G. J. (2003). Modeling the impacts of child care quality on children's preschool cognitive development. *Child Development*, 74(5), 1454–1475.
- NICHD Early Child Care Research Network (2005a). Early child care and children's development in the primary grades: Follow-up results from the NICHD study of early child care. *American Educational Research Journal*, 42(3), 537–570.
- NICHD Early Child Care Research Network (2005b). Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. *Developmental Psychology*, 41(1), 99–114.
- NICHD Early Child Care Research Network. (2007). Age of entry to kindergarten and children's academic achievement and socioemotional development. *Early Education and Development*, 18, 337–368.
- Niles, M. D., Reynolds, A. J., & Roe-Sepowitz, D. (2008). Early childhood intervention and early adolescent social and emotional competence: second-generation evaluation evidence from the Chicago longitudinal study. *Educational Research*, 50(1), 55–73.
- NSW parenting centre (2003). *School readiness* (Discussion Paper 1). Retrieved May 05, 2011, from www.community.nsw.gov.au/docswr/_assets/main/documents/school_readiness.pdf.

- OECD (2006). *Starting Strong II: Early Childhood Education and Care*. Paris: OECD Publishing.
- OECD (2010). *Formal care and education for very young children* (PF3.2 Enrolment in childcare and pre-schools). Paris: OECD. Retrieved August 25, 2010, from www.oecd.org/document/4/0,3343,en_2649_34819_37836996_1_1_1_1,00.html.
- Osborn, A. F., & Milbank, J. E. (1987). *The effects of early education: A report from the Child Health and Education Study*. Oxford Oxfordshire, New York: Clarendon Press.
- Palermo, F., Hanish, L. D., Martin, C. L., Fabes R. A., & Reiser, M. (2007). Preschoolers' academic readiness: What role does the teacher-child relationship play? *Early Childhood Research Quarterly*, 22(4), 407–422.
- PAVO. (1977). Verordnung über die Aufnahme von Kindern zur Pflege und zur Adoption [Decree on the supervision of children for care and adoption]. Retrieved July 4, 2010, from <http://www.admin.ch/ch/d/sr/2/211.222.338.de.pdf>
- Paxson, C., & Schady, N. (2007). Cognitive development among young children in Ecuador: The roles of wealth, health, and parenting. *The Journal of Human Resources*, XLII(49), 49–84.
- Peisner-Feinberg, E., Burchinal, M., Clifford, R. M., Culkin, M. L., Howes, C., Kagan, S. L., et al. (2001). The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. *Child Development*, 72(5), 1534–1553.
- Plomin, R. (1999). Genetics and general cognitive ability. *Nature*, 402(2), C25-C29.
- Ramey, C. T., & Ramey, S. L. (1998). Early intervention and early experience. *American Psychologist*, 53(2), 109-120.
- Ramey, C. T., & Ramey, S. L. (2004). Early learning and school readiness: Can early intervention make a difference? *Merrill-Palmer Quarterly*, 50(4), 471–491.
- Reynolds, A. J. (1995). One year of preschool intervention or two: Does it matter? *Early Childhood Research Quarterly*, 10, 1–31.
- Robin, K. B., Frede, E. C., & Barnett, W. S. (2006). *Is more better? The effects of full-day vs. half-day preschool on early school achievement* (NIEER Working paper May 2006). New Brunswick: The State University of New Jersey Rutgers.
- Rumberger, R. W., & Tran, L. (2006). *Preschool participation and the cognitive and social development of language-minority students* (CSE technical report 674). Santa Barbara, CA: University of California.
- Saluja, G., Scott-Little, C., & Clifford, R. M. (2000). Readiness for school: A survey of state policies and definitions. *Early Childhood Research & Practice*, 2(2). Retrieved May 02, 2011, from <http://ecrp.uiuc.edu/v2n2/saluja.html>.
- Sammons, P., Sylva, K., Melhuish, E., Siraj-Blatchford, I., Taggart, B., Hunt, S., et al. (August 2008). *Effective preschool and primary education 3-11 project (EPPE 3-11): Influences on children's cognitive and social development in year 6* (Research brief DCSF-RB048-049). London: Department for children, schools and families.
- Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R. & Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: High/Scope Press.
- Schweinhart, L. J., & Weikart, D. P. (1988). Education for young children living in poverty:

- Child-initiated learning or teacher-directed instruction? *The Elementary School Journal*, 89(2), 212–225.
- Schweinhart, L. J., & Weikart, D. P. (1997). The High/Scope preschool curriculum comparison study through age 23. *Early Childhood Research Quarterly*, 12, 117–143.
- Schweinhart, L. & Weikart, D. (1998). Why curriculum matters in early childhood education. *Educational Leadership*, 55(6), 57–60.
- Sheridan, S. (2007). Dimensions of pedagogical quality in preschool. *International Journal of Early Years Education*, 15(2), 197–217.
- Shonkoff, J. P., & Meisels, S. J. (2006). *Handbook of early childhood intervention* (2. ed.). Cambridge, UK: Cambridge Univ. Press.
- Siraj-Blatchford, I. (2009). Learning in the home and at school: how working class children 'succeed against the odds'. *British Educational Research Journal*. First published on: 17 June 2009 (iFirst).
- Spiess, C. K., Büchel, F., & Wagner, G. G. (2003). Children's school placement in Germany: does Kindergarten attendance matter? *Early Childhood Research Quarterly*, 18(2), 255–270.
- Stamm, M. (2005). Bildungsaspiration, Begabung und Schullaufbahn: Eltern als Erfolgspromotoren? [Educational aspiration, talent and schooling: Parents as promoters of success?]. *Schweizerische Zeitschrift für Bildungswissenschaften*, 27(2), 277–297.
- Stamm, M. (2010). Früher und intensiver = besser? Zum Einfluss vorschulischer Förderung auf die kognitive und soziale Entwicklung [Earlier and more intensive = better? On the influence of early education on the cognitive and social development]. *Psychologie in Erziehung und Unterricht*.
- Stamm, M., Reinwand, V. I., Burger, K., Schmid, K., Viehhauser, M., & Muheim, V. (2009). *Frühkindliche Bildung in der Schweiz. Eine Grundlagenstudie im Auftrag der UNESCO-Kommission Schweiz* [Early childhood education in Switzerland. A study on behalf of the Swiss Commission for UNESCO]. Fribourg: Universität Fribourg, Departement Erziehungswissenschaften. Retrieved December 11, 2009, from http://perso.unifr.ch/margrit.stamm/forschung/fo_downloads/fo_dl_publ/Grundlagenstudie_FBBE_090220.pdf
- Sylva, K., Melhuish, E. C., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2008). *Effective pre-school and primary education 3-11 project. Final report from the primary phase: Pre-school, school and family influences on children's development during key stage 2* [Research Report No DCSF-RR061]. Institute of Education, University of London.
- Urban, D., & Mayerl, J. (2006). *Regressionsanalyse: Theorie, Technik und Anwendung* [Regression analysis: Theory, technique, and application] (2. ed.). Wiesbaden: VS Verlag für Sozialwissenschaften.
- Vandell, D. L., Henderson, V. K., & Wilson, K. S. (1988). A longitudinal study of children with day-care experiences of varying quality. *Child Development*, 59(5), 1286–1292.
- Votruba-Drzal, E. (2003). Income changes and cognitive stimulation in young children's home learning environments. *Journal of Marriage and Family*, 65, 341–355.
- Waldfoegel, J. (2002). Child care, women's employment, and child outcomes. *Journal of Population Economics*, 15(3), 527–548.

- Walsh, G., Sproule, L., McGuinness, C., Trew, K., Rafferty, H., & Sheehy, N. (2006). An appropriate curriculum for 4-5-year-old children in Northern Ireland: Comparing play-based and formal approaches. *Early Years: An International Journal of Research and Development*, 26(2), 201–221.
- Weiss, R. H., & Osterland, J. (1997). *Grundintelligenztest Skala 1 (CFT 1)* [Basic intelligence test scale 1]. Göttingen: Hogrefe.
- Wolter, S. C., Vellacott, M. C., Denzler, S., Grossenbacher, S., Kull, M., et al. (2007). *Bildungsbericht Schweiz 2006* [Education report Switzerland 2006]. Aarau: Schweizerische Koordinationsstelle für Bildungsforschung.
- Wong, V. C., Cook, T. D., Barnett, W. S., & Jung, K. (2008). An effectiveness-based evaluation of five state pre-kindergarten programs. *Journal of Policy Analysis and Management*, 27(1), 122–154.
- Yoshikawa, H. (1995). Long-term effects of early childhood programs on social outcomes and delinquency. *The Future of Children*, 5(3), 51–75.