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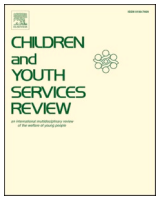

Raised in conditions of psychosocial deprivation: Effects of infant institutionalization on early development

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ABSTRACT

Background: Institutionalization is associated with a substantial developmental risk. Ethical constraints make it challenging to obtain robust empirical data on the effects of deprivation. Furthermore, because institutionalized children often face global deprivation, assessing the specific effects of psychosocial deprivation becomes difficult. Moreover, limited research exists on factors explaining interindividual differences.
Objective: To investigate developmental outcomes of children raised in institutions in conditions of psychosocial deprivation and to identify possible risk and protective factors at institutional and child levels.
Participants and Setting: Secondary analyses of data collected 1958–1961 in Switzerland in a population-based survey of institutionalized infants and toddlers. Participants ($n = 332$, $M_{age} = 11.1$ months, $SD = 6.4$, 48.2 % female, 45.3 % Swiss) were matched with a comparison group of 332 children raised in families ($M_{age} = 10.9$ months, $SD = 6.2$, 50.0 % female, 100 % Swiss).
Methods: Developmental status was assessed using the standardized Brunet-Lézine Developmental Test. Additional data were obtained from administrative records and through observations.
Results: Institutionalized children had significantly lower developmental quotients than the comparison group ($d = -1.60$, $p < 0.001$), with most prominent differences for language and social skills ($d = -1.21/-1.20$, $p < 0.001$). Within the institutionalized group, higher interaction time, higher birth weight, more regular family contact, and a shorter duration of institutionalization were associated with better developmental outcomes.
Conclusions: This study emphasizes the impact of isolated psychosocial deprivation on early development and identifies several risk and protective factors. To reduce developmental risk of institutionalization, the results are globally relevant for infants placed in institutions with comparable conditions today.

1. Introduction

During the first years of life, children's development is particularly susceptible to environmental influences because of the high plasticity of the brain (McLaughlin et al., 2018). Greenough et al.'s (1987) model enables us to distinguish between experience-expectant and experience-dependent plasticity. Experience-expectant plasticity refers to the integration of experiences that, within a typical range of environmental variation, can be expected by all individuals within a specific time frame. These experiences, characterizing an expectable environment, are required for typical development to occur. In contrast, experience-dependent plasticity can be understood as the ability to adapt to individual experiences. Although these experiences can shape brain development and support learning across the entire lifespan, they are not necessary for typical brain development. For infants and young children, an average expectable environment encompasses a variety of experiences, including basic sensory and perceptual input, and social experiences, such as the presence of a consistent, sensitive, and responsive caregiver (McLaughlin et al., 2019).

Deviations from the expectable environment during sensitive periods

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can have particularly negative and long-lasting effects on child development, particularly if they involve adverse childhood experiences. McLaughlin and Sheridan (2016) propose two dimensions to describe different types of adverse childhood experiences: (a) experiences of threat, such as exposure to violence or abuse, and (b) experiences of deprivation. Deprivation, which is the predominant dimension of neglect, is defined as the absence of experiences or environmental inputs that the brain requires to develop normally (McLaughlin et al., 2019). Neglect can be further subdivided according to the type of input the child does not receive. Accordingly, physical neglect refers to the failure to meet children's basic physical needs of adequate nutrition, hygiene, and medical care. In contrast, the term psychosocial neglect, often used interchangeably with psychosocial deprivation, describes a lack of adequate social, emotional, and cognitive stimulation (Zeanah & King, 2022). Poor stimulation can involve both the quantity and the quality of input.

Experiences of psychosocial deprivation are common among children raised in institutions because high child–staff ratios and rigid routines make sensitive, individualized care difficult. Changing shifts and high staff turnover further hamper the development of stable, individualized child–caregiver relationships (Bakermans-Kranenburg et al., 2011). As early as 70 years ago, Bowlby (1952) pointed out that the limited frequency and quality of contact with an adult caregiver provided by institutional care deprives children of the opportunity to develop secure attachments that lay the foundation for healthy physical, intellectual, and social development. A recent *meta*-analysis including more than 300 studies confirms that institutionalization is associated with a significant developmental risk (van IJzendoorn et al., 2020). The negative effects of institutional care on cognitive development have been particularly well studied, with strong effects for cognitive deficits in institutionalized children, with Hedge's $g = 0.81$ (van IJzendoorn et al., 2020). However, in many cases it is difficult to determine whether the negative effects of institutionalization are primarily due to psychosocial deprivation or to a combination of psychosocial deprivation and physical neglect, as institutionalized children often not only lack emotional and cognitive stimulation, but also face low hygiene standards and inadequate nutrition (as documented, for example, for the Romanian institutions after the fall of the Ceausescu regime: Groze & Ileana, 1996; Rutter, 1998). Therefore, one aim of this study is to assess how isolated psychosocial deprivation affects children's early development.

Moreover, studies on institutional deprivation have also shown interindividual variation in children's developmental outcomes (Kreppner et al., 2007). This variation may be attributed to multiple factors, some related to the child and others to the institutions. However, evidence of the extent to which factors related to the institutions can explain these individual differences is scarce. One reason for this scarcity is that the extent of deprivation is often not adequately documented (MacLean, 2003). In addition, comparability across studies is limited by heterogeneity in the operationalization of quality of care (e.g., Smyke et al., 2007; van IJzendoorn et al., 2008). Moreover, little research has examined the role that child-related variables including children's pre-institutional context and the timing and duration of institutional exposure might play in making some children more vulnerable than others to negative conditions in institutions (Smyke et al., 2007). The main reason for such limited evidence is that this kind of data is rarely available (van IJzendoorn et al., 2008). Many studies also lack data on other child-related risk and protective factors that have been identified in research on resilience, such as birth weight and temperament (Masten & Reed, 2002). Therefore, better understanding of individual differences in developmental outcomes of institutionalized children requires further research. With the aim of investigating what factors increase or mitigate the risk of developmental delays associated with institutionalization, this study both examines quality of care by using multiple indicators to more effectively operationalize quality of care and takes child-related variables into account.

1.1. Primary research

1.1.1. Context and study design

This study uses data collected in Switzerland in the late 1950s. At that time, Switzerland had rather invasive child welfare practices, and many children of unmarried or underage mothers and children from migrant workers' families were placed in institutions, usually directly after birth (Businger & Ramsauer, 2019). Between 1958 and 1961, a population-based survey systematically recorded the developmental and living conditions of 431 children, most of them under the age of three years, in all of the 12 infant and toddler institutions in the Canton of Zurich, Switzerland (Meierhofer & Keller, 1974, see Lannen et al., 2021 for further details). A comparison group was formed with data from a community sample of 399 children from the same geographic region growing up in families in the same period (Wehrle et al., 2021). The sample was representative of the Zurich population in parental occupation (Fischer, 1960). These children were examined at the University Children's Hospital Zurich as part of the Zurich Longitudinal Studies (ZLS; Wehrle et al., 2021). The assessment instruments were aligned for the two groups.

1.1.2. Major findings of the original analyses and limitations

The study team at the time collected institution- and person-centered data on infants and toddlers in all 12 institutions (Meierhofer & Keller, 1974). They documented that doctors conducted ward rounds with high frequency in each of these institutions, providing all children with medical care and vaccinations, while the staff adhered to strict feeding schedules and daily bathing routines. Overall, the study team found that the children received adequate food, hygiene, and medical care. However, children were raised in conditions of psychosocial deprivation with a lack of individualized care, reciprocal interactions, and poor cognitive stimulation. Their between-group analysis showed that children in the institutionalized group had significant developmental delays compared to the comparison group. The developmental delays observed in the institutionalized children were particularly evident in their language skills. Family characteristics, sex assigned at birth, and children's contact with the family did not account for differences within the group of institutionalized children. However, the study team found significant differences in developmental outcomes between the 12 institutions. They hypothesized that this was associated with differences in the quality of care between the institutions, but this assumption was not tested (Meierhofer & Keller, 1974). Overall, the analyses were rather basic, which can also be attributed to the fact that statistical methods and tools were still very limited at that time. The main methodological limitations of the analyses are that only bivariate associations were examined, that missing data points were ignored, and that for within-group analyses only specific subgroups, for example children in a certain age range, were compared with each other. This resulted in a significant loss of information that threatens the validity of the findings and limits generalizability.

1.2. Current analyses and significance of the study

The results reported above are available only in a book that is now out of print and was only available in German language (Meierhofer & Keller, 1974). The current study aims to validate and extend the original findings and make them available to the international scientific community. Examining and disseminating this kind of historical data on institutional child abuse and neglect serves two primary purposes: (a) establishing a record of the past to better understand what was happening at the time and what impact it had on child development; and (b) drawing lessons from the past to critically reflect on current care practices and to inform future policy and practice for children (Wright, 2017). This is highly relevant from a global perspective, as institutional care involving psychosocial deprivation, very similar to the conditions of the cohort in this project, is still current practice in many countries

today (Berument, 2013; Koch & Franzsen, 2017; Lee, 2000; The St. Petersburg-USA Orphanage Research Team, 2005).

We reanalyzed the historical data using state-of-the-art statistical methods including multiple imputation and structural equation modelling. Similar to the original analysis, the current analysis consists of two parts: (a) a focus on between-group differences comparing developmental outcomes of institutionalized children and children raised in families and (b) a focus on differences in children's developmental outcomes within the group of institutionalized children to identify risk and protective factors at institutional and child levels.

1.2.1. Between-group analyses: Research questions and hypotheses

Our aim was to address the research question whether infant institutionalization predicts children's developmental status in early childhood. We expected to replicate the results of the original analyses (Meierhofer & Keller, 1974) and therefore hypothesized that children in the institutionalized group score significantly lower than children in the comparison group in all developmental domains (H1a). In addition, we hypothesized that this group difference would be stronger for developmental domains that are more susceptible to environmental influences, such as language and social skills (Laucht et al., 1997; H1b).

1.2.2. Within-group analyses: Research questions and hypotheses

To shed light on individual differences in developmental outcomes among the institutionalized children, the second part of our analysis focused on the research question what factors amplified or buffered the risk of developmental delay in early childhood associated with institutional placement. We included the following factors at child and institutional levels.

Birth weight. Birth weight is well established as a robust indicator of fetal growth and perinatal health (Walhovd et al., 2012). A predictive relation between long-term brain development and later cognitive, motor, and socioemotional development has been found in various studies, particularly in children with extremely low birth weight (Latal, 2009). However, even within the normal range, higher birth weight decreases children's developmental risk (Shenkin et al., 2004). A study by Madigan et al. (2015) showed that growing up in a responsive environment buffers the developmental risk of lower birth weight. Whether children with low birth weight are at increased risk in deprived environments such as institutional care is not yet clear because data on the birth weights of institutionalized children is often lacking (van IJzendoorn et al., 2020). In addition, studies are inconsistent in outcome measures and age at assessment (e.g., Beverly et al., 2008; Nelson et al., 2007; Rakhlin et al., 2017).

Exposure to institutional care. The only randomized controlled trial (RCT) study on the effects of institutional exposure, the Bucharest Early Intervention Project (BEIP), showed that children who spent larger proportions of their lives in institutional care are more likely to have poorer developmental outcomes (Smyke et al., 2007). This dose–response relation between duration of institutional placement and children's developmental outcomes has been confirmed by a recent *meta*-analysis (van IJzendoorn et al., 2020). However, evidence on the role of the timing of institutionalization, typically operationalized as the effect of age at in-care placement, is less clear. Reasons for this are that information on time of in-care placement is often missing completely, that researchers have grouped children into broad categories without further differentiation (e.g., placement in the first year of life), and that the effects of timing and duration are difficult to separate in the data (van IJzendoorn et al., 2008, 2020). However, studies on early stress and adverse childhood experiences support the assumption that deprivation has stronger negative effects when experienced in the perinatal period, a particularly sensitive phase of brain development, than in later stages of child development (e.g. Hambrick et al., 2018). Therefore, a negative effect of younger age at in-care placement can be hypothesized.

Quality of care. Research in early childhood care and education (ECCE) indicates that daycare centers with lower child–staff ratios allow caregivers to respond more sensitively to children's needs and to provide their charges with more cognitive stimulation. This is associated with better developmental outcomes (e.g., Leach et al., 2008). This positive effect of child–staff ratio on children's developmental outcomes could not be confirmed for children reared in institutions in van IJzendoorn et al.'s (2008) *meta*-analysis. However, Smyke et al. (2007) were able to show that better quality of caregiver–child interaction predicts better cognitive development in institutionalized children even after controlling for several child characteristics and the duration of exposure to institutionalization. The relevance of quality of care in the institutional context is confirmed by intervention studies that associated improvements in structural and adult–child interaction aspects of quality of care with better developmental outcomes (e.g. McCall et al., 2019).

Contact with the family. Consistent with more recent data from care institutions around the world (van IJzendoorn et al., 2020), most children in Swiss care institutions in the 1950s and 1960s were not orphans. These children received regular family visits at the institutions, and some even spent most weekends at home (Meierhofer & Keller, 1974). Today, maintaining contact with the birth family is recognized as a fundamental right for children in out-of-home care and is enshrined in Article 9 of the United Nations Convention on the Rights of the Child (1989). So far, the impact of family contact has been studied primarily with respect to subsequent family reunification or placement stability; few studies have examined the direct effect of different patterns of family contact on developmental outcomes of children in out-of-home care (Sen & Broadhurst, 2011). In addition, most of this evidence applies to older children, predominantly in adoptive or foster care, whereas studies that include infants and toddlers are scarce (Humphreys & Kiraly, 2011). One concern raised is that, especially for young children, discontinuity due to transitions between birthparents and new caregivers may interfere with the establishment of stable relationships between children and their foster or adoptive parents (Schofield & Simmonds, 2011). However, whether this applies to our cohort is questionable; these children were raised in institutions in conditions of psychosocial deprivation with a chronic lack of sensitive and responsive caregiving (Meierhofer & Keller, 1974). In this situation children with more regular family contact likely had more opportunities for cognitive and socioemotional stimulation and verbal engagement with adults, which is thought to have a positive effect on child development (Hsin, 2009).

The evidence available led us to hypothesize that having higher birth weight would be associated with better developmental outcomes (H2a). Further, we expected that longer duration of institutional placement (H2b) and younger age at in-care placement (H2c) would increase the risk of developmental delays. In addition, we hypothesized that being placed in an institution with higher quality of care, operationalized here as more interaction time (H2d) and lower child-staff ratio (H2e) would be positively associated with children's development. We also expected positive effects of having more regular contact with the family, measured as receiving more family visits (H2f) and going home more regularly (H2g).

2. Material and methods

2.1. Study participants

Children in the institutionalized group were eligible if they were at least 3 months old at the time of assessment and were younger than 7 months at the first time of in-care-placement. Children with diagnosed medical disorders were excluded (Meierhofer & Keller, 1974). For the current study, we included only children tested with the Brunet–Lézine developmental test (Brunet & Lézine, 1951), because this test was also used with the comparison group. The age cutoff for this test procedure was 30 months. Older children were examined with other developmental tests and were therefore excluded from the present analyses to ensure comparability between groups. This resulted in a final sample of

$n = 332$ infants and toddlers between 3 and 29 months of age at the time of assessment ($M = 11.1$ months, $SD = 6.4$, 48.2 % female, 45.3 % Swiss; reasons for in-care placement: 56.9 % illegitimate birth or a dissolved family, 30.5 % parent's migrant worker status, 8.9 % precarious family situation such as lack of an independent family dwelling).

The children of the comparison group were tested up to five times between the ages of 2 months and 2 years. Thus, in contrast to the institutionalized group, data from multiple time-points were available for each child. To better compare the children of both groups, we matched each child in the institutionalized group with a child in the comparison group for age at assessment and sex assigned at birth. This resulted in a final sample for the comparison group of $n = 332$ ($M_{age} = 10.9$ months, $SD_{age} = 6.2$, 50 % female, 100 % Swiss). The results of the bivariate analysis indicate that the matching procedure resulted in a well-balanced sample (Table 1).

To identify potential confounders that were not considered in the matching procedure, we conducted additional preliminary tests. We found no differences in birth weight, but the two groups differed significantly in nationality: In contrast to the comparison group, where Swiss nationality was one of the original eligibility criteria, the institutionalized group comprised only 45 % children with Swiss nationality (Table 1). This reflects the historical background, as the obligation for both parents in migrant worker families to work was one of the main reasons for institutional placement. To take this group imbalance into account, nationality was included as control variable in the subsequent between-group analyses.

2.2. Procedure

2.2.1. Original data collection

Data were originally collected from the institutionalized group between 1958 and 1961. The heads of the institutions provided consent for study participation. To examine whether the assessment conducted at that time would meet today's standards, the study was recently reviewed by an independent ethics expert who drew on primary historical data, reports, and publications. The review concluded that today's basic ethical criteria were met (Brauer, 2019). Data were collected for the comparison group between 1954 and 1963. Parents provided oral consent for participation, and retrospective written informed consent was obtained from the participants when they were adults. Approval for this procedure was granted by the Ethics Committee of the Canton of Zurich, Switzerland (see Wehrle et al., 2021 for details).

Table 1
Descriptive Statistics and Mean Group Differences.

Variables		IG	CG	Mean group differences	
		M (SD)/%[a]	*M (SD)*/%[a]	Cohen's *d*	*p*
1	Age at assessment in days	338.2 (193.7)	331.7 (188.5)	0.03	0.66
2	Sex (Female)	48 %	50 %	−0.04	0.64
3	Nationality (Swiss)	45 %	100 %	−1.55	<0.001
4	Birth weight in g	3286.3 (559.1)	3334.2 (494.9)	−0.06	0.41
5	DQ Full scale	84.8 (11.0)	100.5 (8.5)	−1.60	<0.001
6	DQ Gross motor skills	89.9 (13.1)	100.8 (9.4)	−0.73	<0.001
7	DQ Fine motor skills	88.1 (14.0)	98.8 (13.2)	−0.62	<0.001
8	DQ Language skills	65.2 (24.7)	101.5 (16.4)	−1.21	<0.001
9	DQ Social skills	83.3 (13.3)	102.1 (9.6)	−1.20	<0.001
10	Age at in-care placement in days	16.18 (28.2)			
11	Duration of institutional care in days	319.8 (188.0)			
12	Family visits	71 %			
13	Going home	30 %			
14	Interaction time in hours	0.93 (0.36)			
15	Child–staff ratio	4.3 (1.3)			

Note. The data of the institutionalized group is based on the multiple imputed data sets; IG = institutionalized group; CG = comparison group; DQ = developmental quotient.
[a]For dichotomous variables: percentage of children with the value 1.

2.2.2. Data processing and dealing with missing data

Contrary to usual practice in secondary analyses (Cheng & Phillips, 2014), no preprocessed data set was available for this study. Original data from the institutionalized group were only available in mostly hand-written paper form and first had to be sorted and digitized to make it accessible for the present study. Details on the extensive data preparation process can be found in our study protocol (Lannen et al., 2021).

The comparison group data was complete, but we identified two reasons for data missing from the institutionalized group: (a) data was not recorded during the original data collection (e.g., a child's birth weight was not available in the institutions' administrative records); (b) the information was lost over time. In general, more information had been preserved for children who remained involved for a hitherto unpublished follow-up study (n = 159; Meierhofer & Hüttenmoser, 1975). More information on eligibility criteria, assessed constructs, and selected results of this follow-up study can be found in our study protocol (Lannen et al., 2021). The availability of institution-level data also varied greatly between institutions. After the data cleaning process, 221 of 332 records (67 %) had data missing for at least one variable. To handle missing data, we used multiple imputation methods with the mice package for R by van Buuren and Groothuis-Oudshoorn, (2011). Details on the imputation procedure, information on data missing for each variable and sensitivity analyses are provided in the Supplementary Material (Appendix A).

2.2.3. Study measures and instruments

Child characteristics. Information on the institutionalized group's birth weight, nationality, sex assigned at birth, and reason for in-care placement was originally derived from the administrative records of each institution. For the current study, we also reviewed data from the maternity hospital archives for birth weight and used additional information from subsequent follow-up assessments (Lannen et al., 2021) to validate and enrich the available data. Information on the comparison group was collected from interviews with the parents, usually the mothers, during the original study (Wehrle et al., 2021).

Developmental status. Children's developmental status was assessed with the *Échelle de développement psychomoteur de la première enfance* by Brunet and Lézine (1951), a standardized developmental test for children aged 1 to 30 months. This was the most widely used developmental test in central Europe at that time, because it was used in the various cohorts of the International Children's Center (ICC) Coordinated Longitudinal Studies. The ICC studies are a set of harmonized studies of children's health and development that were initiated in France in the 1950s and included cohorts from several European countries, one of which was the ZLS cohort (Wehrle et al., 2021).

The test covers children's development across four domains: gross motor skills, fine motor skills, language skills, and social skills. For each of these domains, the tasks are selected according to the age of the child (sample tasks can be found in the Supplementary Material, Appendix B). Depending on how many tasks the child can complete correctly, their developmental age is calculated and then compared to their chronological age. This results in a developmental quotient (DQ) that can be calculated both separately for each scale and as a full-scale score that can be interpreted as an indicator of a child's overall developmental status. In a normative sample of over 700 children, the mean DQ ranged

from 98 to 106, depending on age group; information on the standard deviation was not reported (Rennen-Allhoff & Allhoff, 1987). Specifically trained research staff conducted the developmental tests in both groups. Children in the institutionalized group were assessed in quiet rooms within the institutions, whereas children in the comparison group were assessed in quiet individual settings at the University Children's Hospital Zurich.

Exposure to institutional care. Information on age at in-care placement was available from the institutions' administrative records. In addition, we calculated duration of institutional care as the difference between a child's age at assessment and the age at which they were first placed in an institution. In line with von Hippel's (2009) *impute, then transform* approach, this variable was calculated after the imputation. If the children were known to have spent several weeks in family settings with their biological families, other relatives, or foster families between the first in-care placement and the assessment, the duration was calculated accordingly.

Contact with the family. The study documentation recorded how often children received family visits at the institutions or spent the weekend with their families. To simplify the data and improve validity, we formed two dichotomous variables: family visits (dummy coded: 0 = child received no family visits at all or at most every second week; 1 = child received family visits at the institution at least once a week) and going home (dummy coded: 0 = child never went home; 1 = child spent at least every other weekend with their family).

Quality of care. Meierhofer and her team used observations from all 12 institutions to document child–staff ratio. Furthermore, they calculated interaction time by summing the average time the caregivers spent on each daily care activity per child (Meierhofer & Keller, 1974). The original data on child–staff ratio has not been preserved for about half of the institutions. In these cases, we calculated proxies from data on the ideal-typical situation for each of these institutions: the number of children at full capacity and caregivers at full staffing. All institutions included in the study organized children in groups, typically clustered by age, and housed multiple groups. Because data were not available for each group of every institution and children also changed between groups, an average group-level value was calculated for each institution. To account for the multiple memberships of children who changed institutions, weighted mean scores were calculated from the duration of placement in each institution. If data were not available for one of the institutions a child was placed in, a proxy was calculated from the data available of all the other institutions that had cared for this child.

2.3. Data analytic approach

We used R (version 4.2.1) for all statistical analyses (R Core Team, 2020). After multiple imputation was performed and checked with graphical diagnostics and sensitivity analysis, we matched the data of the institutionalized group with the comparison group by age at assessment and sex using 1:1 nearest-neighbor matching without replacement.

The current study addressed the research questions with two blocks of analyses: (a) between-group analyses comparing the developmental outcomes of institutionalized children with those of children raised in families; (b) within-group analyses to identify risk and protective factors at institutional and child levels.

2.3.1. Between-group analyses

We conducted path analyses in which we first included the full-scale DQ (subsequently referred to as model 1a) and then the individual DQ subscales as outcome variables (model 1b) to allow more differentiated conclusions. Birth weight, age at assessment, sex, and nationality were considered as control variables. However, sex was not included in the final model because the bivariate analysis showed no significant associations with any of the outcome measures.

2.3.2. Within-group analyses

Similar to the between-group part, for the analyses solely concerning the institutionalized group the full-scale DQ was first chosen as outcome variable (model 2a), followed by analyses including all four DQ subscales (model 2b). We entered age at in-care placement, duration of institutional care, birth weight, family visits at the institution, going home, interaction time and child-staff ratio as manifest predictors. In addition, we considered sex as control variable. However, sex was not included in the final model because it was not significantly associated with any of the outcome measures. As children were nested in institutions, for all within-group analyses, cluster-robust standard errors were used to account for the hierarchical structure of the data (Mansournia et al., 2021). Fig. 1 illustrates a basic conceptual model of the within-group analyses.

3. Results

3.1. Between-group analyses

Sample characteristics of both groups, and bivariate correlations with children's developmental outcomes are shown in Tables 1 and 2.

In the multivariate models, we found substantial group differences with large effect sizes both for the model with the full-scale DQ (model 1a) and the model with the four DQ subscales as outcome variables (model 1b): When birth weight, nationality, and age at assessment were controlled for, the children in the institutionalized group scored significantly lower than those in the comparison group across all developmental domains. The strongest group effects were found for children's language skills and social skills (Fig. 2, Table 3).

3.2. Within-group analyses

At a descriptive level, we found individual differences across all developmental domains, with the greatest variation in language skills (Fig. 2, Table 1). Bivariate analyses showed that the predictors included at child and institutional levels are differentially associated with the DQ subscales (Table 4, variables 7–13). This indicates domain-specific effects. This is confirmed by the results of the structural equation models: for model 2a, we found positive, small-to-medium, significant effects on children's DQ of interaction time, birth weight and more family visits at the institutions and a positive, small-to-medium, marginally significant effect of going home more regularly. In addition, longer duration of institutional care was found to have a negative, small-to-medium, significant effect on full-scale DQ. Child-staff-ratio and age at in-care placement did not predict children's full-scale DQ (Table 5). For model 2b, we included all four DQ subscales as outcome variables. Similar to model 2a, we found no significant effects for age at in-care placement or child-staff-ratio (Table 5). However, we found a significant, small-to-medium, positive effect of interaction time on gross motor skills. Moreover, higher birth weight was significantly associated with a small-to-medium effect with gross motor skills and marginally significantly with children's social skills.

In addition, receiving more family visits at the institutions had a positive, small-to-medium, significant effect on children's gross motor skills and social skills and a marginally significant effect on language skills. Going home more regularly was positively associated with a small-to-medium marginally significant effect only with social skills. Longer duration of institutionalization predicted lower outcomes in language and social skills, also with small-to-medium effects. None of the predictors included in model 2b was significantly associated with children's fine motor skills (Table 5). Additional tables in the Supplementary Material include unstandardized coefficients and associated standard errors (Appendix A, Table A.5), and the results of complementary analyses with duration of institutional care included as a categorical variable (Appendix B, Table B.2).

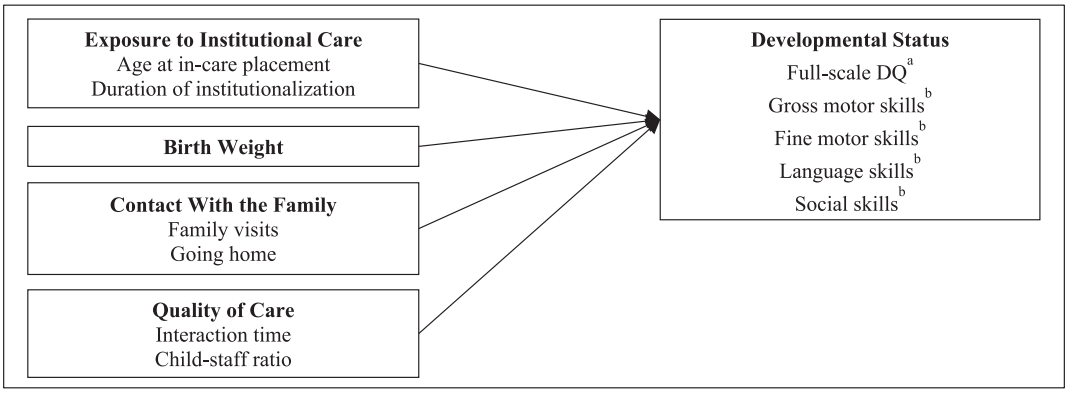

Fig. 1. Conceptual Model of the Within-Group Analyses. *Note.* [a]model 2a with the full-scale DQ as outcome variable, [b]model 2b with all four DQ subscales as outcome variables.

Table 2
Between-Group Analyses: Bivariate Correlations.

Variables		1	2	3	4	5	6	7	8
1	Age at assessment	-							
2	Sex (Female)	0.09*	-						
3	Nationality (Swiss)	0.01	−0.04	-					
4	Birth weight in g	−0.02	−0.07	−0.01	-				
5	DQ Full scale	−0.05	0.05	0.36***	0.13**	-			
6	DQ Gross motor skills	0.12**	0.05	0.21***	0.14**	0.79***	-		
7	DQ Fine motor skills	0.02	0.05	0.21***	0.08†	0.78***	0.48***	-	
8	DQ Language skills	−0.13**	0.01	0.42***	0.09	0.77***	0.50***	0.38***	-
9	DQ Social skills	−0.12**	0.05	0.38***	0.11*	0.85***	0.57***	0.50***	0.70***

Note. DQ = Developmental quotient.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

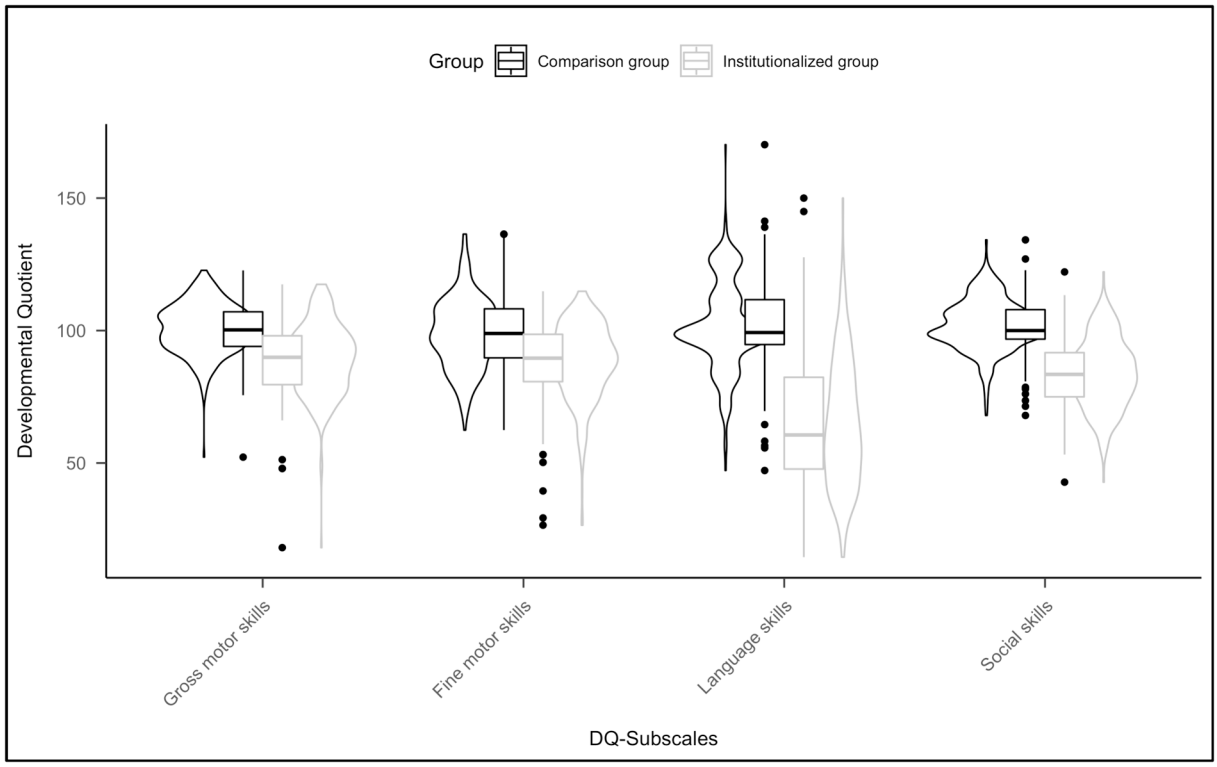

Fig. 2. Grouped Plots for the DQ Subscales. *Note.* DQ = Developmental quotient.

Table 3
Between-Group Analyses: Standardized Coefficients for Model 1a, 1b.

Variables	DQ – Full scale[a] β	Gross motor skills[b] β	Fine motor skills[b] β	Language skills[b] β	Social skills[b] β
Group (IG)	−0.63***	−0.48***	−0.38***	−0.63***	−0.62***
Birth weight	0.10***	0.12*	0.06	0.06	0.08*
Nationality (Swiss)	−0.02	0.09	−0.02	0.04	0.00
Age at assessment	−0.03	0.14***	0.03	−0.12***	−0.11***
R^2	0.40	0.22	0.14	0.45	0.42

Note. DQ = Developmental quotient. IG = Institutionalized group.
[a]Results of model 1a with the Full-Scale DQ as outcome variable; [b]Results of model 1b including all four DQ subscales.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

4. Discussion

The present study aims to contribute to a better understanding of the impact of psychosocial deprivation through infant institutionalization on early development.

4.1. Differences between institutionalized children and children growing up in families

Consistent with previous research and confirming the results of the primary analysis (Meierhofer & Keller, 1974) with modern statistical methods, we were able to show that children growing up in institutions had a significantly higher developmental risk than children raised in families (H1a). The large effect sizes we found for the association between institutionalization and developmental outcomes in early childhood mirror the findings of the BEIP and a recent *meta*-analysis (van IJzendoorn et al., 2020). Our results show that institutionalization was associated with a difference in children's developmental quotient of more than 0.6 standard deviations on average (Institutionalized group: $M = 84.8$, $SD = 11.0$, Comparison group: $M = 100.5$, $SD = 8.5$).

Developmental differences between the two groups studied here cannot be explained by differences in baseline developmental risk, because the two groups did not differ in birth weight at the bivariate level and the results of further between-group analyses remained stable after taking birth weight into account. This is important because many studies face challenges in controlling for whether institutionalized children already had an increased developmental risk: In general, institutionalized children are more likely to have been born to disadvantaged families and thus are exposed to more risks during the pre- and perinatal period than children raised in families, such as limited pre- and perinatal care and maternal malnutrition during pregnancy (MacLean, 2003). A review by Valero de Bernabé et al. (2004) has shown that these factors generally affect birth weight, which in turn increases the risk of developmental delays. The lack of pre-existing differences in birth weight between the two groups in our study indeed suggests that the effects of institutionalization, rather than pre-or perinatal factors, explain the poorer developmental outcome. This is supported by the fact that most children were institutionalized directly after birth and thus were barely exposed to the family environment.

Confirming our hypothesis H1b, we found the strongest group differences for language skills, followed by children's social skills. This corresponds to the results of the Mannheim Study of Children at Risk by Laucht et al. (1997), which showed that cognitive and socioemotional

Table 4
Within-Group Analyses (Institutionalized Group): Bivariate Correlations.

	Variables	*n*	1	2	3	4	5	6	7	8	9	10	11	12
1	DQ Full scale	332	-											
2	DQ Gross motor skills	332	0.77***	-										
3	DQ Fine motor skills	332	0.71***	0.42***	-									
4	DQ Language skills	332	0.64***	0.35***	0.16*	-								
5	DQ Social skills	332	0.76***	0.44***	0.32***	0.54***	-							
6	Sex (Female)	332	0.03	0.03	0.06	−0.01	0.00	-						
7	Birth weight	332	0.13*	0.15*	0.06	0.08	0.10	−0.10	-					
8	Age at in-care placement	332	−0.07	−0.06	−0.01	−0.04	−0.07	0.02	0.13†	-				
9	Duration of institutional care	332	−0.13*	0.05	0.06	−0.27***	−0.21***	0.06	−0.06	0.02	-			
10	Family visits	332	0.12†	0.08	0.00	0.13†	0.15†	−0.07	−0.24**	−0.12	−0.07	-		
11	Going home	332	0.05	0.08	0.07	−0.05	0.03	0.05	0.11	0.13†	0.32***	−0.31**	-	
12	Interaction time	264	0.19***	0.24***	0.13*	0.14*	0.01	0.11*	0.01	−0.06	0.06	0.14†	−0.11	-
13	Child-staff ratio	326	−0.06	−0.17**	−0.06	−0.06	0.14*	0.00	−0.07	0.06	−0.04	0.09	0.03	−0.52***

Note. Except for variables 12 and 13, the bivariate analyses are based on the multiple imputed data; DQ = developmental quotient.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 5
Within-Group Analyses (Institutionalized Group): Standardized Coefficients for Model 2a, 2b.

Variables	DQ Full scale[a] β	Gross motor skills[b] β	Fine motor skills[b] β	Language skills[b] β	Social skills[b] β
Birth weight	0.15*	0.17*	0.06	0.09	0.13†
Duration of institutionalization	−0.16*	0.02	0.04	−0.30**	−0.23**
Age at in-care placement	−0.08	−0.06	−0.02	−0.04	−0.09
Family visits	0.19*	0.17*	0.04	0.17†	0.20*
Going home	0.16†	0.14	0.07	0.11	0.17†
Interaction time	0.14**	0.17*	0.07	0.12	0.04
Child-staff ratio	0.01	−0.08	−0.02	−0.01	0.15
R^2	0.09	0.10	0.02	0.12	0.12

Note. [a]Results refer to model 2a including the full-scale DQ as outcome variable. Model fit: $\chi^2 = 4.34$, $df = 10$, $p = 0.93$, CFI = 1.00, RMSEA = 0.00. [b]Results refer to model 2b including all four DQ subscales as outcome variables. Model fit: $\chi^2 = 4.40$, $df = 10$, $p = 0.93$, CFI = 1.00, RMSEA = 0.00.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

development are particularly affected by environmental and psychosocial risk factors, whereas motor development, especially in infancy, is more strongly determined by biological risk factors (Laucht et al., 1997). Similarly, a more recent population-based cohort study comparing the developmental outcomes of children exposed to psychosocial risk factors with those of unaffected children at the age of 18 months found significant group differences in cognitive and affective domains but not for psychomotor development (Kahr Nilsson et al., 2019).

4.2. Predictors of developmental status in institutionalized children

On average, developmental deficits were evident across all domains in the institutionalized group. However, our data also showed that children were not all equally affected by the unfavorable conditions they experienced in institutions. Unlike Meierhofer's original analyses, in which no associations were found with any of the variables included at child or family level (Meierhofer & Keller, 1974), we were able to identify several risk and protective factors associated with individual differences in children's developmental outcomes:

Birth weight. Confirming our hypothesis H2a, we found that higher birth weight predicted better developmental outcomes, indicating a protective function of better perinatal health. This effect was shown for children's full-scale DQ, gross motor skills, and social skills. The positive relation we found between birth weight and gross motor skills corresponds to the results of a *meta*-analysis by de Kieviet et al. (2009). Furthermore, this result is consistent with the evidence described above that motor development is more dependent on maturation and therefore is more strongly affected by pre- and perinatal risk factors than are other developmental domains (Laucht et al., 1997). One possible explanation for the relation between birth weight and social competence in our institutionalized group is that children with lower birth weight, even moderate low birth weight, have a higher risk of infectious diseases (Hviid & Melbye, 2007). At the time our data were collected, common practice in the institutions was to isolate infected children from the group to prevent further transmission (Meierhofer & Keller, 1974). For children with lower birth weight, this could mean that they were isolated more often and thus had even fewer opportunities for social interaction. Another possible explanation for the relation between birthweight and social skills is that young children's behavior and temperament vary as a function of their birth weight status: Infants with lower birth weight tend to spend less time in active and awake states and to have more difficulties in arousal regulation and orientating to environmental stimuli (Gorman et al., 2001). As a result, these children may show more signs of distress and exhaustion and provide fewer contingent responses to their caregivers. This can be perceived as challenging and increases the risk that these children elicit less responsive care and positive social interactions from caregivers and thus receive less attention (Vallotton, 2009).

Exposure to institutional care. Our results indicate a dose–response relation: The longer children were institutionalized, the lower they scored on the full-scale DQ, language skills, and social skills. This supports the assumption that longer exposure to a deprived environment is a significant risk factor for developmental delays (H2b), which is consistent with previous research findings: One of the very first studies to indicate a negative effect of length of institutionalization was Spitz's landmark work on hospitalism (Spitz, 1945). The infants he studied who were placed in a foundling home under psychosocially deprived conditions showed a strong decline in their average developmental quotient during the first months of institutionalization (Spitz, 1945). Another seminal work on this topic is Bowlby's WHO report, in which he concludes "that the prolonged deprivation of the young child of maternal care may have grave and far-reaching effects on his character and so on the whole of his future life" (Bowlby, 1952, p. 46). Subsequent studies that examined the effects of prolonged placement systematically with larger samples, such as the BEIP (Smyke et al., 2007), also confirmed the increased risk of developmental delays associated with longer placement in institutional care. The fact that, of the four DQ subscales in our analyses, significant associations were only found for language skills and social skills indicates that longer exposure to deprived conditions is a risk factor particularly for developmental domains that are highly susceptible to environmental influences.

Contrary to hypothesis H2c and to the results of the *meta*-analysis by van IJzendoorn et al. (2008), our study did not find age at in-care placement to predict any of the outcome measures. The reason for these contradictory results may be that for the *meta*-analysis, a distinction was only made between children placed before or after the age of 12 months. The authors suggest that the difference found between these two groups arises because children who remain for at least their first year in family care receive more stimulation than those who are institutionalized earlier (van IJzendoorn et al., 2008). This might imply that the children who were institutionalized after 12 months of age also tended to have better family care conditions, whereas the group of children institutionalized within the first 12 months of age were more likely to have more adverse family environments. The present study only included children who were younger than 7 months at the time of initial placement. In addition, most children were placed within a few days after birth. It is therefore likely that the variance in our sample was too small to detect any effect of age of in-care placement.

Quality of care. Partially confirming hypothesis H2d, children placed in institutions with higher average interaction time scored higher on the full-scale DQ and gross motor skills but not on the other developmental domains. To interpret this result, we must keep in mind that interaction time in this study was measured by how much time the caregivers spent on the daily routines which each child. From the study documentation we can conclude that interaction time was notably higher in the institutions in which children were held by a nurse during feeding, as opposed to those where caregivers simply placed the bottle in the children's beds (Meierhofer & Keller, 1974). Accordingly, we can assume that children in institutions with higher interaction time were picked up more regularly and therefore had more position changes throughout the day which has been found to foster gross motor development in infancy (Pereira et al., 2016). However, based on the available data no conclusion can be drawn on the quality of interaction, e.g., whether these children in institutions with higher interaction time also had more direct verbal interaction. This could explain why we did not find positive effects of interaction time on language and social skills. Another explanation why we found no effect of interaction time on these domains could be the lack of variance across institutions in our sample: Given the previous success in overcoming high infant mortality rates, at that time the general belief was that good childcare should be characterized primarily by hygiene, prevention of infectious diseases, and adequate nutrition. In addition, there were concerns that giving children too much attention would spoil them (Gebhardt, 2009). In this zeitgeist, interaction and relationship building did not play a significant role. Accordingly, even in the institutions with slightly better quality of care, the children in our sample typically had less than 1.5 h of interaction time per day, and that was limited to daily care routines (Meierhofer & Keller, 1974).

Our results did not support hypothesis H2e that lower child-staff ratio predicted better developmental outcomes. The lack of effect could be the result of a methodological bias related to the available data: Due to missing data, we had to combine information from data sources of varying degrees of accuracy. More specifically, we had observational data on child-staff ratio that can be assumed to adequately reflect the actual conditions of care for only half of the institutions. For the rest of the institutions, these data could not be recovered. In these cases, we had to calculate proxies from official data provided by the heads of the institutions on ideal-typical child–staff ratios. However, it is common that such standards are not met in practice (Leach et al., 2008), so we can assume that the conditions in these institutions might have been worse than we may infer from the available data. This is also confirmed by the information we found in the study documentation that staff shortages

were common and that the institutions often had to take care of more than the ideal numbers of children. Moreover, the nursing staff in some of the institutions were also in charge of administrative and housekeeping duties, what might have led to an overestimation of the care they were actually able to give (Meierhofer & Keller, 1974).

Another potential source of bias arising from the operationalization of quality of care is that we did not have data for each group and therefore had to calculate mean values for the institutions. However, the study documentation supports the assumption that the quality of care varied by age group and that younger children were especially exposed to poorer conditions: as long as children were not yet physically mobile, they spent the whole day in their cribs except when being nursed and could hardly explore their environment or interact with their caregivers and peers. Moreover, according to the study documentation, children who were in isolation due to infectious diseases were largely left alone (Meierhofer & Keller, 1974).

Finally, although the use of different indicators for the operationalization of quality of care is a strength of this study, both, interaction time and child-staff ratio, only measure structural characteristics. These are believed to be more distal indicators of child care quality and thus to have less direct impact on child development than do characteristics of process quality such as interaction quality (Cassidy et al., 2005). This is consistent with previous research on the role of quality of care for children raised in institutions: Whereas in van IJzendoorn et al.'s (2008) *meta*-analysis, in which quality of care was measured solely by child–staff ratio, no effect of quality of care was found on children's developmental outcomes, the results of the BEIP show a positive association between higher-quality child–caregiver interaction and child outcomes (Smyke et al., 2007) and thus confirm the relevance of process quality. This is also in line with a recent study by Wustmann Seiler et al. (2022), showing that high process quality in ECCE is a relevant contextual protective factor for the development of resilience in children at risk. For institutional care settings, further research is needed that captures quality of care in more detail, including criteria of structural and process quality, and that takes into account the specific needs of children of various age groups.

Contact with the family. Children who received more family visits at the institution had higher scores in all developmental domains except fine motor skills. In addition, going home more often was associated with higher scores on the full-scale DQ and for social skills. This confirms our hypothesis that receiving more family visits and going home more regularly was a protective factor for children of our institutionalized group (H2f and H2g). We can assume that these children placed in institutions in conditions of psychosocial deprivation benefited from the individual attention and the additional stimulation that occurs with more frequent family contact. This is supported by an intervention study by Hakimi-Manesh et al. (1984) which shows that as little as 5 min of additional daily interaction time, including talking, eye-to-eye contact and touching, can be associated with better developmental outcomes. Evidence from resilience research indicates that the positive effect of more family contact may also be explained by the protective role of a supportive adult–child relationship (Masten & Reed, 2002). However, our data does not allow us to draw any further conclusions about this, because we do not have information on interaction quality or parent–child relationships. Generally, the individual family situation and the needs of each child have to be carefully considered when deciding the type and amount of family contact. Especially in cases where no or only very limited family contact is possible, the circumstances of the placement become even more important.

The factors we included accounted for up to 12 % of the within-group variance (see Table 5), which suggests that there are other important factors that explain individual differences. It is likely that quality of interaction and attachment style between children and their caregivers at the institutions or in their families play important roles (Bakermans-Kranenburg et al., 2011). In addition, we can assume that differences in child temperament and personality traits also elicited different behaviors from caregivers, thus influencing the quality of care provided to the individual child (Vorria et al., 2003). This is confirmed by indications in the study documents that some children were "favorites" of certain caregivers. Unfortunately, this data is not preserved in a systematic way for all children, so we were unable to include this in the quantitative analyses for this study.

4.3. Strengths and limitations

In general, the study design has several strengths, including a comparison group growing up at the same time in the same geographic region and the use of a standardized developmental test. In addition, sample sizes are relatively large for this field of research, because research into institutional care is often difficult to implement, especially due to ethical concerns (Kelley et al., 2016; van IJzendoorn et al., 2008). Moreover, the fact that the study assesses a population of institutionalized infants and toddlers is a unique feature that significantly increases the external validity of the findings. For internal validity, it is crucial to disentangle pre-institutional risks from the actual effects of institutionalization. We had very limited data on the socioeconomic status of the families, so we could not control for this. However, the strengths of the study are that we controlled for birth weight as a proxy for perinatal health and that most children were placed in institutional care immediately after birth, so that the postnatal effects of the family environment are likely to be small (van IJzendoorn et al., 2020). The risk of selection bias is further reduced by the fact that the children in this sample were not institutionalized due to child characteristics such as developmental delays or other conditions requiring additional resources or specialized care or due to a history of maltreatment, either of which might be confounded with the effects of institutionalization on child development (MacLean, 2003). In addition, the study allows us to examine the effects of psychosocial deprivation in a rather isolated manner because the children in our sample were not exposed to physical neglect.

Specific strengths of the current analyses over the original analyses lie in the application of advanced statistical methods including sophisticated missing data techniques, an appropriate matching procedure, the use of multivariate analyses, the consideration of multiple placements, and the controlling for within-cluster correlation. As a result, the current analyses provide additional insight into the impact of institutionalization on early development. The extension of the within-group-analyses by the four DQ subscales and the inclusion of additional predictors on child and institutional level also add important value to the original study (Meierhofer & Keller, 1974) because these advances allow better capture of variability in child development and to identify risk and protective factors.

Nevertheless, the study also has some limitations. First, the original data could not be recovered entirely. However, we were able to address missing data issues with multiple imputation, a sophisticated and methodologically robust approach. Moreover, using additional data sources and systematically correcting errors that had occurred when transferring data between sheets or rounding to the decimal place, for example, enabled us to significantly improve the quality of the data. Another concern might be that the zeitgeist of the 1950s could have influenced initial data collection. To prevent potential bias, we excluded variables from the analyses for which we could not reasonably assume objectivity, such as parents' attitudes toward their children as recorded by the authorities. In addition, the availability of a comparison group assessed at the same time in the same geographic region allows us to control for zeitgeist-dependent effects. Finally, one can argue that the contemporary relevance of this study is limited because the conditions in institutional care in Switzerland have changed considerably in the meantime (e.g. Bombach et al., 2017). However, as outlined above, the reconciliation of historical welfare practices is of great importance both for those affected and for society as a whole to address blind spots in history. Moreover, institutional care involving psychosocial deprivation, very similar to the conditions in the present study, is still current

practice in many countries (e.g., Berument, 2013), so these findings are highly relevant globally (For interested readers, a further discussion of why it is important to investigate and disseminate the historical data can be found in Appendix B). In addition, certain issues addressed in this study remain the subject of ongoing debates about institutional care practices in the Global North, such as whether contact with the birth family is beneficial for children in out-of-home care. Especially with infants and toddlers, there is controversy about whether contact with the birth family should occur during the early stages of placement and, if so, how these visits can be arranged and supervised to best meet the child's developmental needs and take into account parental resources and the purpose of placement (Mögel, 2015).

5. Conclusions and future directions

The present study confirms a negative association between institutionalization in infancy and developmental outcomes in early childhood. This association is shown even though the children in the institutions studied here received good nutritional, medical and hygiene care. This finding emphasizes the impact of psychosocial deprivation on early development. Thus, the study makes an important contribution to research, which has rarely been able to disentangle the extent to which developmental delays are due to malnutrition or a lack of stimulation and sensitive and responsive caregiving (MacLean, 2003). Because we can largely exclude selection bias and found no differences in birth weight between children in the institutionalized and comparison groups, our findings also strengthen the assumption that institutionalization itself, rather than pre- or perinatal factors, increases the risk of developmental delays. In our study, the strongest effects were found for language skills and social skills: two developmental domains that are highly susceptible to environmental influences.

Better understanding of what children in institutional care need to fulfill their developmental potential, and thus target interventions effectively, requires risk and protective factors to be identified. In our study, we were able to show that higher birth weight and increased contact with the family were associated with better developmental outcomes, whereas longer duration in institutional care in conditions of deprivation increased the risk of developmental delays.

To examine the impact of early institutionalization across the lifespan and to better understand the potential for recovery from early deprivation, our next step will be to link data from the present study with data from follow-up assessments in adolescence and late adulthood at age 60 years and more. Thus, this work will be the first of a series of papers that examines the development of these individuals across the entire life span (Lannen et al., 2021).

Authors contribution

HSa is completing her doctoral work as part of this study. She was responsible for the data entry and the cleaning process of the institutionalized group's data, as well as the matching procedure of the two groups. She designed the analysis of the data samples and performed the statistical analysis. She conceptualized and drafted all sections of the manuscript and incorporated the co-author's feedback. **FS** is senior researcher in the project. He supervised the statistical analysis of the data and contributed to the interpretation of the results. He provided input, particularly to the method and result sections, and edited the manuscript. **DAE** is a doctoral student in the Zurich Longitudinal Studies (ZLS). She prepared the data of the comparison group and reviewed a final version of the manuscript. **FMW** is a senior researcher in the ZLS. She supervised data preparation of the comparison group and provided input, particularly to the sections about the ZLS and the between-group analyses, and edited a final version of the manuscript. **HSi** is a co-investigator of the study and co-designed the project. She edited a final version of the manuscript. **OGJ** is co-investigator of the study and co-designed the project. He is principal investigator of the ZLS. He edited a final version of the manuscript. **PL** is the principal investigator of the study and designed the project. She contributed to the conceptualization of the paper, in particular the interpretation of the results. She provided input to and edited all sections of the paper and reviewed a final version of the manuscript.

All authors revised the manuscript critically, and approved the submitted version.

Declaration of competing interest

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

Data availability

The authors do not have permission to share data.

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Appendix. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.childyouth.2024.107718.

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