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Designing research to study the effects of institutionalization on brain and behavioral development: The Bucharest Early Intervention Project

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Abstract

This paper provides an overview of the largest longitudinal investigation of institutionalized children less than 2 years old ever conducted. The Bucharest Early Intervention Project is an ongoing randomized controlled trial of foster placement as an alternative to institutionalization in abandoned infants and toddlers being conducted in Bucharest, Romania. In addition to describing the contexts in which this study is imbedded, we also provide an overview of the sample, the measures, and the intervention. We hope that the natural experiment of institutionalization will allow us to examine directly the effects of intervention on early deprivation. We hope it will provide answers to many of the critical questions that developmentalists have asked about the effects of early experience, the timing of deprivation, and the ameliorating effects of early intervention and provide clues to which underlying neurobiological processes are compromised by, and resilient to, dramatic changes in early experience.

This paper describes the Bucharest Early Intervention Project (BEIP), a scientific and humanitarian project designed to document the effects of institutionalization on the development of young children, to determine the degree of recovery from early adversity that foster care can provide, and to assist the government of Romania in building an infrastructure to support alternative forms of care beyond institutionalization for children in difficulty.

Early Deprivation and Subsequent Plasticity

The period from conception to age 3 years is unparalleled in the human life cycle for the rapidity, complexity, and profundity of developmental changes. In the first 3 years, the human infant progresses from complete dependence upon its caregiver to a mobile, verbal, and cognitively sophisticated child capable of

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understanding and participating actively in rule-bound group social situations. Investigators are only now attempting to understand the changes in brain development that underlie these remarkable developmental advances (Nelson, Bloom, Cameron, Amaral, Dahl, & Pine, 2002). One important strategy has been to study the effects of various kinds of deprivation on brain development.

Throughout human history, children worldwide have experienced deprivation of various forms but these experiences have not been studied experimentally to reveal the effects of early deprivation on the developing brain. Thus, the majority of research in this area has used animal models that are more amenable to manipulation and allow invasive methods to reveal brain–behavior links during early development (Sanchez, Ladd, & Plotsky, 2001). Despite the importance of animal research, however, applicability of these findings to human development is fraught with difficulty, particularly with regard to their use in evidence-based interventions or in the formulation of social policy designed to enhance developmental opportunities.

Institutional rearing, which is still common in Eastern Europe, Asia, and Central and South America, is associated with social deprivation and with limited opportunities for young children to form selective attachments. Studying children raised in institutions, therefore, provides an opportunity to capitalize on a natural experiment that involves caregiving in an environment of relative deprivation. This makes it possible to address a number of questions. How much recovery is possible for children who experience early social deprivation? Are there critical periods that limit recovery from early deprivation? Are different domains of development compromised to similar degrees? Do different domains of development follow similar trajectories of recovery? What are the crucial ingredients in facilitating recovery? In previous research, these questions have had to be addressed indirectly by investigators studying children adopted out of institutions. In this paper, we describe an ongoing intervention study of institutionalized young children in Bucharest, Romania.

Children and Institutionalization: Previous Research

For most of the 20th century, clinicians and researchers have noted the deleterious effects of institutional rearing on the development of young children (Dennis & Najarian, 1957; Goldfarb, 1945a, 1945b; Provence & Lipton, 1962). Although many of these studies were uncontrolled or poorly controlled, more recent investigations have been more rigorous and have confirmed earlier findings from descriptive studies suggesting that institutional care was associated with a variety of maladaptive outcomes (Vorria, Rutter, Pickles, Wolkind, & Hobsbaum, 1998a, 1998b).

Contemporary research has documented many problems in young children adopted out of institutions in Eastern Europe, and Russia, and several other countries (Gunnar, Bruce, & Grotevant, 2000). Abnormalities include a variety of serious medical problems (Johnson, 1997; Johnson, Miller, Iverson, Thomas, Franchino, & Dole, 1992), physical and brain growth deficiencies (Benoit, Jocelyn, Moddeman, & Embree, 1996), cognitive problems (Morison, Ames, & Chisholm, 1995; O'Connor, Rutter, Beckett, Keaveney, Kreppner, & the English and Romanian Adoptees [ERA] Study Team, 2000; Rutter & the ERA Study Team, 1998), speech and language delays (Albers, Johnson, Hostetter, Iverson, & Miller, 1997; Groze & Ileana, 1996), sensory integration difficulties and stereotypies (Cermak & Daunhauer, 1997; Chisholm & Savoie, 1992), and social and behavioral abnormalities (Fisher, Ames, Chisholm, & Savoie, 1997; O'Connor, Bredenkamp, Rutter, & the ERA Study Team, 1999). The latter include difficulties with inattention/hyperactivity (Kreppner, O'Connor, Rutter, Beckett, Castle, & Croft, 2001), disturbances of attachment (Chisholm, 1998; Chisholm, Carter, Ames, & Morison, 1995; O'Connor et al., 1999; O'Connor, Rutter, & the ERA Study Team, 2000), and a syndrome that mimics autism (Federici, 1998; Rutter, Andersen–Wood, Beckett, Bredenkamp, Castle, & Groothues, 1999). Most of the available data concern children adopted from Romania, which was

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the leading source of international adoptions for families in the United States and many other Western countries in the decade of the 1990s (Johnson, 2000).

Some of these abnormalities are associated with risk factors that precede placement in the institutions, but quality of care often is inadequate in these institutions and many problems in children seem related to the ecology of institutional life (Ames, 1997; Johnson, 2000; Muhamedrahimov, 2000). One of the distinguishing features of the quasiautistic syndrome reported in these children, for example, is that the symptoms improve dramatically following adoption (Rutter et al., 1999). Therefore, a major purpose of the BEIP is to determine which effects are remediable and which are not.

A number of longitudinal studies have been conducted as natural experiments to examine the effects of institutionalization on children's development. The first study was initiated in the later 1960s and early 1970s in residential nurseries in London (Tizard, 1977). Barbara Tizard and her colleagues studied young children who were reared in institutions for their first 2 to 4 years of life. She studied four groups of children: a group that was adopted between ages 2 and 4 years, a group of children returned to their biological families between 2 and 4 years of age, a group who remained institutionalized, and a comparison group of never-institutionalized children. On virtually all cognitive, social, and behavioral measures, the adopted group had the most favorable outcomes and the institutionalized group had the least favorable outcomes (Hodges & Tizard, 1989a, 1989b; Tizard & Hodges, 1978; Tizard & Rees, 1974, 1975). Nevertheless, group assignment was not random and selection factors may have been substantially related to the demonstrated outcomes. Further, children who were adopted or those who were returned to their biological parents may have differed in important ways from those who remained institutionalized. The other limitation of the Tizard data is that the measures are quite dated by contemporary standards.

Two longitudinal studies have been conducted recently using children adopted from Romanian institutions. Ames, Chisholm, and colleagues (Ames, 1997; Chisholm, 1998; Chisholm et al., 1995; Fisher, Ames, Chisholm, & Savoie, 1997) conducted a longitudinal study of babies adopted from Romanian institutions into Canada. Their investigation included three groups of children: children adopted into Canada after having spent at least 8 months in a Romanian institution (n = 46), children adopted into Canada from Romania at less than 4 months of age (n = 30), and a Canadian born (but not adopted) comparison group matched on age and gender to the first group (n = 46). They found behavior problems, disturbances of attachment, and lower IQs in the group of children who had spent 8 months or more in Romanian institutions.

O'Connor, Rutter, and colleagues studied 165 children adopted from Romania (144 [87%] from institutions) and compared them at ages 4 and 6 years to 52 children adopted within the United Kingdom (O'Connor et al., 1999; O'Connor, Rutter, Beckett, et al., 2000; Rutter et al., 1999). They interviewed parents of these children using semistructured interviews regarding attachment disorder signs and behavior problems at age 4 years and administered a home-based version of the Strange Situation procedure. They repeated these interviews and administered the McCarthy Scales to children at age 6 years of age. They found that both at age 4 and age 6, duration of deprivation was linearly related to number of signs of attachment disorders. Children exhibiting indiscriminate sociability at age 6 years had experienced deprivation for twice as long as the cluster of children exhibiting no attachment disorder signs (M = 22 vs. 11 months). Although cognitive recovery was inversely related to age of adoption, social and emotional problems were less clearly related to timing.

O'Connor, Rutter, and the ERA Study Team (2000) also examined developmental level and attachment disorder behaviors. They reported a modest negative correlation in 6-year-old children adopted out of Romanian institutions between global cognitive index and attachment disorder behaviors (–0.24). Nevertheless, when duration of deprivation was taken into account, the association between

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cognitive delays and attachment disorder symptomatology disappeared. These findings suggest that attachment disorder symptomatology and global cognitive impairments were largely independent. Aggressive behavior appears to be largely independent of signs of attachment disorder in institutionalized children, whereas associations of signs of attachment disorder with language delays and stereotypies are sufficiently low to suggest that another factor (or factors) may be influencing all three of these developmental problems (Smyke, Dumitrescu, & Zeanah, 2002).

Taken together, these findings suggest that, although social deprivation may be associated with impairment across a range of developmental domains, the degree of impairment and trajectories of recovery may vary for these different domains. These tentative conclusions must be tempered by the realization that these studies are flawed by lack of randomization and selection bias in who is adopted, lack of data about individual differences in institutional experiences, and lack of adequate comparison groups, that is, native children who have never been institutionalized.

Neurobiological abnormalities

Given all of the dramatic behavioral abnormalities observed in institutionalized and formerly institutionalized children, it seems reasonable to explore neural systems that might be associated with those behavioral abnormalities. Previous research on institutionalized children has not included measures of brain functioning, although some assessments have been conducted with children adopted out of institutions. For example, Chugani and colleagues (Chugani et al., 2001) conducted a 2-deoxy-2-[^{18}F]fluoro-D-glucose positron emission tomography study in 10 children (average age = 8 years) who had been adopted after living in a Romanian institution. Nearly all children had been placed in the institution before 1.5 months of life and had lived in the institution an average of 38 months before being adopted. Compared to a control group of healthy adults, the adoptees showed significantly reduced brain metabolism in the orbital frontal gyrus, the infralimbic prefrontal cortex, medial temporal structures (including the amygdala and head of the hippocampus), the lateral temporal cortex, and the brain stem. Compared to a sample of 10-year-old children with medically refractory epilepsy, the adoptees showed significant decreases in glucose metabolism in the left orbital frontal cortex, left medial temporal structures, and left lateral temporal cortex. Behaviorally, the adopted children were described as suffering from mild neurocognitive impairments, impulsivity, and attention and social deficits.

Collectively, results from this study, the first of its kind, points to the serious neurobiological sequelae of early and prolonged institutionalization. In particular, these children suffered from metabolic deficits in the areas of the brain believed to be involved in higher cognition, emotion, and emotion regulation. Unfortunately, this study suffers from the same shortcomings as other postadoption studies noted earlier, making it unclear to whom the results generalize.

In order to enhance our understanding of brain–behavior relations in socially deprived children, we have included several measures of neural activity and other measures known to be associated with neural activity in our assessment battery. These are described in more detail below; but before describing particulars of the study, some contextual details are necessary.

Contexts of the Study

Clearly, a project led by several investigators at different sites and conducted on another continent poses significant logistical and scientific challenges. To understand these challenges and how we have addressed them, we begin by describing our understanding of the multiple contexts in which the investigation is embedded.

Historical context

Romania is a republic in the southeastern part of Central Europe, bordering Eastern Europe and the Balkan Peninsula. Located at the crossroads of Europe, Asia Minor, and the East, the area that is now Romania has a long

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and tumultuous history. Inhabited by humans since the Pleistocene Era, early Indo-European settlers gave way to the Thracians, who occupied the lands south of the Carpathian Mountains to the Adriatic and the Aegean seas. These tribes were conquered by the Roman Empire in 106 AD. The new province, Dacia, became one of the most colonized and highly romanized of the empire. Although the empire retreated from Romania after less than 200 years of occupation, its influence lived on in the national identity and the distinctly Latin language spoken by today by Romanians (Iorga, 1925/1970; Treptow, 1997).

Romania endured hundreds of years of conflict following the Roman retreat, including invasions from Asia, the Ottoman Empire, and the Austrio–Hungarian Empire. As residents of a buffer zone, Romania's population struggled through constant warfare while European nations further west flourished. Romania did not emerge as a united and independent nation until the second half of the 19th century, and this period of independence was soon characterized by totalitarian rule (Calafteanu, 1998; Treptow, 1997).

After World War II, Romania came under the influence of the Soviet Union as part of the Eastern bloc. Nicolae Ceauşescu, a former shoe cobbler, came to power in 1965 as Secretary General of the Communist Party in Romania and quickly created Eastern Europe's most highly centralized and totalitarian government. Initially, the self-styled "genius of the Carpathians" won great favor with the West for his defiance of the Soviet Union. Rapid industrialization and massive capital accumulation boosted the economy to the highest growth rate in the region, but these positive steps were short-lived and the latter part of the Ceauşescus reign is remembered only for economic disaster and unbridled abuses of human rights (Bachman, 1991; Treptow, 1997).

Ceauşescu's strategy to revitalize the economy by forcibly increasing the population and workforce and his obsession to pay off all international debt led to economic disaster for most Romanians. Punitive wage cuts; the rationing of food, gasoline, electricity, and heat; draconian restrictions on emigration; and brutal suppression of government critics drew international attention to Romania's abuse of human rights.

Among the most objectionable of Ceauşescu's policies, and most relevant to institutionalization, was his attempt to increase Romania's workforce through an increased birthrate. Abortion and all forms of contraception were banned, family planning was guided by the state, and women were encouraged to bear at least four or five children. Those who did not were punished by the deduction of a "celibacy tax" from their paychecks, and women of childbearing age were forced to undergo gynecological exams in their workplaces. These policies led to an increased birthrate but also to increased child abandonment, deaths of women from illegal abortions, increased infanticide, and infant mortality, which rose to the highest in Europe at 27 per 1000 live births (Moskoff, 1980).

Child abandonment rose, because many women carried unwanted pregnancies to term and many others were too poor to raise offspring in the dismal economy. At the time of Ceauşescu's execution in the Revolution of 1989, over 170,000 children were in overcrowded state-sponsored institutions, most in appalling conditions (Rosapepe, 2001).

Context of institutional care

Early in 1990, ABC News aired the first of many reports about the living conditions of children in Romanian institutions. The reports showed shocking images of children deprived of contact and nutrition. This led to intense interest in international adoption in the United States and Western Europe. Between 1994 and 2001 (figures between 1990 and 1993 are unreliable), a total of 26,293 children were adopted, of whom 15,112 (57.5%) were adopted internationally (Grupul Independent pentru Analiza Sistemului de Adoptii Internationale, 2002).

Institutional care for children began in the latter part of the 19th century in Romania, as it did throughout Europe and in the United States. At the mid-20th century, at the time that Rene Spitz began to publish papers and show films about the condition of young chil-

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dren in institutions (Spitz, 1945), Romania came under Communist control. During this era, institutionalization was not stigmatized and may have even been encouraged. The presence of widespread poverty and the legal mandates of Ceauşescu led increasing numbers of families to place their young children in institutions.

Pressures to deinstitutionalize in the past decade have come from inside and outside Romania and have had a significant effect. At the beginning of 2002, only about 40,000 children remained institutionalized, and many handicapped children were in far more humane and therapeutic settings than they had been previously (UNESCO, 2002). For example, the same placement center that housed 900 children less than 3 years of age in 1989 now houses only 200 children, and the upper age range has increased to as old as 8 years. Many of the older children are now attending public schools in Bucharest. Younger children are sometimes admitted to institutions together with their mothers, and assistance is provided to the family to attempt to prevent abandonment.

Despite these changes, poverty remains widespread, and options for alternatives to institutionalization, such as foster care, are limited. Nongovernmental organizations (NGOs) estimate that in 2001, more than 8,000 children were newly admitted to institutions in Romania, despite attempts to prevent institutionalization (B. Simion, personal communication, June 15, 2002).

Political context

The Romanian Constitution, adopted in 1991, guarantees democratic rights to all citizens (Government of Romania, 1991). The government's executive branch is led by an elected President, who appoints a Prime Minister, who in turn appoints a Council of Ministers to the cabinet. The legislative branch consists of a bicameral Parliament with a Senate and a Chamber of Deputies. The President, Deputies, and Senators are directly elected for 4-year terms. Formerly, the legal system was a mixture of civil law and communist legal theory, but the current legal system is based on that of France's Fifth Republic. The judicial branch is governed by a Supreme Court appointed by the president. There are numerous political parties active in elections, ranging from a nationalist party on the right to a Communist party on the left (United Nations, 2001).

Several government structures are charged with the protection of children's rights and the provision of specialized services. A broad and rapid reform process decentralized the child protection system in 1997, relegating this authority to the local county councils of each of Romania's 40 counties and the six sectors of Bucharest. The current system is governed by the National Authority for Child Protection and Adoption (ANPCA), led by a Secretary of State who reports to the chief minister of the General Secretariat of the Government. ANPCA issues guidelines and proposes legislation. At the county level, the County Council President is in charge of supervision, coordination, and accounting for child protection. Subordinate to the County Council President are two entities: the Commission for Child Protection, a specialized decision-making body that determines children's legal status and recommends protection measures; and the Directorate for Child Protection (DPC) which acts to implement, monitor, and provide services in keeping with the county strategy. Residential institutions, foster care networks, and other services are managed by the DPC whereas the decisions to place children in these forms of care are made by the commission.

The Commission for Child Protection grants licenses to foster parents and sanctions adoptive families. It also can recommend the severance of parental rights, but this can only be enacted through a ruling of the court.

The Ministry of Health and Family (MHF) also plays an important role in child protection and aims to develop specialized social services for mothers during the pre- and postnatal periods. The MHF has under its auspices maternity hospitals and the Institute for Maternal and Child Health (IOMC), which is charged with professional training and research and development.

As a candidate for membership in the Eu-

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ropean Union, Romania has come under increasing pressure to complete significant reforms in key areas, including child protection. Since the European Union threat to suspend Romania's application in June 2001, the government has placed a moratorium on the much-maligned system of international adoptions and declared child protection a national priority. A series of legislative changes are being drafted to remedy the shortcomings of previous social policy.

Cultural context

Many peoples have settled and intermixed to form modern Romania, which is probably more ethnically homogenous today than at any time in its history. Almost 90% of the 21.7 million people who populate Romania are of Romanian ethnic origin. The second largest group consists of Hungarians (about 7%), who tend to be concentrated in Transylvania and Banat. Finally, at least 2.5% of the population is Rroma Gypsies, who live throughout Europe but who have a significant concentration in Romania (Romanian National Institute for Statistics, 2002). In fact, the elected Emperor of all Rroma worldwide lives in Romania. Despite their small proportion in the general population, this ethnic group is perceived by many Romanians to be greatly overrepresented in institutions for young children.

Romanian, the official language, is spoken throughout the country and in its former territories, such as the Republic of Moldova. French and English are also taught widely in Romanian schools. Literacy is high (>95%), and education through 8th grade is compulsory (Romanian National Institute for Statistics, 2000).

Almost 53% of Romanians live in 252 towns and cities, and the remainder inhabit 13,000 villages. Until the latter half of the 20th century Romania was an agrarian nation, and village life is still focused on sustenance agriculture and animal farming (Treptow, 1997). Bucharest, the site of our project, is both the capital and the largest city of Romania and is inhabited by more than 2 million people, or roughly 10% of the country's population (Romanian National Institute for Statistics, 2002).

Administrative context

Early on, we realized the logistical advantages of partnering administratively with an established NGO in Romania. The work of its French parent organization, Solidarité Enfants Roumaines Abandonées (SERA), has been continued by SERA Romania, founded in 1996, making significant contributions to the national effort to deinstitutionalize Romania's children. SERA Romania works throughout the country to restructure residential facilities, develop community based child welfare services, strengthen local governments to protect children's rights, and to build an infrastructure of trained personnel to assist children in need. SERA Romania is accredited by ANPCA to carry out activities in child protection, and through it we were able to employ the research assistants, social workers, and foster families required for the project.

We also entered into scientific partnership with the Ministry of Health through the IOMC, which assisted us by screening and recruiting a comparison group of community children for the study. The IOMC has a vested interest in pediatric research and has lent the study considerable scientific collaboration and logistical support.

Access to the institutionalized infants and toddlers selected as study participants was granted through collaborative agreements with the Directorates for Child Protection. For purposes of enhancing representativeness and to increase the pool of available participants, we entered into collaborative agreements with child protection authorities responsible for all of the institutions for young children in Bucharest (a total of six). These agreements allowed us to screen children, identify potential participants, place children in foster families, and carry out longitudinal follow-up procedures. The local commissions of each sector agreed to license foster parents trained for the project.

All of the research assistants administering procedures and collecting data are employed

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by SERA Romania, which also employs the team of social workers who developed and now maintain the 56 foster homes in Bucharest that the project supports. Foster families are also employed by SERA Romania, in keeping with the European model of foster care in which the foster parents are paid salaries rather than a subsidy for each child in their care.

Ethical context

From the beginning of deliberations regarding the BEIP by the Research Network on Early Experience and Brain Development (which is supporting the work), ethical considerations were foremost. We developed a research plan designed to combine scientific aims with substantial humanitarian aid because we felt we were obligated to conduct a study that attempted to improve rearing conditions for institutionalized children.

A second consideration was to ensure that we would not create an intervention that would exist only as long as our support was available and then disappear. We were especially concerned that children whom we had removed from institutional care and placed in foster homes would not have to return to the institutions once the project ended. Thus, we attempted to negotiate agreements with local governmental authorities to ensure that no child would have to return to institutionalization. We were successful in establishing such an agreement with Sector 1, the sector in Bucharest in which the largest number of our participants resided, as well as with several other sectors, but at least one sector declined to assume support of foster homes we had created after the project ended. We agreed with our administrative partner, SERA Romania, that we would assist them in supporting foster care after children "graduated" from the project for any situations in which the government did not assume support.

A third consideration involved the question of randomization. Although randomization was advantageous scientifically in addressing the selection bias that limits all of the previous research on institutionalized children, such an approach meant that half of the institutionalized children potentially would remain in institutions during the study. Of course, we would never have endorsed a design that randomized children to institutional care if family settings were available, but in this case, we had children who were already institutionalized and who had no other options available to them. Given the limits of our resources and the realization that without the intervention all of the children would have remained institutionalized, we concluded that randomization was acceptable, with a major condition in place. We pledged not to interfere with placement of any child in a family setting, if such a setting became available during the course of the study. These decisions, we agreed, were to be left entirely to the various Commissions on Child Protection in Bucharest. Therefore, children in either the institutionalized or the foster care groups could return to their families or be adopted if the commission so directed. If foster homes other than those we supported became available, then we would not interfere with removal of children from the institutional group and their placement in foster care.

As Figure 1 indicates, this policy of noninterference has meant that, to date, of the 136 children who were randomized, 16 have been returned to their biological families (8 from the foster care group and 8 from the institutional group) and another 10 children have been adopted within Romania (4 from the foster care group and 6 from the institutional group). In addition, 12 children randomized to the institutional group have been placed in government sponsored foster homes, because these homes became available.

Another ethical issue involved cultural relativity. That is, we were concerned that we help implement a model of parenting for Romanian foster parents that was culturally appropriate, rather than assuming that our U.S.-based model would be acceptable without modifications. To aid us in this effort, we took advantage of manuals and training courses developed by Romanians and for Romanians under the sponsorship of NGOs. The training period comprised 30 hr, including hands-on

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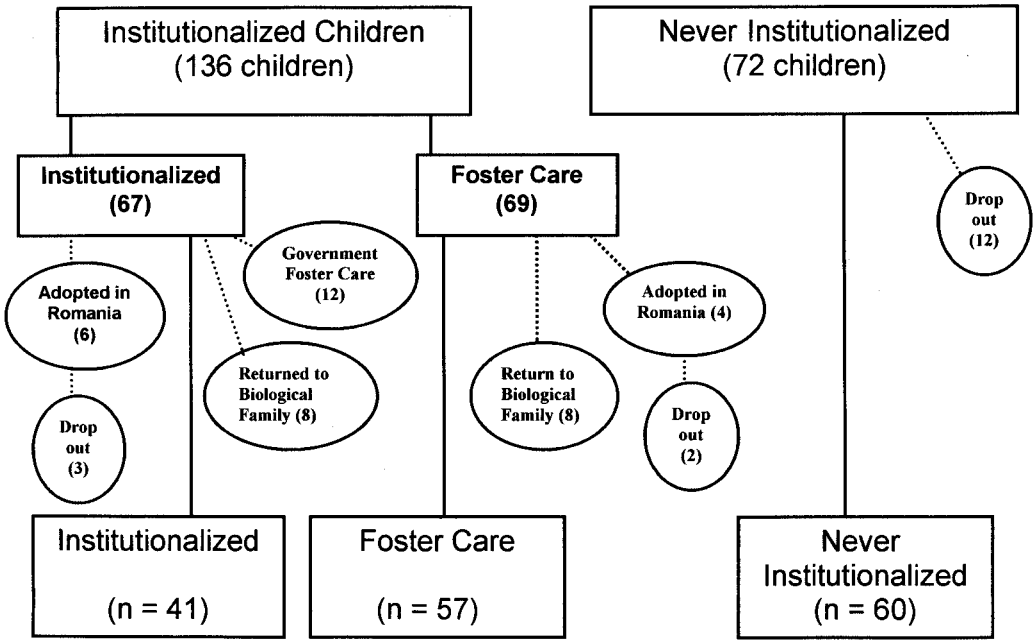


Figure 1. The distribution of the institutionalized and never institutionalized sample.

involvement with young children in institutions. In addition, we check repeatedly in consultation sessions with our Romanian staff about the cultural appropriateness of all approaches that we advocate and about the meaning of behavior that we observe.

A final ethical dilemma involved the economic disparity of salaries in Romania and the United States. We wanted to ensure that we paid salaries commensurate with the expertise of the staff and foster parents we employed, but not so high that they would create undue coercion to participate either as a member of the staff or as a foster parent. Consultation with government authorities and NGO personnel to make salaries equitable was quite helpful in this regard.

These issues were discussed in great detail during the 18 months of planning that preceded implementation and were refined following submission to three different university institutional review boards. At the same time, the protocols were also approved by our partners and collaborators, the IOMC, under the auspices of the Romanian Ministry of Health and the local Commissions for Child Protection.

Project Design and Methods

Feasibility phase

In the fall of 2000, we began an initial feasibility phase of the study. The goal of this phase of the research was to establish feasibility of measures, procedures, training, and administration. We constructed a full-scale scientific laboratory in Bucharest's oldest and largest institution for young children, St. Catherine's. We recruited research assistants and provided them with training in the United States and Romania. We tested all of the proposed procedures and measures with 30–50 children who were living in the institution that housed our lab but who were not available for the longitudinal study, usually because their legal status made them available for imminent adoption. We also established methods of recruiting, training, and monitoring foster families and set up protocols and methods of

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working collaboratively with our administrative partners at SERA Romania.

In March 2001, we concluded that the intervention study was scientifically, logistically, and administratively feasible, and we launched the intervention phase in April 2001. In the sections that follow, we detail our experimental methods, including setting, design, participants, and measures, and then describe the intervention.

Intervention phase

This phase of the project comprises a randomized, controlled trial of foster care as an intervention for institutionalized young children.

Study design. Baseline assessments prior to randomization assured comparability of intervention and control groups and therefore increased confidence that outcome differences reflect true effects of the intervention. Randomization prior to intervention addressed two important issues. First, it addressed the concerns about previous studies of adopted children that have the potential of selection bias with regard to who is adopted and therefore included in studies. Second, randomization prior to intervention increased the likelihood that prenatal risk factors, which cannot be ascertained, were evenly distributed across the intervention and control groups. The inclusion of a Romanian never-institutionalized comparison group allowed for use of measures that have not been standardized on Romanian children. This permitted us to evaluate whether our measures would yield the same findings in a Romanian comparison sample as in a U.S. sample and to reveal potential ethnic differences. Because we predicted that foster care would enhance the development of formerly institutionalized children, inclusion of a never institutionalized comparison group allowed us to have a basis of evaluating the degree of developmental recovery that resulted from the intervention.

The study was designed to vary both length of time in institutions and months of intervention at each time of assessment. That is, if we assess a group of children aged 17–20 months, for example, some of the children would have baseline assessments only, whereas others would have had 1–15 months of intervention, depending upon the age at which they entered the study. This may allowed us to assess the effects of timing of intervention on remediation.

Setting: Institutional environment. Although there is considerable variability in Bucharest's placement centers, with significant differences seen even between different units of the same institution (see Smyke et al., 2002), they share several features in common. These include a regimented daily schedule, a high ratio of children to caregivers, and a management structure led by medical personnel.

A standard unit at St. Catherine's Placement Center houses 36 children: 12 infants and 24 toddlers/preschoolers. Infants and toddlers have different daily schedules, but all children share a 6:30 am wake-up, a 1–3 pm afternoon nap, and an 8 pm bedtime. Children in both age groups are fed meals in small groups seated in high chairs or around small tables. Multiple children are fed a bite at a time in turn by a caregiver who rarely speaks during the meal. "Hygiene" periods for washing and changing are scheduled before and after meals. Each morning the younger age group has 90 min of "stimulation" scheduled while those over 36 months of age attend educational activities or a kindergarten equivalent. Before lunch and before dinner, two times (totaling 3.5 hr) are scheduled for outdoor free play in pleasant weather and TV/playroom time in bad weather. Children are confined to bed when they are ill. Quarantines and staff shortages also can keep children indoors.

Since the early 1990s, an infusion of humanitarian aid has equipped most institutions with toys and playgrounds. Caregivers, however, most commonly supervise children at play rather than engaging with them. Physical punishment is not condoned officially, but it occurs in many institutions (Stativa, Tabacaru, Stanescu, & Simion, 2000).

Since all children are fed, bathed, changed, and put to bed at the same time, each child interacts only briefly with caregivers as they complete instrumental tasks. During the course

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of a day, a child has contact with three shifts of caregivers, a physician, a nurse, and a psychologist. In a given week, a child may come in contact with 17 caregivers rotating in 8-hr shifts: 3 housekeepers, 4 nurses, 2 educators, 1 physician, 1 psychologist, and 1 physical therapist.

Participants. Participants are 208 children and their parents, foster parents, or institutional caregivers (see Figure 1). As noted, 136 children were recruited from all six institutions for young children in Bucharest. These children ranged in age from 5 to 31 months at the time of recruitment and had spent more than half of their lives in institutional care.

Institutional group. Inclusion criteria included all children in institutions in Bucharest who were 31 months or younger and who had spent at least half of their lives in an institution. Screening for inclusion in the study consisted of pediatric (including neurological) examination, growth measurements, and assessment of any physical abnormalities. Exclusion criteria included genetic syndromes (e.g., Down syndrome), definite signs of fetal alcohol syndrome, and microcephaly (more than 2.5 standard deviations [*SD*] below the mean for occipitofrontal circumference), using standards from Tanner (1973). Subjects selected for inclusion fell within 2.5 *SD* from the mean for occipitofrontal circumference, using standards from Tanner (1973).

Of the 187 institutionalized children screened for participation in the study, 51 cases were excluded on medical grounds, including fetal alcohol syndrome, microcephaly, Down syndrome, and related conditions. Four subjects who were included in the study had suffered congenital syphilis but had and received timely treatment. None of the subjects tested positive for HIV infection. The remaining 136 children were in fair health and suffered no known genetic abnormalities or signs diagnostic of fetal alcohol syndrome.

Hearing was also tested using an AuDX Bio-logic Systems Corp. otoacoustic emissions measurement system. Of the 187 subjects who were screened, 23 (12%) were untestable, 90 (48%) passed in both ears, 35 (19%) failed in both ears, and 39 (21%) failed in one ear. The high rate of failure was most likely due to the high incidence of acute and chronic middle ear disease noted with tympanometry and otoscopy.

Of the 136 institutionalized children included in the study, 78 are of Romanian ethnicity (57.4% of sample), 36 are Rroma Gypsy (26.5%), 1 is Turkish (0.7%), 1 is of subcontinent Indian extraction (0.7%), and the remaining 20 (14.7%) cannot be classified. At the time of baseline assessment, all subjects had spent between 51 and 100% of their lives in the institution ($M = 89\%$). Of the total of 136, 70 children (51.5% of sample) have spent all of their lives in an institution (see Figure 2).

Gestational age data were available only for 112 subjects, and many of these estimates were of uncertain reliability. There was a range of 30–42 weeks ($M = 37.2$ weeks, $SD = 2.2$ weeks). Birth weight (available for 117 cases) ranged from 900 to 4150 g ($M = 2767$ g, $SD = 609$ g) and was significantly different from the community control group ($M = 3338$ g, $SD = 467$ g). The average age at baseline assessment for the institutionalized group was 21.6 months.

The 136 institutionalized children were randomly assigned either to the foster care intervention group (FCG) or to the continued institutional care group (IG). Because siblings were randomized together, 69 children were assigned to foster care and 67 children were assigned to continued institutional care. Following random assignment, no differences were observed between the resulting groups in gender distribution, age, birth weight, or percentage of life spent. There were delays ranging from days to 13 weeks ($M = 6$ weeks) between completion of baseline assessments and actual placement in foster care. At the present time (24 months postbaseline) only 5 of 136 participants have dropped out of the study (2 adopted out of the FCG and 3 adopted from the IG).

Foster parents. Of 60 foster families recruited to participate, 27 (46%) were single parent families (11 widowed, 11 divorced, and 5 never married). The age of the foster mothers ranged from 30 to 66 years ($M = 47.7$ years). All foster mothers had a high school

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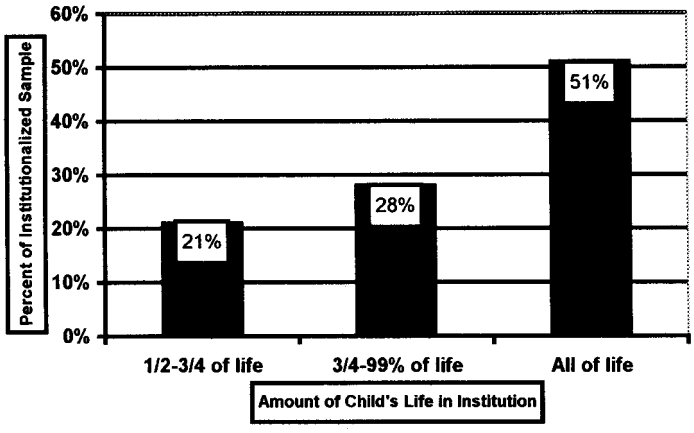


Figure 2. The portion of the child's life spent in the institution.

education: 37 (63%) had completed vocational training, 11 (19%) had specialized skills, and 4 (7%) had completed college. In addition, 16 (27%) were retired, and 3 (5%) had never been employed. Of the 60 families recruited originally, 50 are currently employed, caring for 62 children. The income per household (including their salary but not the child's supplement) ranged from $63 to $355 monthly ($M$ = $165 monthly).

Community comparison group. Another 72 children who had never been institutionalized were recruited using birth records at the same maternity hospitals where the FCG and IG had been born, and they are included as a community comparison group. Their parents were approached by personnel from the IOMC (directly or through their family physician) at the children's routine clinic visits and invited to participate. They were matched to the other groups by child age and gender. The screening included pediatric examination, physical growth measurements, and psychosocial interview with the family. All participants fell within 2 *SD* from the mean for physical growth (weight, length, occipitofrontal circumference). The group comprises 42 males and 31 females. Of the 72 who consented to participate, 66 children (91.7%) were Romanian, 4 children (5.6%) were Rroma, 1 child was Spanish, and 1 child was Turkish. To date, families of 12 children have dropped out (9 in the first 3 months of the study), generally citing time pressures.

Of the 60 community comparison children currently in the study, 6 are being raised in single-parent families. Of community mothers participating in the study, 29 (46%) have high-school level education whereas 21 (33%) hold university degrees. Fifteen (24%) are homemakers, 9 (4%) are unskilled laborers, 15 (24%) are skilled laborers, and 24 (38%) are professionals. In keeping with Romania's negative population growth, 39 (61%) families have only 1 child. The number of children per household ranges from 1 to 7, but the mean is 1.5. Fathers' levels of education mirror those of their spouses: only 6 (9%) are unemployed. Household income ranges from $76 to $606 per month ($M$ = $200), which is close to the national average.

Procedures. For all subjects enrolled in the study, informed consent was obtained from biological parents and/or the Commission for Child Protection. Videorecording consent was obtained from all parents and caregivers.

Following baseline assessment, all subjects are evaluated at 9, 18, 30, and 42 months of age. Thus, the youngest subjects to enter the study (6–8 months) undergo five assessments, whereas the oldest undergo three assessments. At 42 months, the age of final data collection, the youngest children at the time of study initiation will have received 37 months of intervention (i.e., foster care placement) whereas the oldest children in the study will have received 11 months of intervention.

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Table 1. *Constructs and measures*

Constructs	Measures	Source of Data
Caregiving environment	Observational Record of the Caregiving Environment	Naturalistic observation
Physical growth	Height	Exam of child
	Weight	Exam of child
	Head circumference	Exam of child
Level of cognitive functioning	Bayley II	Exam of child
Language ability	Reynell	Exam of child
	REEL	Caregiver report
Social communication	Early Social Communication Scales	Exam of child
Temperament	Puppet Interview	Exam of child
Interactional behavior	Crowell Procedure	Structured lab observation
Attachment	Strange Situation procedure	Structured lab observation
	Disturbances of Attachment Interview	Caregiver report
	Attachment *Q*-set	Naturalistic observation
Problem behaviors/competencies	Infant/Toddler Social Emotional Assessment Scales	Caregiver report
Emotion recognition	Visual Paired Comparison Test	Exam of child
Face recognition	Event related potentials	Exam of child
Attention	Mismatched Negativity Test	Exam of child
Brain electrophysiology	EEG power	Exam of child
	EEG coherence	Exam of child
	EEG laterality	Exam of child

Each assessment consists of up to 14 procedures (depending on age) and is usually divided into three visits at the laboratory and one home/institutional observation. Additionally, physical growth measures of all children in the institutional and foster care groups are obtained monthly.

Each child's principal caregiver accompanies the child during evaluations. In lieu of a parent, institutionalized children are accompanied by their "favorite" caregiver, as determined through interviews and observations. When the staff was unable to identify a favorite caregiver, we included the person who had spent the most time with the child and knew the child best.

Measures. The measures included in this study and the constructs they are intended to assess may be found in Table 1. These include a range of structured and unstructured procedures, in laboratory and naturalistic settings, as well as elicited and observed behaviors in the child. Because the most important deficits documented in children adopted out of institutions involve abnormalities of cognitive functioning, social communication and social relatedness, and attachment (Ames, 1997; Chisholm, 1998; Johnson, 2000; O'Connor, Marvin, Rutter, Olrick, & Britner, 2003; O'Connor, Rutter, & the ERA Study Team, 2000; O'Connor, Rutter, Beckett, et al., 2000; Zeanah, 2000), these were all included as central measures.

Caregiving environment. This will be the most extensive study ever conducted on the caregiving environment of the institution. Further, we will use the same measure (Observational Record of the Caregiving Environment) to assess similarities and differences in caregiving environments in the institution, foster care homes, and homes of the never institutionalized children. No previous study has attempted to demonstrate that individual differences in outcome are related to individual differences in the "dose" of intervention, in this case, the quality of the caregiving environment.

Physical growth. Physical growth is assessed using standard measures of weight,

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length/height, occipitofrontal circumference, midarm circumference, and triceps skinfold. Height is measured using a stadiometer.

Cognitive level. The Bayley Scales of Infant Development—second edition (BSID-II) are used to assess developmental level. The BSID-II was selected because it was in use by psychologists at St. Catherine's Placement Center before the project began.

Language. Language development was assessed with the Receptive–Expressive Emergent Language (REEL) scales (Bzoch & League, 1972) and the Reynell Developmental Language Scales III (Edwards, Garman, Hughes, Letts, & Sinka, 1997). The REEL and the second edition REEL (REEL-2) are parent/caregiver interviews that have been used in clinical practice in a Romanian language version for many years. The revised Reynell is a 62-item scale emphasizing vocabulary and connected speech, which is administered by a trained examiner directly to the child and can be used with children between 18 months and 7 years of age.

Social communication. The Early Social Communication scales (Mundy, Hogan, & Doehring, 1996) are administered by an examiner to assess the child's initiation of joint attention, response to joint attention, and behavior regulation. These skills are important components of social and emotional reciprocity, and their assessment in institutional children may reveal specific strengths and weaknesses related to subsequent outcomes (Morales et al., 2000; Mundy & Gomes, 1998).

Temperament. Individual differences in emotional disposition have been linked to a variety of outcomes in young children. They also have been shown to mediate the effects of caregiving environments on children's behavior. We selected two tasks from a standard laboratory battery for the assessment of temperament (Goldsmith & Rothbart, 1999) to assess positive affect: the peek-a-boo and the puppet interview tasks. For peek-a-boo, the child's caregiver/mother participated; for the puppet interview, a female experimenter performed the task. We decided to attempt to elicit positive affect during this part of the assessment because we predicted that individual differences in positive affect reactivity might relate to general social relatedness.

Interactional behavior. Patterns of social interaction with familiar caregivers are established in the first few months of life, under ordinary circumstances. These patterns are somewhat stable over time and have been associated with a variety of risk and protective factors and shown to predict a variety of outcomes in young children. In the institutional setting, we were curious about whether individual differences in interactional behavior between young children and their caregivers would be associated with other characteristics of the children's development. We used the Crowell Procedure (Crowell & Feldman, 1988) to observe a variety of more and less structured episodes, including free play, clean-up, blowing bubbles, a series of teaching tasks and a separation and reunion between the child and a caregiver who knew the child well. Previously, this measure has differentiated clinic-referred and nonreferred children (Crowell & Feldman, 1989), maltreated and nonmaltreated children (Smyke, 2000), and relationship differences in maltreated children with foster and biological parents (Zeanah, Larrieu, Heller, & Valliere, 2001).

Attachment. The development of a hierarchy of preferred attachment figures is an important developmental task in the first year of life, and significant impairments in attachment in institutional settings have been demonstrated (Smyke, Dumitrescu & Zeanah, 2002; Tizard & Rees, 1975; Vorria, Papaligoura, Dunn, van IJzendoorn, Steele, Kontopoulou, & Sarafidou, in press). In order to assess attachment in the institutional setting, we use three different methods. First, we use the Strange Situation procedure (Ainsworth, Blehar, Waters, & Wall, 1978), observing the child with his or her favorite caregiver. Second, we conduct naturalistic observations of the child in his or her unit and code these observations with the Attachment *Q*-set (Waters & Deane, 1985). Third, we use the Disturbances of Attachment Interview (Smyke & Zeanah, 1999) to assess attachment disorder symptomatology. This interview has been validated preliminarily in a sample of institutionalized Ro-

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manian children (Smyke et al., 2002; Zeanah, Smyke, & Dumitrescu, 2002).

Emotion recognition. As described, institutional care involves serious disruptions of caregiver–infant interactions. Moreover, in the first 1–1.5 years of life, infants have only limited face to face interactions with their caregivers, thus restricting their access to emotional information displayed on the face of the caregiver. This occurs primarily because infants spend most of their time in individual cribs and have only occasional views of their caregivers' faces (mostly during feeding and changing). Based on the assumption that face recognition is an experience-expectant and activity-dependent process (see Nelson, 2001), we posited that institutional care would lead to impairments in emotion recognition, possibly due to delays in the development of the amygdala and surrounding circuitry purported to be involved in this process (for review, see Nelson, 2001; Nelson & deHaan, 1996). Consistent with this view are recent studies by Pollak and colleagues, who demonstrated that maltreated and neglected children differ from typically developing children in their electrophysiological and behavioral responses to facial expressions of emotion (e.g., Pollak & Kistler, 2002; Pollak, Klorman, Thatcher, & Cicchetti, 2001; Pollak & Sinha, 2002).

We employ two tasks designed to examine the discrimination and recognition of facial expressions. The first involves the visual paired comparison procedure in which infants are first presented with pairs of identical faces (e.g., the same model posing the same expression; "happy") and then tested by presenting the familiar stimulus alongside a stimulus in which the facial expression has changed ("happy" vs. "fear"). Looking time is recorded, and longer looking at the novel stimulus permits the inference that the infant has discriminated the two emotions. In our second paradigm, we record event-related potentials (ERPs) while infants are presented with happy, fear, anger, and sad faces (25% probability each). Here, the goal is to examine whether the neural correlates of emotion recognition differ across our samples. Collectively, we hope to be able to specify some of the areas of neural functioning underlying social relatedness that are impacted by early social deprivation.

Electrophysiology. One of the prime goals of this project is to examine the effects of early deprivation on brain development. To accomplish this goal we acquire brain electrical activity via electroencephalogram (EEG) while the children participate in one of the assessments in the laboratory. The EEG hardware consists of a battery powered, optically isolated bioamplifier with 16 channels, a PC dedicated to stimulus presentation, a PC dedicated to EEG acquisition, and the additional equipment hardware required for precise auditory and visual stimulus presentation. This setup allows us to acquire ongoing EEG as well as to synchronize the presentation of visual or auditory stimuli to the EEG to acquire ERPs. Our intention is to examine the ongoing EEG during a number of different conditions, as well as acquire ERP data to both auditory and visual stimuli.

The EEG data are acquired using a lycra stretchable cap that has tin electrodes sewn into it. For a full description of similar EEG methods, see Fox, Henderson, Rubin, Calkins, and Schmidt (2001). Research assistants spent time at the laboratory of one of the investigators (N.A.F.) during which time they were trained on the equipment and acquisition of EEG with infants and young children.

There are four issues to be investigated with respect to the EEG data: (a) the patterning of EEG power in different frequency bands across the scalp, (b) the development of EEG power spectra, (c) intrahemispheric EEG coherence, and (d) frontal EEG asymmetry. More specifically, power spectra are computed for each of the 12 electrode sites to examine power in various frequency bands. In order to track the development of alpha peak frequency, the EEG is recorded under two conditions: lights on and lights off. Power spectra of the EEG during the lights on and off segments are compared to identify the alpha band for the different aged infants and children, since it is known that this band changes with normative development (Mar-

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shall, Bar-Haim, & Fox, 2002). In addition, within-hemisphere coherence between pairs of electrodes is computed. Coherence is a frequency-dependent cross-correlation that provides a measure of the degree to which the EEG signals at different electrode sites are in phase (working together) or out of phase with each other. A number of researchers have argued that with development and during cognitive activity the degree of coherence across the scalp decreases as different regions begin to work independently (Bell & Fox, 1994; Thatcher, 1994). Finally, we wish to examine the degree to which power recorded from scalp locations over the left and right prefrontal cortices is asymmetric. A variety of data from a number of clinical, neurological, and psychophysiological sources have indicated that the left and right prefrontal cortices are differentially specialized for the expression and experience of affects associated with approach or withdrawal. Specifically, the left prefrontal region appears to be associated with affects and motivation to approach novel stimuli whereas the right appears to be associated with affects and motivation to withdraw from novelty. Indeed, a number of studies suggest that the pattern of prefrontal EEG asymmetry may be a marker for the dispositon to express dysphoric affect: individuals displaying right frontal EEG asymmetry are more likely to express and experience negative affect and dysphoric mood. We thus decided to examine the pattern of frontal EEG asymmetry in infants and children in our study.

In addition to collecting EEG data during different stimulus conditions, we acquire EEG time locked to the presentation of auditory and visual stimuli. We are interested in the infants' and young childrens' physiological responses to novelty in the auditory channel. To examine this process we present an ERP protocol in which subjects are presented with a stream of 300 short (150 ms) stimuli, 76% of which are "standard" tones, and 12% of which are "deviant" tones of slightly different frequencies, and 12% of which are complex "novel" stimuli. Stimulus presentation is synchronized with EEG acquisition, which enables us to examine the ERPs to the three classes of stimuli. We are particularly interested in the ERP responses to the deviant and novel sounds in relation to the ERP response to the standard tones. The comparison of these ERP waveforms allows us to investigate electrophysiological reactivity to auditory novelty.

Face recognition. Given the important role that face recognition plays in caregiver–infant interactions prior to the onset of language, we are also evaluating the child's ability to recognize his or her caregiver's face and discriminate this from the face of a stranger. Building on previous work in one of our laboratories (C.A.N.) and recent extension to children with autism (Dawson, Carver, Meltzoff, Panagiotides, McPartland, & Webb, 2002), children are presented with digitized images of their primary caregiver's face and the face of a stranger while ERPs are recorded. From this project we intend to evaluate not only whether children show ERP evidence of discriminating caregiver from stranger but also whether the neural processes involved in such discrimination are the same across groups.

Theoretical implications

This design allows us to determine within and across developmental domains, using multiple levels of analysis (see Cicchetti & Dawson, 2002), the implications of early experiences of extreme adversity for developmental processes. As indicated in Table 2, how results for each of the three groups of children compare will have implications for understanding the importance of early experiences and potential recovery from early adversity. Although one can argue that we have considerable data already about the importance of early experiences for development, it is rare to find a single study using an experimental design in which these questions can be addressed in multiple domains of development simultaneously. Obviously, the design also lends itself to evaluating the effects of various mediators and moderators of outcome.

Intervention

After selecting a design that focused on enhancing brain and behavioral development, it

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Table 2. *Implications of findings for early experiences and developmental process*

Hypothetical Findings	Implications
Baseline	
IG = FCG = CCG	Adverse early experiences do not matter; individual differences are probably intrinsic.
IG, FCG < CCG	Early experiences of deprivation compromise developing systems.
Follow-up	
IG = FCG = CCG	Early deficits, if they occur, are effaced by subsequent development.
IG = FCG < CCG	Early experiences determine outcomes; remediation through environmental enhancement is not possible.
IG < FCG = CCG	Adverse early experiences are completely remediable through environmental enhancement.
IG < FCG < CCG	Adverse early experiences have effects that are somewhat remediable through environmental enhancement.

Note: IG, continued institutional care group; FCG, foster care intervention group; CCG, community comparison group.

was important to include an intervention that was feasible within the context of Romanian social policy and within the context of our project. We chose foster care because, although it was quite limited in Romania throughout the 1990s, the government is now actively promoting alternatives to institutionalization and local authorities began to develop foster care programs in 1998. We designed the foster care intervention to be realistic within the constraints of logistics but to benefit from best practices approaches in the United States.

Recruiting foster parents

Over a period of 4 months, we recruited and trained 60 foster parents from the Bucharest community. We advertised through posters, brochures, and newspaper ads. In addition to a standard salary, we offered complete support for the children's material needs and a 3-year employment contract. The limited foster care that existed in Romania before 2001 was sponsored primarily by international adoption agencies that used foster care to enhance development during the 6 months prior to adoption. Because of the moratorium imposed on international adoptions in June 2001, adoption agencies diminished and many foster parents lost employment. Nearly half the foster parents we recruited were already licensed and had previous work experience.

Training foster parents

Foster care is classified as a profession in Romania, requiring a license to practice and a full-time commitment. County and sector Commissions for Child Protection issue foster care licenses to qualified persons of both genders (although the overwhelming majority are female) who have fulfilled a series of criteria stipulated by law and have completed an accredited training course.

A Law of Maternal Assistance requires that all prospective foster parents submit a criminal background check, proof of adequate living space (including an extra room for the child), a high school diploma, a health certificate, and the written approval of all members of the household. Having fulfilled these, the prospective foster parent must complete 30 hr of coursework before applying to the commission for a license.

Initial placement of foster children

BEIP social workers were charged with matching children to appropriate foster homes. To this end, they conducted visits at the institution with prospective foster parents to observe and interact with children there. The social workers placed children in the foster homes and visited these homes every 10 days for the first several months of placement and twice monthly thereafter. Maintaining close contact

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enabled the social workers to solidify their own relationships with foster parents, to monitor children's adjustment to the placement, and to document difficulties.

Monitoring foster parents

BEIP social workers distributed the caseload so that each social worker was responsible for no more than 20 cases. Within the first 2 weeks after placement, frequent telephone calls and visits occurred. Those cases presenting special problems received more attention and staff resources. For all families, case managers are available 24 hr each day to address concerns and emergencies.

Home visits allow social workers to check on children's status and to listen to foster parents' concerns. While many of the worries expressed by foster parents are related to problems of behavior, sleep, and illness, others concern material needs, rising prices, utility bills, and keeping a household functional in Romania's transitional economy.

Supporting foster parents

Support for foster parents in the challenging job of nurturing very young, deinstitutionalized children is provided in three interrelated ways. During the initial placement of the child in the foster family and continuing over time, the social workers provide personal support via visits and telephone calls and discuss issues regarding child behavior or other issues relevant to the foster parent. Developmental and behavioral interventions are provided to assist foster parents in the management of their children. These sessions allow foster parents to feel more successful in their jobs and also to have feedback from other foster parents whose children may have experienced similar problems. In addition, BEIP social workers conducted an 8-week foster parent support group that had as its goal both education and support for foster parents.

Behavioral challenges

Although some children made a relatively smooth transition to placement, others posed more challenges for foster parents. Placement in a foster family represents a marked change for the deinstitutionalized child who may react with marked agitation and anxiety to the differences in food, sleeping arrangements, and demand for personal interaction. Concerns regarding children's behavior seemed to peak at approximately 1 month postplacement. We addressed these problems by assisting foster parents in the implementation of individually tailored behavioral interventions.

Developmental challenges and interventions

In order to encourage language development and caregiver–child interaction, a language stimulation group was introduced. Derived from a manualized approach to language facilitation (Schober–Peterson & Cohen, 1999), each session focused on such language support skills as turn taking, imitating, pretending, and focusing. In addition to providing information about, and opportunity to practice, specific language development skills, the group enabled foster parents to see the importance of getting down on the floor and playing with their foster children. Further, group facilitators noted that the sessions also gave children opportunities for supervised peer interactions, addressing an area of relative weakness. As language skills have improved, study personnel have proposed an intervention focused on the development of appropriate play skills.

Contributions to Developmental Science: Sensitive Periods and Neurobiological Development

As the first randomized, controlled trial of foster care for institutionalized children ever conducted, the BEIP will provide the most definitive test to date for the widely held belief that young children develop more favorably in families than in large group settings with rotating staff. Beyond informing social policy in Romania and in many other countries where institutional care is practiced, the study also stands to contribute to our understanding of how the experiences of children raised in adverse circumstances may yield insights relevant for understanding normal developmental

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processes, both behavioral and neurobiological.

Studies of children adopted out of institutions have suggested that cognitive and social domains of development are clearly compromised. Following adoption, recovery of cognitive abilities is a fairly linear process: the younger children are adopted and the longer they are in adoptive homes, the more they recover cognitively (O'Connor, Rutter, Beckett, et al., 2000). Social and emotional functioning, on the other hand, is less straightforward, as some significant socioemotional deficits have been identified even in early adopted children (O'Connor, Rutter, & the ERA Study Team, 2000). This suggests differential effects of deprivation on different domains of development. From a theoretical perspective, it is paramount to understand why some domains of development are more compromised than others and why some are more protected than others. It is our view that only by understanding the neurobiological mechanisms that underlie development will we truly understand behavioral development.

For many years, developmental science has argued that social deprivation in the first years of life has significant consequences for the cognitive and socioemotional development of the young child. The issue of the magnitude of these effects goes to the heart of a fundamental concern among developmental psychologists about the consequences of early experience for later behavior. The observations of Spitz (1945), Goldfarb (1945a, 1945b), and Bowlby (1952) regarding the consequences of early separation or loss of the mother and institutionalization suggested that lack of early social interaction had profound effects upon the social and emotional development of the child. These observations were supported by the work on isolation effects in nonhuman primates.

Scientists, such as Harlow (1971), provided dramatic evidence of the consequences of social deprivation for the young monkey's behavioral development, showing that early separation of the infant from mother had significant effects on the monkey's social and emotional development. Animals exhibited depressed affect and little social interaction with conspecifics even after they were placed back into a peer group. Raising the monkey with same aged peers had a similar outcome, in that these animals exhibit high degrees of anxious-like behaviors.

Although the behavioral aftermath of social isolation in the early months of life has been well documented, less is known about the underlying neurobiology of these effects. That is, even in nonhuman primate studies, where there is a good deal of description of the behavioral consequences of early social deprivation, there are few data on the effects of such deprivation on the developing central nervous system. What systems, for example, are compromised by lack of early social contact?

As well, there are few data that address the issue of sensitive periods for the effects of deprivation. While we know a good deal about developmental changes in the nervous system during early development, we know much less about the effects of timing of social deprivation on the processes involved in this development. This contrasts with ample data that exist on the effects of timing of certain types of sensory deprivation on developing perceptual systems, such as visual–perceptual development. Much less is known about the effects of timing of social deprivation during the first years of life on subsequent socioemotional development, although some effects of timing of maternal separations on Rhesus macaques (see Nelson et al., 2002) and of timing of maltreatment in humans have been documented (see Manly, Kim, Rogosch, & Cicchetti, 2001). Such information is important for interpreting the aforementioned results of studies that have found differential outcomes in cognitive and social domains in children adopted from institutions. Perhaps there are periods of development during which social interaction is critical for adaptive behavioral development. If so, when do they occur and how much recovery is possible if those periods are characterized by limited opportunities for interaction?

Questions about sensitive and critical periods in social and emotional development are among the most pressing in neuroscience. This will be the largest longitudinal investiga-

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tion of institutionalized children less than 2 years old at the time that the intervention begins. This will allow a more fine-grained look at issues of timing of intervention and recovery than previous studies that have included children with histories of deprivation longer than 2 years. The BEIP will allow an examination of the issue of the effects of length of early social deprivation (infants and young children in the sample vary in the length of time they have spent in the institutional setting), and it will allow us to directly examine the effects of intervention on such early deprivation. Hopefully, it will provide answers to many of the critical questions that developmental psychopathologists have asked about the effects of early experience, the timing of deprivation, and the ameliorating effects of early intervention and provide clues to which underlying neurobiological processes are compromised by, and resilient to, dramatic changes in early experience. With regard to the neurobiological systems affected by such deprivation, we anticipate several such systems to be affected. For example, due to its prolonged developmental trajectory, a number of regions that lie within the prefrontal cortex (e.g., orbitofrontal, dorsolateral) may be affected. Similarly, if we construe the environment in which institutionalized children are raised as stressful, then the hippocampus likely will be affected. Finally, given the role of the amygdala in mediating emotional responses to environmental demands, we might also expect amygdala circuitry to be deleteriously affected.

Natural experiments, such as institutional care, provide an opportunity to enhance the ecological validity of experimental designs typical of neuroscience and to refine the observational designs typical of ethology in order to address vital questions about normal and pathological developmental processes. This investigation was actually designed with specific policy questions in mind, as recommended by Cicchetti and Toth (2000), who pointed out the inherent difficulties in post hoc application of scientific findings to policy questions. Questions posed by the BEIP are both theoretically interesting and practically important, especially in a setting in which the course of policies about how best to provide for abandoned children are being actively constructed. Results of studies such as this experiment in nature have the potential to inform scientific and policy questions in many related areas as well.

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