Normality and impairment following profound early institutional deprivation: A longitudinal follow-up into early adolescence.

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Developmental theories provide several contrasting propositions about what may be expected with respect to psychological change and continuity when there is a radical change in the rearing environment from very poor to generally good quality. Thus, emphasis has been placed on people’s continuing responsivity to the environment through the period of development in childhood and adolescence and into adult life (Clarke & Clarke, 1976, 2000). There is support for this view from the evidence that children exposed to abuse and neglect can improve markedly in their cognitive functioning after adoption in middle childhood into well-functioning families (Duyme, Arseneault, & Dumaret, 2004; Duyme, Dumaret, & Tomkiewicz, 1999). Long-term follow-ups into adult life of seriously antisocial adolescents have similarly shown important changes in adult life that appear responsive to experiences during that age period (Laub & Sampson, 2003; Sampson & Laub, 1993). Turning points for the better or the worse can and do occur post childhood (Rutter, 1996).

By contrast, over recent years there has been a growing body of evidence from both human and animal studies that, in some circumstances, seriously adverse experiences in very early childhood can have enduring effects that may result from either a type of biological programming of the brain during a sensitive period of development or, alternatively, damage to neural structures (Bateson & Martin, 1999; Greenough & Black, 1992; Gunnar, Morison, Chisholm, & Schuder, 2001; Hubel & Wiesel, 2005; McEwen & Epperson, 2002; Meany & Szyf, 2005; Parker, Nelson, & the Bucharest Early Intervention Project Core Group, 2005; Rutter, 2006c; Rutter et al., 2004; Weaver et al., 2004; Wismer Fries, Ziegler, Kurian, Jacoris, & Pollak, 2005). This body of work does not deny the effects of later experiences, but it does postulate limitations. Although not spelled out in most writings, there appears to be an implicit assumption that the effects are universal. It
should be noted, however, that despite attempts to generalize such neural effects to all experiences in childhood (Gerhardt, 2004; Schore, 1994), the research findings are explicit in showing that this is not so (Bruer, 1999).

A third related developmental issue concerns the concept of sensitive periods. During the 1960s, research into imprinting phenomena in birds had led to the postulate of fixed immutable critical periods in which later development was, in effect, “fixed” by experiences in early life. Systematic studies cast serious doubt on this notion (Bateson, 1966; Hinde, 1970), and the idea fell out of fashion. However, recent research findings on biological programming have shown that it would be mistaken to reject the phenomenon of marked age-related variations in children’s responses to experiences—variations that might reflect either differences in susceptibility or in patterns of response. The former are illustrated by reactions to hospital admission (Rutter, 1981), and the latter by the effects of unilateral brain lesions on language functioning (Vargha-Khadem, Isaacs, van der Werf, Robb, & Wilson, 1992). Nevertheless, although the reality of sensitive periods is no longer in doubt, very little is known about their limits, or about the mechanisms involved.

A fourth body of theory and research has focused on marked variations in children’s responses to adversity—differences that have given rise to the concept of resilience (Luthar, 2003; Luthar, Cicchetti, & Becker, 2000; Rutter, 2006b, in press). Once more, empirical research findings provide support. Both naturalistic and experimental studies in humans and other animals have shown the reality of huge individual differences in outcome following all manner of environmental hazards. Genetic research in recent years has shown that an important part of the mechanism involved concerns gene–environment interaction (Moffitt, Caspi, & Rutter, 2006; Rutter, 2006a; Rutter, Moffitt, & Caspi, 2006; Stevens, Sonuga-Barke, Asherson, Kreppner, & Rutter, 2006). However, it is unlikely that this fully accounts for the variation.

In order to test these developmental propositions, some form of natural experiment that pulls apart variables that ordinarily go together is required (Rutter, 2007; Rutter, Pickles, Murray, & Eaves, 2001). The fall of the Ceausescu regime in Romania in 1989, and the subsequent adoption into generally well-functioning families of children who had spent their first few years in institutions that were both severely understaffed and provided conditions of extreme pervasive deprivation, provided such a natural experiment (Rutter & the English and Romanian Adoptees [ERA] Study Team, 1998). In order to fulfill the criteria of adequate natural experiments, several conditions need to be met. First, there must be a major discontinuity in qualities of the rearing environment, with the change of environment both rapid and accurately timed. The adoption of Romanian children clearly met that condition. In most cases the children moved from the institution to their adoptive home without any intervening change. In the institutions, most children were confined to cribs or cots with high sides, had no toys, had very little interaction with staff or other children, and experienced impersonal feeding of gruel through propped-up bottles with large teats and group washing by means of hosing down with cold water (Castle et al., 1999; Children’s Health Care Collaborative Study Group, 1992; Reich, 1990). At the time of entering the United Kingdom, a high proportion of the children were severely undernourished and developmentally delayed (Rutter & the ERA Study Team, 1998), and many had infections and other medical problems (Beckett et al., 2003). The findings on children adopted from Romanian orphanages into families in the United States and Canada were closely comparable (Ames, 1997; Benoit, Jocelyn, Moddeman, & Embree, 1996; Fisher, Ames, Chisholm, & Savoie, 1997; Johnson et al., 1992; Maclean, 2003; Morison, Ames, & Chisholm, 1995). The quality of the adoptive families in the United Kingdom is evident through the fact that they had to go through a rigorous social service screening and approval process, through the very low rate of subsequent adoption breakdown, and through the more limited measures available on family functioning (Castle et al., 2006; Colvert et al., in press; Rutter & the ERA Study Team, 1998).

The second key condition is that social selection should be minimal. A major limitation of most earlier studies of institution-reared children is that serious biases arose from two different sources. First, many children had been admitted into institutional care after the early years, with the inevitable uncertainties over the extent to which admission was influenced by the children’s own handicaps or by difficulties that preceded institutional admission. Second, whether or not children remained in the institution was influenced to an important extent by their own qualities. The consequence of these two biases is that there will be unavoidable difficulties in determining which sequelae are due to institutional experiences and which to individual features that preceded institutional admission or which influenced later adoption. Neither bias applied to any marked extent in the case of adoptions from Romanian institutions. In the vast majority of cases, institutional admission had been in the early weeks of life, so far as is known no children were adopted prior to 1989, and it was very rare for children to leave institutional care to return to their biological families, if this occurred at all (Rutter & the ERA Study Team, 1998).

Less is known about possible factors influencing the choice of children by prospective adoptive parents. Romanian authorities controlled which children could be considered for adoption, and prospective parents had only limited choice. The adoption situation was also highly unusual in that many parents were seeking to adopt a child for altruistic motives stemming from compassion over the terrible plight of the institutional children portrayed in the media, rather than wanting a child as a solution to their infertility. Accordingly, it was evident that, although some parents sought to choose a child whom they thought might develop well, others deliberately chose children who were obviously suffering (Beckett et al., 2006).

The third condition for an adequate natural experiment is that longitudinal data should be available to determine within-individual change over time, and not just between-group differences. This was provided in the U.K. study of Romanian adoptees in which there are prospective data from age 4 to age 11 (with a further assessment at age 15, which is currently under way; Beckett et al., 2006; Rutter & the ERA Study Team, 1998). It was also provided in the parallel Canadian studies (see Maclean, 2003). In order that the longitudinal data should allow an adequate test of developmental hypotheses, it is also necessary that attrition be minimal and that the original sample was representative of the population at risk. Both were so in the U.K. study.

The fourth condition is that the sample should include sufficient variation for competing possible risk and protective factors to be compared in a systematic fashion. The design of the English and
Romanian Adoptee (ERA) study was determined by the decision to have as the main focus the possible importance of variations in the age at which the children left institutional care. Random sampling within age bands was used to provide a range extending up to 42 months for the age of leaving institutions (see Rutter & the ERA Study Team, 1998). Assessments at the time of U.K. entry showed that the sample also varied in important ways. Thus, although the Romanian children as a group had a mean weight far below normal—indicating gross subnutrition—not all children were seriously undernourished. This provides the opportunity to contrast, for example, the prognostic importance of duration of institutional care with that of level of subnutrition. Similar variations applied to indices such as developmental level and head circumference.

The overall background to the present research is provided by findings on intercountry adoption (see Gunnar, van Dulmen, & the International Adoption Project Team, 2007; Maclean, 2003; van IJzendoorn & Juffer, 2006). As Maclean (2003) has pointed out, research designs need to be shaped by the questions to be tackled, and in particular, comparison groups need to be chosen with these in mind. There is no one ideal comparison group that serves all purposes. It is necessary, therefore, to be quite explicit on what the ERA study was, and was not, designed to accomplish. As already indicated, the main interest concerned the use of a natural experiment to test competing developmental hypotheses with respect to the long-term effects of early institutional deprivation. In order to do that, a comparison group of adopted children who had not experienced institutional deprivation was needed (the choice of adoptees of a general population sample was determined by the need to control for the possible effects of adoption). A sample of within-U.K. adoptees who were placed before the age of 6 months was chosen in order to achieve a best scenario adoption comparison. It follows that this design means that the findings are not informative on the quite different (but equally important) issues of how the psychological development of adoptees compares with that of nonadopted children, and of how this might vary according to their age at adoption.

This article concentrates on the outcome at age 11 according to the pervasiveness and persistence of malfunction across a wide range of psychological domains. The focus on this issue was much influenced by Luthar’s (Luthar, 2003; Luthar et al., 2000) astute observation that conclusions about apparent resilience could be misleading because the focus was on good functioning in some areas, with a lack of attention to poor functioning in others. Her arguments, like ours, include no assumption that the mediating mechanisms will be the same for all outcomes. These are being considered in other articles dealing with cognition (Beckett et al., 2006), use of services (Castle et al., 2006), quasi-autistic patterns (Rutter et al., 1999), disinhibited attachment (Rutter et al., 2007), language (Croft et al., 2007), and inattention/overactivity (Kreppner, O’Connor, Rutter, & the ERA Study Team, 2001). Here, instead the focus is on the broader issue of the extent to which early depriving institutional rearing is compatible with normal functioning at age 11 and the parallel question of which features predispose to pervasive malfunction across several psychological domains.

Thus, this article starts first with a critical examination of whether “normal” functioning is indeed truly normal and whether pervasive malfunction is truly pervasive and substantially handi-
deprivation in many other respects (see O’Connor, Rutter, Beckett, et al., 2000). Although the main focus in this article is on the 144 children who were reared from infancy in very depriving institutions, the group of non-institution-reared Romanian children serves as an additional comparison group as it allows for the direct comparison between two groups of children from similar underprivileged family backgrounds during the time period in question but which differ in terms of specific risks associated with institutional care.

The Romanian children were compared with a group of 52 children born and adopted within the U.K. before the age of 6 months. None of the children in the within-U.K. adoptee group had been exposed to early deprivation, neglect, or abuse. The choice for this comparison group was on the grounds that it would be possible to control for the experience of adoption per se and rearing in above average homes without prior exposure to nutritional and/or psychological deprivation. The families of the within-U.K. adoptees were approached through a range of local authority and voluntary adoption agencies. Because the ERA study was supplied with names of within-U.K. adoptees from adoption agencies only after they had contacted the families themselves and obtained their agreement, we do not have exactly comparable figures on the participation rate in that sample. It is estimated that approximately half of the families approached agreed to participate.

For 193 of 217 (89%) children, data had been obtained at both ages 6 and 11 for all seven areas of functioning (i.e., the outcome measures). There were no differences in participation between the within-U.K., institution-reared Romanian, and non-institution-reared Romanian subgroups (i.e., 94%, 86%, and 88%, respectively, participated). Across the entire sample, children with missing data did not differ from those without missing data in terms of their gender (i.e., 33% of children with missing data were boys and 67% were girls; 52% of children without missing data were boys and 48% were girls; Fisher exact test \( p > .10 \)) or adoptive family’s social class (i.e., 85% of families in both groups had professional, managerial, or other skilled, nonmanual occupations). The children with missing data at 11 years of age but complete data on the seven domains at 6 years of age \((n = 14)\) were no different from the children with complete data at both ages in their rates of normality and impairment at 6 years of age (i.e., 57% and 54%, respectively, showed no impairment at 6 years). Within the Romanian sample, there were no differences in terms of the children’s age at entry to the U.K. between those with and those without missing data (i.e., mean ages of entry were 16 and 15 months, respectively).

Adoptive parents from both the Romanian and U.K. samples were generally above average in their educational attainments, although there was some spread (Beckett et al., 2006; Rutter et al., 2004). Neither such variations nor the reasons for adoption (i.e., infertility or altruism) were significantly associated with outcomes (O’Connor, Rutter, Beckett, et al., 2000), and they did not relate significantly to our measure of normality and impairment at age 11. Most children had been placed in institutions in the first weeks of life (the mean age of entry was 0.34 months, \(SD = 1.26\); see Rutter & the ERA Study Team, 1998), making it unlikely that the reason for their admission to institutions was manifest handicap. It appeared from all reports that severe economic adversity played the major role in the decision to place the children into institutional care (Children’s Health Care Collaborative Study Group, 1992; Reich, 1990; Rutter & the ERA Study Team, 1998).

There were 4 children in the institution-reared Romanian sample and 1 child in the within-U.K. adoptee sample who presented severe and pervasive impairment at the time of the research visits. Because of the severity of their impairment, the standard battery of assessments was unsuitable and was only administered in part. These 5 cases were included in the first set of analyses, which presented overall rates of normality and impairment. The rationale for this was that for all 5 children there was a clinical diagnosis of pervasive impairment. However, these 5 children were excluded from all subsequent analyses dealing with individual areas of impairment and analysis of heterogeneity in outcome.

**Measures**

**Outcome Measures: Normality and Impairment**

Seven domains of functioning were investigated, which are described in detail in the online supplemental materials. These were chosen on two main grounds. First, we included the four patterns that, at age 6 years, were most strongly and specifically associated with institutional deprivation—namely, cognitive impairment, quasi-autistic patterns, inattention/overactivity, and disinhibited attachment (Kreppner et al., 2001; O’Connor, Rutter, Beckett, et al., 2000; O’Connor, Rutter, & the ERA Study Team, 2000; Rutter et al., 1999, 2007; Rutter, Kreppner, & O’Connor, 2001). These had also been evident in other studies of institution-reared children (Goldfarb, 1945; Hodges & Tizard, 1989a, 1989b; Maclean, 2003; Province & Lipton, 1962; Roy, Rutter, & Pickles, 2000, 2004; Skuse, 1984; Spitz, 1945; Wolkind, 1974). Second, we included the three areas of psychopathology that have been found to be most prevalent in general population studies—namely, conduct, emotional, and peer relationship problems (Green, McGinnity, Meltzer, Ford, & Goodman, 2005; Meltzer, Gatward, Goodman, & Ford, 2000). It should be noted that these involve substantial co-occurrence across domains (Agnew, Costello, & Erkanli, 1999; Caron & Rutter, 1991). These seven domains cover most of those that are common at age 11 and that give rise to substantial impairment. We have not included features such as stereotyped repetitive movements (Beckett et al., 2002), which are commonly associated with institutional deprivation but do not show strong persistence after leaving the institution and tend not to be associated with major social impairment if there is no association with malfunction in other domains. Equally, we have not included psychopathological patterns such as eating disorders or schizophrenia that are of major clinical importance at later age periods but are not common at age 11.

Criteria for when impairment existed were set in accordance to two conditions. First, it was important to determine the cutoff for impairment for all measures in a way that allowed for comparisons across ages. Second, it was necessary to determine the cutoff criteria in a way that allowed for comparisons across domains. Thus, across all measures the 85th (or 15th) percentile was chosen as the cutoff for impairment. The only exception was for quasi-autistic features, where clinical diagnosis was the criterion. Normality was present when a child did not reach cutoff in any of the seven domains. Multiple impairments were defined by a child reaching cutoff in two or more of the seven domains of functioning.
(more details on the seven measures are provided in the online supplemental materials).

**Validation Measures: Service Use**

Parents were asked to provide information on whether or not mental health professionals were consulted for the adopted child (Castle et al., 2006). If so, information was provided on what type of diagnoses was given, how many consultations or sessions took place, whether medication was prescribed, and whether parents felt that there was improvement. We considered two or more mental health sessions to be a meaningful validation of an existent problem. There was a comparable assessment of special educational provision in either mainstream or special schools (see Castle et al., 2006). Major provision was categorized as present if, up to the age of 11 years, the child had attended a special school, had received a formal statement of recognized educational needs (resulting in substantial extra individual help in an ordinary school), or had been held back a year.

**Explanatory and Predictor Variables**

**Duration of deprivation.** Duration of deprivation was indexed by a continuous measure of the children’s age (in months) when they entered the U.K. (for the Romanian adoptees). In addition, duration of deprivation was expressed in categorical terms, with one group of Romanian children having been adopted below 6 months of age (Romanian 0 to <6), a second that was adopted between 6 and under 24 months (Romanian 6 to <24), and a third that was adopted at 24 up to 42 months (Romanian ≥24). With the latter categorical variable, group comparison was possible with the within-U.K. adoptees, who were all placed with their families before the age of 6 months (within-U.K. 0 to <6) and with the non-institution-reared Romanian sample. We employed an additional measure of actual time spent in institutions expressed in months. Although this measure was highly correlated with age at entry to the U.K. (Pearson’s r = .94, p < .001, n = 144), it was meaningful to include it in our analyses as a few children were removed from an institution and lived with their prospective adoptive U.K. families in Romania for some weeks before entry to the U.K. was cleared. In addition, some of the children who were mainly reared in institutions had some periods of family care (i.e., 80 of 144 had spent their entire life in institutions prior to adoption, 53 of 144 had spent more than half their life in institutions, and only 11 of 144 had been in institutions for less than half their life).

**Quality of care in the institutions.** The quality of individual care in the institution(s) was assessed through the parental interview at the time of the first visit to the family (i.e., either at age 4 or age 6). Adoptive parents were asked to describe the conditions in the institution in which the child they adopted had been living. Their responses were coded on a 4-point scale: very poor = frequent change of staff and/or individual care strongly discouraged, poor = some individual care but frequent staff changes, adequate = child predominately cared for by same person, and good = individual care by the same person (note that none of the institution-reared children received a rating of good).

**Obstetric problems and birth weight.** Specific items in the interview with the adoptive parent provided information on obstetric and birth difficulties. Obstetric problems in the institution-reared Romanian sample were coded as present when there were confirmed reports either that a child was born markedly prematurely (n = 13), the mother was known to have been an alcoholic (n = 2), or the mother experienced marked stress during pregnancy (n = 2). Birth weight was derived from a combination of reports from adoptive parents and where possible from independent records (i.e., intercountry adoption records). Low birth weight was categorized as less than or equal to 2,500 g: this was chosen as a cutoff because of the poorer standards of postnatal care that existed in Romania in the late 1980s. Data on birth weight were available for 127 of the 144 institution-reared children adopted from Romania.

**Measures of children’s state at time of U.K. entry.** First, children’s weight at time of entry to the U.K. was used as an index of the degree of subnourishment, and head circumference at the time of entry was used because previous research has shown that it is a reasonably good index of brain volume (Cooke, Lucas, Yudkin, & Pryse-Davies, 1977; Wickett, Vernon, & Lee, 2000; Winick, 1976). These physical measures were taken from assessments carried out when the children arrived in the U.K. or as part of the entry clearance process that involved assessments in Romania. The physical measures were entered into the Child Health Growth Programme to assess the measures relative to population norms (Boyce & Cole, 1993; based on Buckler, 1990). This metric provides a continuous standardized measure of physical development in terms of standard deviations above or below the U.K. population norm for their age. Second, the degree of developmental delay at time of entry to the U.K. was assessed through the Denver Developmental Scales (Frankenberg, Van Doornick, Lidell, & Dick, 1986), which were completed retrospectively by the parents at the time of the first assessment (at 4 or 6 years). Further information on the reliability, validity, and assessment strategy of these measures and their use in the present sample can be found in O’Connor, Rutter, Beckett, et al. (2000) and Rutter and the ERA Study Team (1998). Third, the child’s initial health at arrival was also assessed through the interview with the adoptive parent at the time of the first visit. Specific items in the interview covered a range of potential health problems associated with institutional care. Major health problems at time of placement (present in 48 of 144 institution-reared children) included gastrointestinal, respiratory, and other health problems due to malnutrition, and blood-borne viruses (see Beckett et al., 2003, for details). Fourth, vocalization and language on arrival was assessed through specific items on the language subscale of the Denver Scales (see Croft et al., 2007). For children who were age 18 months or over on arrival a distinction was made between those children who did and those who did not imitate speech sounds or words with a recognizable sound.

**Measures indexing catch-up in physical development.** Measures of head circumference and weight assessed at 6 years of age expressed in standard deviations from the norm were used as indices of degree of recovery from early institutional deprivation, as substantial catch-up in physical development was reported in the study sample following adoption (O’Connor, Rutter, Beckett, et al., 2000; Rutter & the ERA Study Team, 1998).
tion on whether or not adoptive mothers changed their partner, on whether negativity and difficulties existed in the marriage, and on adoptive parents’ mental health. Information was obtained through parental reports based on questionnaire and interview assessments. The composite measure was used both as a continuous measure and in the form of a cutoff measure indexing whether or not risk was present in the adoptive home.

Background of adoptive parents. An assessment was made of the mothers’ cognitive abilities using the National Adult Reading Test (Nelson & Willison, 1994). This is a nonphonetic reading task of 50 words of increasing difficulty that is highly correlated with IQ (Bird, Papadopoulou, Ricciardelli, Rossor, & Cipolotti, 2004). Details of the adoptive parents’ educational qualifications were also gathered and classified on the basis of a 3-point scale for fathers and mothers combined: low = neither mother nor father had a degree or professional qualification, medium = at least one parent had university/professional qualifications, and high = both parents had a university degree or professional qualification or above.

Procedure

The procedures for the assessments at 6 years of age have been reported in detail (see Kreppner et al., 2001; O’Connor, Rutter, Beckett, et al., 2000; O’Connor, Rutter, & the ERA Study Team, 2000; Rutter, Kreppner, & O’Connor, 2001). The assessments of parents and children when children were 11 years of age were conducted in a similar fashion to the assessments at 6 years of age. In brief, members of the research team contacted parents prior to the child’s 11th birthday. Families who agreed to participate in the follow-up phase at 11 years of age were visited at home on two occasions. First, a comprehensive interview was conducted with the primary caregiver, and a set of behavioral and family relationship questionnaires was completed. Second, a formally trained researcher conducted a comprehensive assessment of the child’s social, cognitive, and physical development, including standardized cognitive and neuropsychological testing, semistructured interviews, and behavioral observation. In addition to the parental and child assessments, questionnaires were also sent to all children’s teachers to gain information about their behavior and functioning at school.

Results

Results are presented first in relation to the validation of our measures of normality and multiple impairment, then in relation to the psychological hypotheses laid out in the introduction.

Validity of Measures of Normality and Impairment

Validity was examined in two different ways. First, we employed information relating to professional service use in order to test whether freedom from impairment was valid. Of the 40 children in the institution-reared Romanian group who remained free of impairment over time, only 1 child (2.5%) had received more than one mental health session. There was only 1 child of the 40 (not the same one who had received more than one mental health session) who received major educational provision. In contrast, of the 29 institution-reared Romanian children who had persistent multiple impairments, 22 (76%) had more than one session with mental health professionals, 19 of whom were given a diagnosis involving attachment difficulties, autism related difficulties, and/or inattention/overactivity. Twenty-one children in this group received major educational provision (18 of these 21 had also seen mental health professionals more than once). The difference between the proportion of children who consulted a mental health professional in the group remaining free of impairment and the group with persisting multiple impairments was significant, \( n = 1/40 \) (2.5%) versus \( n = 22/29 \) (76%), Fisher exact test \( p < .001 \). The difference between the two groups in terms of the proportions receiving major educational provision was also significant, 2.5% versus 72%, Fisher exact test \( p < .001 \).

A second test of validity was provided by means of a comparison with typically developing children without problems in the general population. We did this in two ways. First, where population norms were available we compared the scores obtained in our normally functioning institution-reared sample with that of the population norm. Second, we compared the mean scores of the institution-reared children who were free of impairment at both time points against the percentile ranks obtained from the distribution of scores within the sample of within-U.K. adoptees who were free of impairment at both time points, the latter being the most conservative comparison of normality possible within our sample. The institution-reared children who were free of impairment at both times had an average IQ of 100.65, with a score of 100 being representative of the population norm. Their Social Communication Questionnaire (see Berument, Rutter, Lord, Pickles, & Bailey, 1999; also Rutter, Bailey, & Lord, 2003) score was 2.76 and well below the cutoff of a score of 15. We also calculated the total problem score from the Rutter Scales for which cutoff criteria have been suggested (see Hogg, Rutter, & Richman, 1997). The institution-reared children without impairment had a mean total problem score reported by parents of 5.83 and reported by teachers of 4.57. Again, both scores were well below the suggested cutoffs of 11 and 9 for parents and teachers, respectively. The mean scores from the Social Communication Questionnaire and the total problems scale of the Rutter Scales for the institution-reared children without impairments fell between the 50th and 75th percentile ranks obtained from the distribution of scores in the problem-free within-U.K. adoptee group (the differences between the mean scores of the two groups were not statistically significant). The mean IQ score of 100.7 of the problem-free institution-reared group fell between the 15th and 25th percentiles of the problem-free within-U.K. adoptees’ distribution with a mean IQ of 108.9. The difference in mean scores was significant, \( t(69) = 2.64, p < .05 \), although both were within the normal range. There was also a difference between the institution-reared children and the within-U.K. adoptees in terms of disinhibited attachment, with the former showing slightly elevated scores. Of the 40 problem-free institution-reared children, 6 (15%) scored 1 or greater (but below the cutoff of 4) on a scale ranging from 0 to 6 compared with none of the within-U.K. adoptees’ distribution with a mean IQ of 108.9. The difference in mean scores was significant, \( t(69) = 2.64, p < .05 \), although both were within the normal range. There was this was not so in the within-U.K. adopted sample (Rutter et al., 2007). When we applied the less conservative criterion of being problem-free at age 11 irrespective of level of functioning at age 6 and compared the institution-reared problem-free group with the problem-free within-U.K. adoptee group, the findings were essentially the same as those presented above.
Is the Pattern of Multiple Impairments Exhibited by the Institution-Reared Children Similar to or Different From That of Other Noninstitutionally Deprived Groups?

An issue related to validity is the question of whether or not multiple impairments had the same meaning in the institutionally deprived and nondeprived groups. In order to make a meaningful comparison between these children who had experienced prolonged institutional deprivation and those who did not, and also to obtain a representative number of children with multiple impairments in each of these two groups, we pooled the nondeprived within-U.K. adoptees with the non-institution-reared Romanian adoptees and the very early (<6 months) adopted institutionalized Romanian adoptees (as it will be shown in the following that these three groups did not differ significantly from one another). We compared this group with the pooled sample of the 6–42 months institutionally deprived children on the possible patterns of overlap of impairments.

Three patterns of possible overlap of impairments at age 11 were examined. First, because institutional deprivation was associated with specific behavioral disturbances including disinhibited attachment (O’Connor, Rutter, Beckett, et al., 2000), quasi-autism (Rutter & the ERA Study Team, 1998), and cognitive impairment (O’Connor, Rutter, Beckett, et al., 2000), we examined whether a larger proportion of the institutionally deprived group presented impairment in these areas compared with the pooled comparison group. Second, inattention/overactivity in combination with the aforementioned disturbances has been linked to institutional deprivation (Kreppner et al., 2001), but inattention/overactivity without any of the above three institution-related disturbances may be less likely to be associated with early institutional deprivation. Hence a second pattern was considered in which inattention/overactivity did not involve one of the three deprivation-specific patterns but co-occurred with conduct, emotional, and/or peer relationship problems. The rationale for doing this was that this would constitute a pattern of overlap that is very common in clinical populations (Agnold et al., 1999), and it was necessary to examine whether this would be different for institutionally deprived children. Third, the two groups were compared in terms of the proportion of children with a pattern of overlap involving none of the above areas of impairment, hence including only conduct, emotional, and peer relationship problems.

The data presented in Figure 1 suggest that among the children with multiple impairments, a pattern involving quasi-autistic features, cognitive impairment, and/or disinhibited attachment was nearly twice as common in the group of children who suffered institutional deprivation for more than the first 6 months of life than in the pooled comparison group (68% versus 36%), but the association fell just short of statistical significance (Fisher exact test \(p = .06\)). Inattention/overactivity without any of the above three impairments but in combination with conduct, emotional, and/or peer relationship problems was nearly three times as high in the nondeprived group compared with the prolonged institution-reared group (43% versus 15%). On the other hand, inattention associated with one of the three supposedly deprivation-specific patterns was more common in the institutionally deprived children (33% versus 7%). Proportions of children showing overlap among conduct, emotional, and peer relationship problems without impairments in any of the above areas were similarly small for both groups at 11 years.

Rates of Normality and Impairment at 6 and 11 Years by Adoptee Group and the Effects of Duration of Institutional Deprivation

Table 1 shows that at both age 6 and age 11 smaller proportions of children in the 6 to <24 months and ≥24 months adoptee groups compared with the other three adoptee groups were free of impairment, and correspondingly, larger proportions in these two adoptee groups compared with the other three groups showed multiple impairments. Overall the association between adoptee group and level of impairment was significant at both ages (see Table 1).

A number of follow-up analyses were necessary to confirm that (a) the rates of children with and without impairment in the 6 to <24 months and ≥24 months adoptee groups were not statistically different from one another; (b) the rates of children in the non-institution-reared Romanian group, the within-U.K. adoptee group, and the <6 months institution-reared Romanian group were not statistically different from one another; and (c) if both (a) and (b) were true, then we needed to confirm that the rates in the 6+ months institution-reared Romanian groups combined were statistically different from the other three groups pooled together. Bonferroni’s correction was used to adjust for multiple testing (i.e., \(\alpha = 0.05/6 = .0083\)).

The rates of children with or without impairments in the 6 to <24 months and ≥24 months institution-reared groups were not significantly different from one another at either time: age 6, \(\chi^2(2, N = 92) = 1.40, p = .497\); age 11, \(\chi^2(2, N = 88) = 2.25, p = .324\). Additionally, the rates of children with or without impairment across the <6 months institution-reared Romanian, the non-institution-reared Romanian, and the within-U.K. adoptee groups were not statistically different at both ages: age 6, \(\chi^2(4, N = 115) = .345, p = .987\); age 11: \(\chi^2(4, N = 110) = 6.09, p = .193\). Finally, the combined group of <6 months institution-reared Romanian children, non-institution-reared Romanian children, and within-U.K. adoptees showed significantly higher rates of normal functioning and lower rates of impairment compared with the combined ≥6 months institution-reared group at both ages: age 6, \(\chi^2(2, N = 207) = 34.89, p < .001\); age 11: \(\chi^2(2, N = 198) = 33.73, p < .001\).

A series of McNemar tests (McNemar, 1947) was conducted to examine change over time in the rates of children without impairment within each adoptee group. There was no significant change over time for any of the institution-reared Romanian adoptee groups: for the 0 to <6 months group, \(p = .508, n = 40\); for the 6 to <24 months group, \(p = .302, n = 47\); and for the ≥24 months group, \(p = .180, n = 39\). Change over time was also not significant for the non-institution-reared Romanian group (\(p = .625, n = 18\)) or the within-U.K. adoptee group (\(p = .549, n = 49\)).

Possible gender differences were also examined across zero, one, and two or more impairments. There were no significant gender differences with respect to normality and impairment within the institution-reared Romanian sample. At age 6, 40% of girls and 52% of boys showed no impairments, \(\chi^2(2, N = 136) = 3.14, p > .05\); at age 11, 39% of girls and 48% of boys showed no impairments, \(\chi^2(2, N = 130) = 1.31, p > .05\). Equally, the gender differences were not statistically significant in the within-U.K. adoptee sample, although there were somewhat more girls than boys who functioned normally at age 11. At age 6, 78% of girls...
and 69% of boys had no impairments, $\chi^2(2, N = 50) = 3.22, p > .05$; at age 11, 94% of girls and 70% of boys had no impairments, $\chi^2(2, N = 50) = 4.62, p < .05$.

The finding that there was no difference in rates for normality and impairment between the 6 to 24 months and 24 to 42 months institution-reared Romanian groups and that both groups showed significantly greater rates of impairment than the institution-reared group adopted before 6 months of age was important. In other words, the findings suggested that there was a significant negative effect of institutional care when it lasted for at least the first 6 months of life but that there was little, if any, additional negative effect of duration of deprivation thereafter. This finding of a potential sensitive period with a cutoff at around 6 months of age was explored further by categorizing age of entry in 6-month bands and comparing rates of children with multiple impairments (i.e., impairment in two or more domains) across these ages at entry groups (see Figure 2). The data from age 11 presented in Figure 2 clearly suggest a marked increase of rates with multiple impairments in the group who entered the U.K. between 6 and 12 months (i.e., from 12% with multiple impairments in the 6 months group to 50% in the 6–12 months age at entry group) and no systematic increase thereafter. Chi-square analyses within the 6–42 months institution-reared group confirmed the absence of a significant association between age of entry (categorized in 6-month age bands) and exhibiting two or more impairments at both time points: age 11, $\chi^2(5, N = 84) = 5.30, p = .381$; for trends, $\chi^2(1, N = 84) = 0.15, p = .701$. Even when we treated level of impairment as a score (ranging from zero to seven domains impaired) there was no association with age of entry within the 6–42 months adoptee sample.

With respect to individual domains of functioning at 11 years, none of the seven areas were significantly correlated with age of entry or total amount of time spent in institutions within the 6–42 months adoptee sample. Although not illustrated here in a figure,

### Table 1

<table>
<thead>
<tr>
<th>Age and no. of impairments</th>
<th>Within-U.K. (n = 50)</th>
<th>Non-institution-reared Romanians (n = 21)</th>
<th>Institution-reared Romanian &lt;6 months (n = 44)</th>
<th>Institution-reared Romanian 6 to &lt;24 months (n = 49)</th>
<th>Institution-reared Romanian 24–42 months (n = 43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 6</td>
<td>0 impairments</td>
<td>72.0</td>
<td>71.4</td>
<td>68.2</td>
<td>38.8</td>
</tr>
<tr>
<td></td>
<td>1 impairment</td>
<td>18.0</td>
<td>19.0</td>
<td>22.7</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>2+ impairments</td>
<td>10.0</td>
<td>9.5</td>
<td>9.1</td>
<td>36.7</td>
</tr>
<tr>
<td>Age 11</td>
<td>0 impairments</td>
<td>78.0</td>
<td>55.6</td>
<td>64.3</td>
<td>27.7</td>
</tr>
<tr>
<td></td>
<td>1 impairment</td>
<td>8.0</td>
<td>27.8</td>
<td>23.8</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>2+ impairments</td>
<td>14.0</td>
<td>16.7</td>
<td>11.9</td>
<td>57.4</td>
</tr>
</tbody>
</table>

**Note.** At age 6 years, $\chi^2(8, N = 207) = 37.06, p < .001$; at age 11, $\chi^2(8, N = 198) = 42.78, p < .001$. 
the findings from age 6 showed a similar trend across 6-month age 
bands: at age 6, $\chi^2(5, N = 88) = 5.55, p = .352$; for trends, $\chi^2(1, 
N = 88) = 1.60, p = .205$; and treating impairment as a score at 
age 6, $r = .18, n = 88, p > .05$.

Degree of Individual Continuity in Normality and 
Multiple Impairments Over Time

Because of the apparent importance of a 6-month age cutoff, it 
was necessary to examine individual continuity separately in the 
groups of children entering the U.K. above and below the age of 6 
months. Within the institution-reared Romanian sample entering 
the U.K. before 6 months of age, most (73%) showed no impair-
ment at age 6, and most (79%) of these continued to show no 
impairment at age 11 (see Figure 3). The degree of continuity for 
this group was closely comparable with that observed in the 
within-U.K. adoptee sample (i.e., 35 of 48 children [73%] showed 
no impairment at age 6, and 31 of 35 children [89%] continued to 
show no impairment at age 11). By contrast, of those entering the 
U.K. after age 6 months (see Figure 4), only a third (34%) were 
free of impairment at age 6, with 59% of that group remaining free 
of impairment at age 11. Nearly half (44%) showed multiple 
impairments at age 6, and three quarters (74%) of these continued 
to do so at age 11.

The relatively high degree of continuity in impairment at an 
individual level meant that there was little scope for studying the 
onset and offset of impairment between ages 6 and 11. Within the 
entire institution-reared Romanian sample (i.e., ages at entry rang-
ing from 0 to 42 months—data from Figures 3 and 4 combined), 
there were only 15 (out of 68) children with at least one area of 
impairment at age 6 who were free of impairment at age 11. Most 
($n = 12$ or 80%) had entered the U.K. at over the age of 6 months. 
Similarly, there were only 18 children who developed impairment 
between ages 6 and 11. Of these, two thirds were at least 6 months 
of age when they entered the U.K. There were no significant 
differences in age at U.K. entry between the offset and onset of 
impairment groups, although twice as many children showed onset 
in the group entering the U.K. at >6 months compared with those 
in the <6 months group (i.e., 12/29 or 41%, versus 6/29 or 21%). 
The main conclusion must be that it is more meaningful to focus 
on impairment at age 11.

Which Factors in the Pre- and Postadoption Environment 
Were Associated With Normality and Multiple 
Impairments at Age 11?

From the analyses above it is evident that one main factor 
predicting outcome was the experience of institutional deprivation 
for at least the first 6 months of life. Nevertheless, there was 
considerable heterogeneity in outcome within the 6–42 months 
institution-reared group, with a substantial proportion showing 
normal functioning at 11 years. We analyzed next whether any of 
a set of measures serving as indices of the pre- and postadoption 
environment were significantly associated with age 11 normality 
and impairment within this group of 6–42 months institution-

![Figure 2. Rates of children with two or more impairments within the institution-reared Romanian sample by age of entry pooled in 6-month bands.](image)

At 6 years:

- No impairment: 29 children (n = 29)
- 1 impairment: 8 children (n = 8)
- >=2 impairments: 3 children (n = 3)

At 11 years:

- No impairment: 26 children (n = 26)
- 1 impairment: 9 children (n = 9)
- >=2 impairments: 5 children (n = 5)

![Figure 3. Continuity and change in normality and impairment for institution-reared Romanian children entering the U.K. at <6 months of age.](image)
reared children. The plan for the statistical analyses consisted of two steps. First, we examined whether any of the possible predictor variables significantly differentiated between the children with and without impairments (see Table 2). Second, we conducted multivariate logistic regression analysis to assess the independent and combined effects of the significant predictors of normality and impairment.

Rather surprisingly, none of the measures of duration of institutional deprivation, or of physical state or overall developmental level on arrival to the U.K., differentiated between normality and impairment.

Table 2

Predictors of Normality and Impairment at 11 Years in Institution-Reared Romanian Children Age 6 Months or More at U.K. Entry

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Normality/impairment</th>
<th>Statistical significance testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>1 domain only</td>
</tr>
<tr>
<td></td>
<td>M (SD) n</td>
<td>M (SD) n</td>
</tr>
<tr>
<td>Time spent in institutions (months)</td>
<td>20.07 (10.76) 29</td>
<td>19.07 (9.23) 15</td>
</tr>
<tr>
<td>Age of entry to the U.K. (months)</td>
<td>22.48 (10.07) 29</td>
<td>23.13 (9.03) 15</td>
</tr>
<tr>
<td>Weight at entry to the U.K. (in SDs)</td>
<td>−2.06 (2.61) 29</td>
<td>−2.52 (1.42) 13</td>
</tr>
<tr>
<td>Weight at 6 years (in SDs)</td>
<td>−0.60 (0.98) 29</td>
<td>−0.42 (0.84) 14</td>
</tr>
<tr>
<td>Head circumference at entry to U.K. (in SDs)</td>
<td>−2.52 (1.35) 28</td>
<td>−3.54 (1.49) 12</td>
</tr>
<tr>
<td>Head circumference at 6 years</td>
<td>−1.69 (0.85) 29</td>
<td>−2.02 (1.52) 14</td>
</tr>
<tr>
<td>Developmental delay at entry to U.K.</td>
<td>42.31 (19.17) 28</td>
<td>44.30 (15.36) 14</td>
</tr>
<tr>
<td>Mother’s NART (IQ)</td>
<td>116.18 (5.79) 28</td>
<td>116.38 (5.78) 14</td>
</tr>
</tbody>
</table>

% (n/N) \% (n/N) \% (n/N) \chi^2(1) trends p

Vocal at entry (only within ≥18 months at entry sample) 68.4 (13/19) 20.0 (2/10) 20.0 (5/25) 10.15 .001

Very poor quality of individual care in institution 44.8 (13/29) 80.0 (12/15) 73.7 (28/38) 5.52 .019

Adoptive family risk index 10.3 (3/29) 20.0 (3/15) 7.5 (7/40) 0.59 .442

Physical health problems 31.0 (9/29) 46.7 (7/15) 28.2 (11/39) 0.11 .745

Obstetric problems 10.3 (3/29) 13.3 (2/15) 15.0 (6/40) 0.31 .576

Birth weight below 2,500 g 37.5 (9/24) 16.7 (2/12) 27.8 (10/36) 0.51 .473

Parental education—both adoptive parents having a university degree or professional qualifications 37.9 (11/29) 40.0 (6/15) 50.0 (20/40) 0.47 .495

Male 48.3 (14/29) 33.3 (5/15) 40.0 (16/24) 0.40 .526

Note. ANOVA = analysis of variance; NART = National Adult Reading Test.

* The findings were not significant when using the continuous measure of family risk; no impairment: M = 0.90, SD = 1.29; 1 impairment: M = 1.27, SD = 1.33; 2+ impairments: M = 1.40, SD = 1.41; F(2, 81) = 1.17, p = .313.
impairment at age 11 once the subgroups without institutional care or whose institutional care lasted for less than 6 months had been excluded. Similarly, neither weight at 6 years (used as an index of overall physical catch-up) nor head circumference at 6 years (used as an index of brain growth catch-up) was significantly associated with normality or impairment at 11 years. In addition, information regarding the postadoption environment (adoptive family risk index, adoptive mother’s IQ, and adoptive parents’ educational qualifications) failed to differentiate between the children with zero, one, or two or more impairments. Among the children age 18 months or more at U.K. entry, the presence or absence of meaningful vocalizations was a significant factor. Two thirds of the children with normal functioning at age 11 (68.4%) had such vocalization, compared with only 20.0% of those with multiple impairments. Most of the children were in institutions of extremely poor quality, but the proportion was significantly lower in those with normal functioning at age 11 (i.e., 44.8%, compared with 80.0% of those with one impairment and 73.7% of those with multiple impairments). Neither health problems at entry nor obstetric problems or weight at the time of birth predicted functioning at age 11. The child’s gender was also not associated with level of functioning at age 11 (see Table 2).

Thus, only two variables out of the set of predictors in Table 2 were significantly associated with normality and impairment at age 11 (i.e., very poor quality of care and meaningful vocalization at entry). Table 2 further indicates that the figures for the two significant variables were comparable between the groups with one and two or more impairments, but the proportions in these two impairment groups were markedly different from the normal-functioning group. Hence we collapsed the two impairment categories for multivariate logistic regression analyses, resulting in a binary dependent variable (0 = no impairment, 1 = one or more impairments). Considering the meaning of the two predictor variables, it made conceptual sense to examine whether meaningful vocalization added anything to the effects of quality of care (as opposed to examining whether quality of care was explicable from meaningful vocalization). Moreover, quality of care was significantly associated with children showing meaningful vocalization at entry (see Croft et al., 2007). Stepwise multivariate logistic regression analyses were conducted within the 6 to 18 months sample (n = 52). First, quality of care (0 = very poor quality, 1 = other) was entered into the model, and at the second step, meaningful vocalization was entered (0 = absent, 1 = present). In Step 1, quality of care made a significant contribution to the model, \( \chi^2(1, N = 52) = 4.76, p < .05 \), suggesting that those children who had experienced very poor quality care were more likely to show impairments. In Step 2, only vocalization was a significant predictor (OR = .10, p < .05), indicating that the children who were vocal were less likely to show impairments. Quality of institutional care was no longer a significant predictor (OR = .47, p > .10). The final model was significant: \( \chi^2(2, N = 52) = 16.45, p < .001 \).

Finally, the lack of a significant association between the degree of subnutrition and the presence of multiple impairments was a striking negative finding. In order to further examine this with respect to age of U.K. entry, we compared the association between subnutrition and multiple impairments at age 11 in <6 and ≥6 months at entry groups (see Figure 5). Binary logistic regression analyses entering weight at entry (≤1.5 SD below the norm = 0, >1.5 SD below the norm = 1) and age at entry (<6 months = 0, ≥6 months = 1) as predictor variables and multiple impairments (0 = absent, 1 = present) as the criterion showed that only age of entry, but not weight at entry, was a significant predictor: age of entry, (OR = 6.75, p < .001); weight at entry (OR = .61, p > .10); model \( \chi^2(2, N = 123) = 18.80, p < .001 \). Additional analysis, which included the interaction term of Weight at Entry × Age of Entry, confirmed that the only significant predictor was age of entry. It is evident that the main predictor of multiple impairments is the age of the child at the time of leaving institutional care and not the degree of subnutrition.

Discussion

The first question we had to tackle concerned the validity of our measures of normality and multiple impairment. The findings were reasonably clear-cut. Most of the children showing no evidence of impaired functioning on our criteria had not experienced a need for either mental health or special educational services. Moreover, their scores on all seven domains considered were far below the usually accepted clinical cutoffs and were within the normal range. We conclude that there is every reason to suppose that their functioning was indeed normal according to standard criteria. Of course, as with any group of typically developing children, they may have had minor problems or transient difficulties, but these had not given rise to the need for services. We conclude that a substantial proportion of children exposed to profoundly depriving institutional conditions do function normally at age 11. Moreover, most of them had already been functioning normally at age 6.

The evidence similarly suggested that the designation of impairment extending across two or more domains of functioning was also valid. The great majority (76%) had received mental health services, and there was a high degree of persistence between ages 6 and 11. We conclude that, despite at least 7 years’ rearing in a well-functioning adoptive family, about half of the children continued to show multiple impairments.

Because multiple impairment was so infrequent in the noninstitutionalized group of children adopted within the U.K., there was only a very limited possibility of considering whether the particular pattern of multiple impairments found in institution-reared children differed from that usually found in the general population. Nevertheless, we compared the pattern of multiple impairments presented by children experiencing prolonged institutional deprivation (i.e., for at least the first 6 months of life) with that exhibited by the remainder of children with multiple impairments in our sample (i.e., pooling together children from the within-U.K., non-institution-reared Romanian, and <6 months institution-reared Romanian groups—who did not differ significantly from one another). The findings suggested that the multiple impairments in the group exposed to prolonged institutional rearing involved the deprivation-specific patterns of cognitive impairment, quasi-autism, and disinhibited attachment in over two thirds (68%) of cases. By contrast, most cases of multiple impairments in the children who had not experienced prolonged institutional deprivation usually involved some mixture of conduct, emotional, or peer relationship problems with or without inattention/overactivity. In view of the small numbers, this difference in pattern should be regarded as one worthy of further study but not one that can be regarded as established at the present time.
Having shown the likely validity of our measures of normality and multiple impairments, we focused next on the psychological hypotheses that we sought to examine. The most striking finding was the apparent 6-month threshold. When the institutional deprivation lasted for less than the first 6 months of life, there was no detectable increase in the rate of multiple impairments over that found in adopted children who had not experienced institutional deprivation. This is in keeping with the findings from the parallel Canadian study (Maclean, 2003), as well as with other studies of severely deprived children (Clarke & Clarke, 1976, 2000). Although the generally good outcome might seem surprising in view of the profound level of deprivation in Romanian institutions, it seems that apparently full recovery usually occurs when the deprivation did not persist beyond the age of 6 months.

What was surprising was the marked stepwise increase in the rate of multiple impairments for children whose institutional deprivation lasted for the first 6 months and beyond. We undertook analyses to test whether this could be an artifact of the children selected for adoption, or of the families adopting them, but we found no evidence that this was the case. The associated finding was that the rate of multiple impairments did not rise further according to any increase in duration of institutional deprivation. To some extent, this contrasts with the findings that were reported for age 6 years (Rutter, Kreppner, & O’Connor, 2001), but even at that age the main contribution to the linear trend came from the above and below 6 months distinction.

Because significant linear relationships had previously been reported between duration of institutional deprivation and several individual outcomes at age 6, a whole range of checks were undertaken to ensure that the present negative finding was valid. At age 6, there was some tendency (not found at age 11) for outcomes to be slightly worse in the children with more prolonged deprivation. The slight (and it was very slight) difference between the age 6 and age 11 findings was due to the further partial catch-up in cognitive functioning between ages 6 and 11 for the most cognitively impaired children (Beckett et al., 2006); the decrease in disinhibited attachment over the same age period (Rutter et al., 2007); and the late development of new emotional problems between ages 6 and 11, which were unassociated with duration of deprivation (Colvert et al., in press). It should be appreciated, too, that some of the earlier reports of the ERA study did not differentiate the few Romanian children who had not experienced institutional care from the majority who had (i.e., Rutter, Kreppner, & O’Connor, 2001), whereas this report does.

Three caveats need to be expressed with respect to the lack of a dose–response relationship between duration of institutional deprivation and the rate of multiple impairments. First, it could be a consequence of the older children being successful survivors. It is known that there was a very substantial mortality rate in institutions for young children. This means that the children who had spent longer in institutions were those who had not died when they were younger. There is no way of telling how big an effect this was, but it could be an important factor. Second, we studied duration only up to the age of 42 months. It is possible that there could be a dose–response relationship beyond 42 months. It would certainly be unwise to suppose that it does not matter if institutional deprivation goes on longer. Third, although not evident in our findings, it could be that there is a dose–response relationship with more specific outcomes.

The possibility of either biological programming or neural damage needs to be considered in relation to four main findings. First, as already noted, there is the stepwise increase in the frequency of multiple impairments associated with institutional deprivation that lasts for at least the first 6 months of age. That is much more in keeping with the postulate of some sort of intraorganismic effect on brain functioning than the postulate of continuing responsivity to environmental variations. Second, there is the finding of no decrease in the level of multiple impairments between 6 and 11 years. Third, there is the marked continuity between these years with respect to individual differences in impairment. Fourth, there is the lack of any detectable impact of individual differences with respect to qualities in the adoptive families. In addition, research by other groups is producing increasing evidence of enduring changes in the functioning of both the brain and the neuroendocrine system in response to early institutional deprivation (Gunnar et al., 2001; Marshall, Fox, & Bucharest Early Intervention Project Core Group, 2004; Wismer Fries et al., 2005). A recently completed pilot structural and functional imaging study of a subgroup
of children from the present sample points in the same direction (Mehta et al., 2007). Although it would be premature to draw conclusions about the mechanisms involved, it is justified to conclude that some form of biological change is likely and that its more detailed study should constitute a research priority.

The one significant negative finding on mechanisms is that the presence of pervasive impairment does not seem to be dependent on the degree of subnutrition. The meaning of the lack of an effect of subnutrition is considered in greater detail in a separate article dealing with possible causal pathways between institutional deprivation and psychological outcomes (Sonuga-Barke et al., 2007). With respect to the findings in this article, we simply note that the main features leading to lasting functional impairment need to be sought in the psychological, rather than nutritional, aspects of the deprivation.

Both biological programming and neural damage hypotheses are often interpreted as meaning that the effects are both universal and immutable. Our findings do not support that view. Most crucially, our results showed that a substantial proportion (about one quarter) of the children who experienced profound institutional deprivation for the first 6 months or more nevertheless showed normal functioning across seven broad domains and did not appear to need special services—medical or educational. The only two variables that were significantly associated with this individual variation in outcome were the presence of even minimal language at the time of U.K. entry and the qualities of the institution environment as reported by parents. These two factors were significantly associated, but the language measure showed the main effect. The finding is considered in more detail by Croft et al. (2007), but in brief, the minimal language appears to reflect some kind of cognitive reserve that is a function of degree of institutional deprivation and that mainly relates to cognitive, rather than behavioral, outcomes. Its relevance here is that, as with other findings, it points to the individual variation in outcome being more a function of the preadoption than of the postadoption environment. The finding also points to the likelihood of meaningful individual differences in how the institutional environment impinged on individual children. Regrettably, the study provided no opportunity to measure these.

Two main caveats have to be expressed, however. First, individual variations in responsivity to institutional deprivation may reflect genetic, as well as experiential, factors. That is, gene–environment interactions affecting susceptibility to environmental influences may be operative (Rutter, 2003, 2006b; Rutter et al., 2006). DNA samples are being collected now as part of the ERA study, and such a mechanism will be examined in our future analyses (Stevens et al., 2006). Second, the measures at age 11 provided little leverage on the possibility that either internal working models (or mental sets) or active coping strategies influenced outcome. The assessment at age 15 will provide more scope for assessing these possibilities.

Finally, we need to consider our lack of any findings that point to the influence of postadoption experiences on outcome. Three main points need to be made. First, the very large and remarkable catch-up in psychological functioning after leaving institutions and being adopted into mostly well-functioning families points to the major beneficial impact of adoptions. Second, there were important changes that took place between 6 and 11 years. Some of these may have reflected no more than error variance, but some did not. Thus, we found significant cognitive improvement in those who were most cognitively impaired at age 6 (Beckett et al., 2006).

Third, the lack of evidence of importance of variations in the postadoption environment with respect to multiple impairments is likely to be a function in large part of the limited variation in the quality of the adoptive family environment (there were very few dysfunctional families), together with our limited measurement of that environment.

It will be appreciated that we have made little reference to other studies of intercountry adoption. That is not because they are uninformative. Indeed, their importance has been well-demonstrated in authoritative reviews (Gunnar et al., 2007; Maclean, 2003; van IJzendoorn & Juffer, 2006). Rather, it reflects the fact that none have focused on examination of pervasive patterns of impairment (although the Canadian study has some findings that are relevant and, insofar as they are, point to similar conclusions—Maclean, 2003). Meta-analyses have not examined the specific effects of institutional deprivation (van IJzendoorn & Juffer, 2006), and the large-scale questionnaire study by Gunnar et al. (2007) that did so was cross-sectional and lacked evidence regarding within-individual change. Adoption provides a good example of a natural experiment, and more use needs to be made of it to examine psychological hypotheses about the process of development. Adoption tends to be thought of as a way of testing for genetic mediation, but that is not at all the way that it has been used here. Rather, the radical change in environment that is entailed when profound institutional deprivation precedes adoption creates a “natural experiment” (Rutter, Pickles, et al., 2001) that may be used to test hypotheses about environmental mediation. Our findings provide strong support for such mediation, but equally, they point to the need to consider the possible changes in the organism that provide for the persistence of effects—what has sometimes been expressed as “how the environment gets under the skin.” If there is to be adequate examination of possible mediating and moderating mechanisms, however, there will need to be robust biological, as well as behavioral, measures.

In conclusion, profound institutional deprivation lasting longer than the first 6 months of life has major effects on patterns of pervasive impairment at age 11. The pattern of normality and impairment is mainly established by 6 years of age, with considerable continuity at the individual level between 6 and 11 years. Our assessment of normality and impairment seems valid, as judged by use of professional services and population norms. The key finding is the apparent 6-month cutoff associated with normal versus impaired functioning: At both ages, about two thirds of children adopted from institutional care before the age of 6 months showed normal functioning, whereas only about one third of children adopted after that age showed normal functioning, and around half within that group showed multiple impairments. However, aside from the 6-month cutoff, there is continuing uncertainty concerning the factors that lead to these huge individual differences in outcome. It is speculated that it may take some time for institutional deprivation to exert its pervasively damaging effects, but after approximately 6 months of life some form of intraorganismic change could have occurred that is difficult to reverse.

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Special Section on the Interplay of Biology and Environment

*Developmental Psychology* invites manuscripts for a special section on the interplay of biology and environment. We are interested in papers that have the potential to change or challenge how developmental psychologists think by gaining new insights into any of the following:

- How experience affects mind, brain, and gene expression throughout development (e.g., how early experience can change gene expression),
- Genetic mediation of environmental effects on mind and body during development (e.g., how similar experiences can have different effects because of the genotypes of those undergoing the experiences),
- How social relations affect cognition, perception, and emotional and physical health (e.g., neuroimaging evidence of the effect of social connectedness or isolation on the brain during development),
- Neuroscientific insights into cognitive, perceptual, emotional, and social processes during development (e.g., evidence that neural systems recruited to do the same chore change over development),
- Interrelations between physical health and mental health (cognitive and emotional) during development (e.g., work in developmental psycho-neuro-immunology), and
- How emotions affect brain function (and hence cognition and perception) and physical health during development (e.g., evidence that one’s emotional state affects the way the brain processes stimuli even from earliest infancy).

We would particularly like to encourage submissions from disciplines outside of developmental psychology whose interdisciplinary work holds important implications for understanding developmental processes.

Initial inquiries regarding the special section may be e-mailed to Adele Diamond, Associate Editor, at Adele.Diamond@ubc.ca.

The submission deadline is **September 30, 2007**. Review papers, empirical reports, and theoretical papers are all encouraged. The main text of empirical reports should not exceed 20 double-spaced pages (approximately 5,000 words), in addition to figures, tables, references, and/or appendixes. Formal submissions must be submitted through the electronic portal of *Developmental Psychology* at http://www.apa.org/journals/dev/submission.html. Please be sure to specify in the cover letter that your submission is intended for the special section.