

Growth and development in internationally adopted children: extent and timing of recovery after early adversity

Jesús Palacios, Maite Román and Carlos Camacho

Faculty of Psychology, University of Sevilla, Sevilla, Spain

Accepted for publication 24 May 2010

Abstract

Background Following initial adversity, internationally adopted children arrive with significant growth and developmental delays. Post-placement recovery has been widely documented, but little has been known about its extent and timing several years after placement and in children with diverse pre-adoptive experiences.

Methods A total of 289 children adopted from six countries into Spanish families were studied. Growth and psychological development were considered on arrival and after an average of over 3 years.

Results Growth and developmental initial delays affected a substantial percentage of the children. Post-adoption recovery seemed quicker and more complete in weight and height than in head circumference and psychological development. Initial and later values were correlated, but growth–development relation on arrival subsequently lost significance. Most of the catch-up happened in the first three post-adoption years.

Conclusion Adoption offers an impressive opportunity for recovery after previous adversity, although continuity between past and present persists. The improvement is more marked in some areas than in others and more substantial in the first post-adoption years.

Keywords

catch-up, development, early adversity, growth

Correspondence:

Jesús Palacios,
Department of
Developmental
Psychology, University of
Sevilla. Calle Camilo J.
Cela s.n. 41018 Sevilla,
Spain
E-mail: jp@us.es

Introduction

With adoption, children experience a dramatic change that offers opportunities for both paediatric and psychological research. This paper tackles their well-studied initial delays and later recovery in growth and psychological development, as well as the underexplored domains of the timing of the recovery and the long-term growth–development connections.

Research on the growth of internationally adopted children has documented significant delays on arrival and a noteworthy recovery thereafter (Johnson 2000; Pomerleau *et al.* 2005; Miller *et al.* 2009). Van IJzendoorn and colleagues (2007)'s meta-analysis showed considerable initial delays in height,

weight and head circumference, with a more complete post-adoption catch-up in the first two. While recovery is clear, little is known about its timing. If a month of linear growth is lost for every 3 months spent in an orphanage (Johnson 2000), what is the post-adoption catch-up rate? Does recovery happen over several years or is it more evident shortly after adoption?

Developmentally, initial impairment and later recovery have been also documented (Pomerleau *et al.* 2005; Van IJzendoorn *et al.* 2005; Vorria *et al.* 2006), but again little is known about the timing of recovery. In a study of Romanian adoptees, most changes happened during their early post-adoption years (Rutter 2006), although cognitive improvements were

documented several years later (Beckett *et al.* 2006), albeit only for those who were initially more impaired.

Finally, the growth–development relation in international adoptees remains largely unexplored. Both aspects have been found to be related prior to and shortly after adoption (Miller *et al.* 2005; Pomerleau *et al.* 2005), but their long-term connection is unexplored. The scant evidence suggests that the initial relation diminishes over time.

The current study refers to adoptees from six different countries and considers growth and developmental status on arrival as well as at an average of more than 3 years after placement. Four hypotheses are tested: (i) initial delays and a later significant recovery are expected in both growth and development; (ii) given the diversity in the countries of origin, significant differences are expected depending on this variable, at least on arrival; (iii) the initial correlations between growth and development will diminish or even disappear after a significant post-placement period; (iv) the catch-up will be more significant shortly after arrival, with a decreasing slope of change thereafter.

Methods

The 289 children in the sample were adopted in four Spanish regions representing approximately 50% of the national population (Palacios *et al.* 2007). These regions are similar to the rest of the country in terms of family demography, average socio-economic status and the resources for adoptive families. The countries of origin (China, Colombia, Guatemala, India, Romania and the Russian Federation) represented 80% of all international adoptions in Spain at the time.

The proportion of adoptees from different countries in the sample mirrored that throughout Spain at that time, with 24% from China, 18% from Colombia, 18% from India, 18% from the Russian Federation, 12% from Romania and 10% from Guatemala. The average age at adoption was 34.9 months.

The families were contacted through the child protection authorities. Around 80% of the approached families agreed to participate, but in one of the regions almost 40% of adopters declined, with those who adopted in Romania predominating. Some stated that they were unhappy with the public agency and/or tired of follow-ups.

The families were visited at home approximately 38 months post placement. Information was gathered in an interview about their child's pre-adoptive history, as well as their growth on arrival. From the first paediatric visit following the children's arrival, most parents had written information on weight and

height, but only 69 on head circumference. These 69 children did not differ from the rest with regard to any of the initial growth values ($P = 0.392$ for weight, 0.467 for height, 0.971 for developmental status). Initial developmental status was assessed using the parents as informants with a retrospective version of the Battelle screening scale. Current weight, height and head circumference were obtained during the home visit, in which children up to 6 years were assessed with the complete Battelle scales, and the rest using WISC-r. The scoring of the retrospective Battelle was blinded to both arrival growth status and current developmental status.

Following common practice, growth scores above or below 6 standard deviations were not used in the analysis of the particular dimension, as they are so extreme that could reflect incorrect data (12 children on arrival and 3 at present were discarded for this reason). According to WHO (1995), z scores below -2 represent a severe delay and those between -1 and -2 a moderate delay, while those over -1 are considered normal. For psychological development, an index in months was calculated by subtracting the chronological age from the mental age.

The data can also be examined in terms of linear lag (Johnson 2000), expressing the distance between the values observed and the norm values for the age: if a girl arrives at 20 months with a height equivalent to 13 months, her linear height lag would be -7 .

For the timing of the recovery, the rationale of the analysis is as follows: to recover from their initial delays, children need to grow faster than 12 months in a year, so the question is by how many additional months each child progressed by year. In 12 months, the girl mentioned above grew from an initial height of a 13-month-old to that of a 28-month-old: she gained three additional months in a year. Since, at the time of the study, by sampling decision, the children had been with their families for over 1 year, four groups were created, based on the time after arrival: 2 years or less ($n = 69$), 2–3 years ($n = 94$), 3–4 years ($n = 59$) and over 4 years ($n = 67$). Knowing how many additional months per year were gained by these groups reveals the speed or timing of their recovery.

Results

Growth and development on arrival

Growth

On arrival, the average z scores were -1.48 for weight, -1.46 for height and -0.71 for head circumference. A severe delay was present in around a third of the sample (initial values, Table 1).

Table 1. Post-adoption recovery: initial–current contrast

	Weight		Height		Head circumference		Psychological development	
	Initial	Current	Initial	Current	Initial	Current	Initial	Current
No delay	37.3%	84.5%	38.9%	75.6%	33.3%	65.8%	38.3%	62.3%
Moderate delay	30.3%	14.4%	23.9%	18.1%	29%	21.5%	18.2%	20.5%
Severe delay	32.4%	1.1%	37.2%	6.3%	37.7%	12.7%	43.5%	17.2%

Regarding linear growth lag, the initial average values were -10.62 months for weight, -5.86 for height and -7.13 for head circumference (initial values, Fig. 1). Only 15.2% of the children with complete data had a normal level in all three anthropometric indicators.

There were positive correlations between the different growth domains: weight with height, $r = 0.55$; weight with head circumference, $r = 0.58$ and height with head circumference, $r = 0.57$ (all $P < 0.001$).

The differences by country were non-significant, although different trends were observed, particularly regarding the head circumference of the children from Romania and India (grey bars in Fig. 2). Gender differences were non-significant.

For the overall sample, there was no significant correlation between length of institutionalization or age on arrival and growth indicators. However, among children adopted at the age of 4 or younger (75% of the sample), a longer stay in orphanages was associated with greater initial height problems ($r = -0.17$, $P < 0.05$). Among those who had spent 7 months or less in orphanages, there was a significant negative correlation between orphanage time and head circumference ($r = -0.48$, $P < 0.05$).

Psychological development

On arrival, 38% showed a normal development while 44% were severely delayed (initial values, Table 1). The developmental linear lag was -7.63 months (Fig. 1).

Gender differences were non-significant when adoption age was controlled. Differences by country were significant, even when adoption age was considered. The main differences were between children from China and those from India and Romania (both $P < 0.01$) (grey bars in Fig. 2).

The children without institutional experience (adopted from foster care, mainly from Colombia and Guatemala) were less delayed than the others, for whom a longer exposure to orphanages was significantly related to more marked delays ($r = -0.45$, $P < 0.001$). Also, the older the children at adoption, the more pronounced their developmental delay ($r = -0.60$, $P < 0.001$).

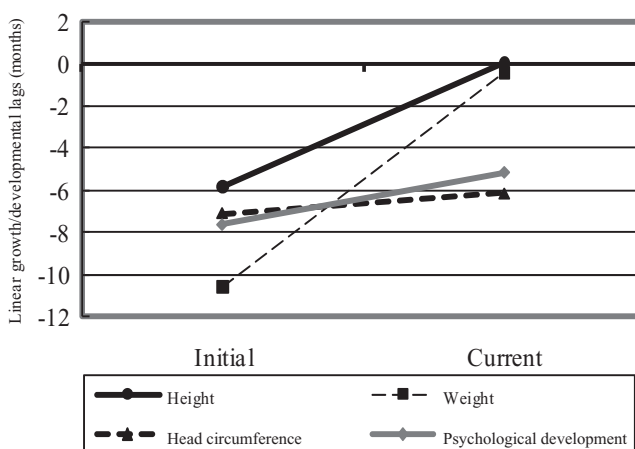


Figure 1. Linear growth and developmental lags on arrival and an average of 3 years later (in months).

On arrival, psychological development was significantly correlated with z scores for height ($r = 0.24$, $P < 0.01$), weight ($r = 0.17$, $P < 0.05$) and head circumference ($r = 0.26$, $P < 0.05$).

Post-placement recovery

Growth

Over 3 years after arrival, the average z scores were 0.09 for weight (-1.48 initially), -0.1 for height (-1.46 initially) and -0.46 for head circumference (-1.71 initially) (all $P < 0.001$). The percentage with severe delays greatly decreased: 6.3% for height (37.2% initially), 1.1% for weight (32.4% initially) and 12.7% for head circumference (37.7% initially) (current values, Table 1). Half of the sample (52.5%) presented normal growth scores in all three domains (15.2% on arrival).

The linear lag progress was particularly evident in the case of weight and height (Fig. 1): the current lag was -0.42 months for weight (-10.62 on arrival), -0.002 for height (-5.86 on arrival) and -6.16 for head circumference (-7.13 on arrival).

The increase was higher for those with lower initial values ($r = -0.67$ for weight, -0.79 for height, -0.71 for head circumference, all $P < 0.001$). However, current and initial growth indi-

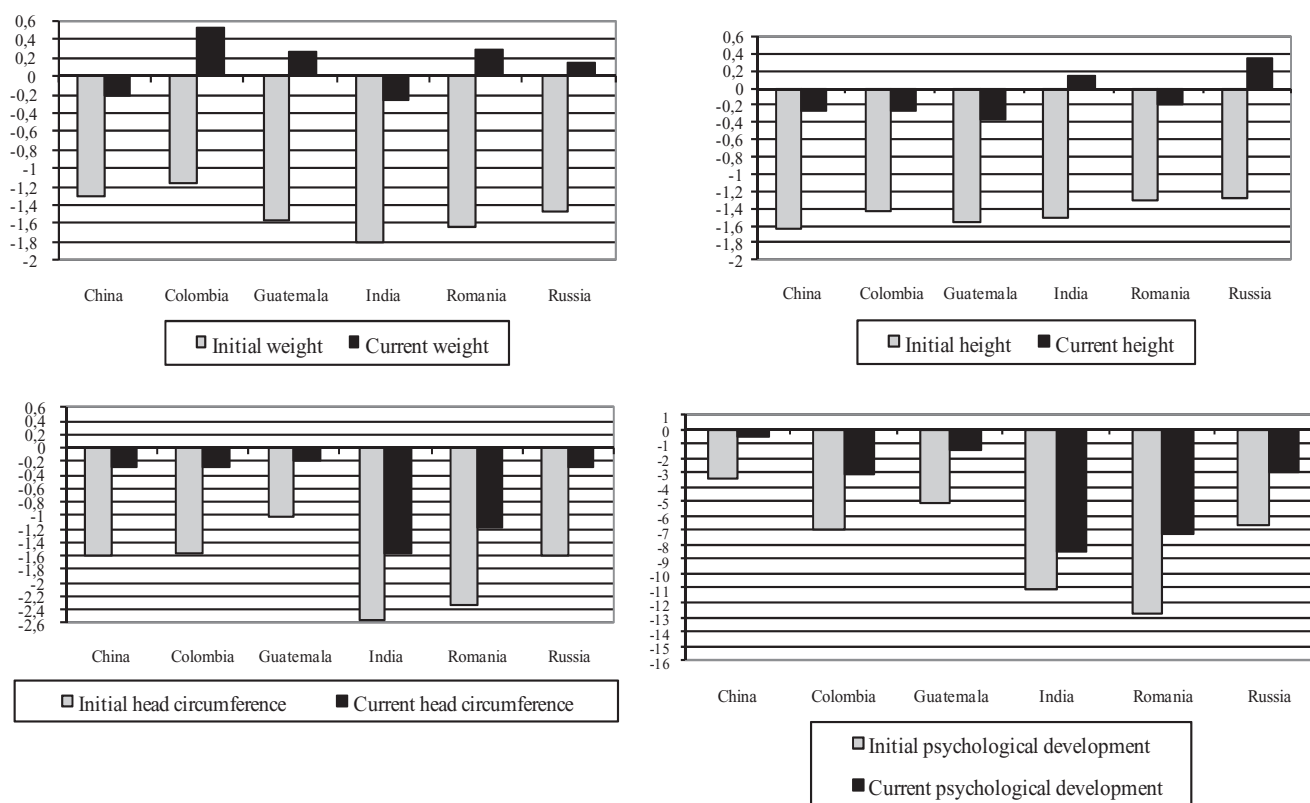


Figure 2. Height, weight, head circumference (in z scores) and development (in months) on arrival and at the time of the study by country of origin.

cators were positively correlated: weight $r = 0.26$, height $r = 0.42$ (both $P < 0.001$), head circumference $r = 0.34$ ($P < 0.01$). Therefore, even with a more substantial catch-up, children who had been initially more delayed tended to score lower 3 years later. When the differences between the initial and the current values were corrected for regression to the mean, changes in both weight (+0.46 z) and height (+0.52 z) remained highly significant ($P < 0.001$), but not in head circumference (+0.05 z), which implies that the observed improvement in the latter could be interpreted in statistical terms.

Figure 2 shows post-adoption anthropometric indicators by country of origin. Significant differences were found in weight ($P < 0.01$) and head circumference ($P < 0.05$), but not in height. No significant differences were found regarding the length of institutionalization or age at adoption (except for head circumference, $r = 0.13$, $P < 0.05$, with age at placement).

Developmental status

The difference initial–current psychological index was significant ($P < 0.001$). Currently, 62% showed normal development

(38% initially), 21% a moderate delay (18% initially) and 17% a severe delay (44% initially) (Table 1). The current severe delay of 17% is higher than that found for weight (1%) or height (6%), and closer to the percentage for head circumference (13%).

The difference in developmental lag was also significant ($P < 0.001$), with a current lag of -5.17 months (initial, -7.63) (Fig. 1). Those initially more delayed showed greater progress ($r = -0.37$, $P < 0.001$), although the initial–current correlation remained significant ($r = 0.52$, $P < 0.001$). When the difference between the initial and current values was corrected for regression to the mean, the resulting non-significant value (+0.07) suggests that the observed improvement could be attributed to a statistical phenomenon.

Gender and between-country differences were non-significant when adoption age was considered. Children without institutionalization showed a better development than the others ($P < 0.05$), for whom there was a significant correlation between the length of institutionalization and their current development ($r = -0.46$, $P < 0.001$). The correlation between growth and psychological development found on arrival disappeared when age at adoption was considered.

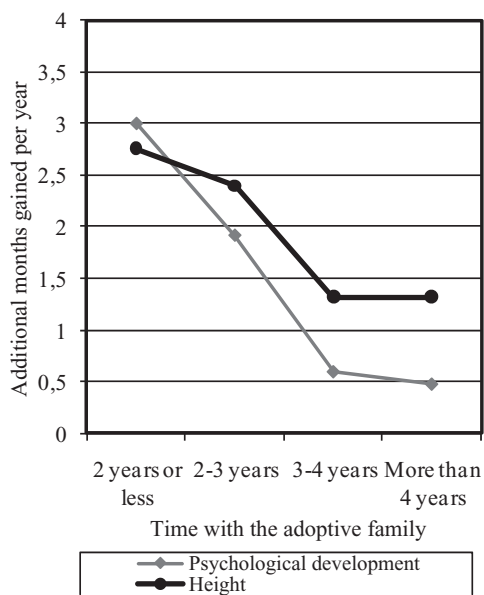


Figure 3. Timing of recovery: additional months gained per year after adoption in height and psychological development.

Timing of the recovery

The effect on height provides a good illustration of the timing of growth catch-up. During the first 2 post-adoption years, there was an additional gain of 2.76 months per year, remaining relatively stable (2.4) during the following year, and then dropping to 1.32 months in the following 2 years (Fig. 3). Similar, but more marked, was what happened to weight (an additional gain of 6 months per year in the first 2 years and 3.96 months in the following year, dropping thereafter to 1.32 per year). The initial values for head circumference were known for fewer children, making the analysis unviable.

The developmental improvement was also higher in the first two post-adoption years (three additional months per year) and between the second and third post-adoption years (1.92 additional months per year). After the third year, progress was more modest, at 0.6 additional months per year (Fig. 3).

Although the improvement among children who had been adopted at a later age was more modest, differences related to adoption age were not statistically significant ($P = 0.234$).

Discussion

Confirming our first hypothesis, the initial growth and developmental indicators were greatly affected by early adversity. These results, and their connection with previous institutional-

ization, confirm the previous research. Also, as predicted, there was a substantial post-adoption recovery, particularly for weight and height. As Van IJzendoorn and colleagues (2007) pointed out, head circumference recovery follows a different pattern and something similar occurs in the psychological domain. In all aspects, the progress was more marked for those with poorer initial values.

When corrected for regression to the mean, the differences between the initial and current values remained highly significant for weight and height, which highlights the importance of the catch-up, given that such correction implies a more stringent estimate of the differences. However, head circumference and psychological development did not pass the test; although there were changes between the initial and the current values, their magnitude was limited and the recovery was not sufficiently significant. If catch-up means complete recuperation (as in weight and height), what this suggests is that, in these two domains, there is improvement, but not full recovery.

Contrary to our second hypothesis, no systematic differences were found with regard to country of origin, which probably reflects their diversity of circumstances (Pomerleau *et al.* 2005). So, for instance, in their study of adoptees from Guatemala, Miller and colleagues (2005) reported significant differences between children adopted from orphanages and from foster care, so it would not be adequate to consider all children from Guatemala as similar. Also, the circumstances in the different orphanages within a country, and for different children within an orphanage, may differ significantly.

This may help to explain why the length of institutionalization and adoption age were not always significantly related to delays. The connection was clearer for psychological development (more delay following longer institutionalization) than for growth (significant relation only for those adopted under age 4 years). For head circumference, our data are consistent with Johnson *et al.*'s (1992): time in orphanages correlates with initial head circumference only for those with less exposure, which implies that the head circumference of younger children is more affected by adversity, and also that some children may recover from their initial handicaps even while in orphanages (Miller *et al.*, 2007; Dobrova-Krol *et al.* 2008).

Significant positive correlations between all of the initial scores suggest that the whole child is negatively affected by early adversity, but, confirming our third hypothesis, the scores were no longer correlated after a significant period spent with the adoptive family, as in Judge (2003) and O'Connor and colleagues (2000). Together with the less complete recovery in head circumference and psychological development, this suggests that the recovery follows different patterns for different aspects,

with more similarity between weight and height, and between head circumference and psychological development. While pre-adoption impairment seems to occur synchronically, post-adoption recovery appears asynchronous. This parallels data reported by Vorria and colleagues (2006) (complete recovery in weight and height, but not in intelligence) and Sonuga-Barke and colleagues (2008) (contrast between weight and both head circumference and IQ).

As for the timing of recovery, the first three post-adoption years show a substantial improvement, confirming our fourth hypothesis and other data (Rutter 2006). If, prior to adoption, children lose 4 months of linear growth for every year spent in orphanages (Johnson 2000), our data suggest that, in the first two post-adoption years, they make an additional gain of around 3 months per year in both height and psychological development, with a faster and more pronounced change in weight. Although less steep, the recovery in the third post-adoption year seems also noticeable, but the speed of recovery decreases thereafter, especially for psychological development. For head circumference, our data suggest more similarity with psychological development than with weight and height.

The more modest recovery after the third post-adoption year requires at least two qualifications. First, our psychological index is biased towards intelligence, as children over 6 years old were assessed by an IQ test including linguistic abilities. Perhaps in other psychological domains, the improvements extend beyond these first years. Second, the data here reported are average and reflect the general trend. However, in their study of Romanian adoptees, Beckett and colleagues (2006) (on intelligence) and Sonuga-Barke and colleagues (2008) (on head circumference) have shown that the initially more impaired children were still making some progress several years after placement. In general, however, it seems that head circumference and IQ are more susceptible than weight and height to persistent deficits following early adversity (Rutter 2006).

Also of interest is the positive correlation between initial and current scores, as found by Judge (2003), O'Connor and colleagues (2000) and Pomerleau and colleagues (2005). The adopted children's past continues to influence their current status. Although adoption is mainly about change, continuity also exists.

Finally, our data suggest that the international adoptees are a heterogeneous group, even when they come from the same country. Crude generalizations about children adopted at a particular age or from a given country should be avoided.

Three limitations of this study should be highlighted, which remain relevant even if they are shared by many other studies in the field. First, although our sample is relatively large, the

number of children from each country is reduced for the analysis of within-country differences. Also, the number of children with reliable initial head circumference values is small. Second, the information about the pre-adoption experiences is limited and comes from the adoptive parents, who know little about the children's past. Finally, the assessment of initial developmental status through parental retrospective report is problematic, even if a similar approach has proved satisfactory elsewhere (Beckett *et al.* 2006).

Key messages

- Adopted children join their new families with significant growth and developmental delays, related in part to the length of their institutional experiences and age at adoption.
- After a significant period with their new families, children show a significant recovery, more complete for weight and height than for head circumference and psychological development.
- There are no systematic differences depending on country of origin, highlighting the heterogeneity of circumstances both between and within countries.
- In the contents here studied, improvement after initial adversity seems to be a time-bound process, with most recovery taking place in the first three post-adoption years.
- Although the new life after adoption brings about new opportunities, the influence of the past does not completely disappear.

Acknowledgements

This study was commissioned and funded by the Spanish Ministry of Social Affairs and by the Social Services Department of the Castile and León Government. This article was written while the first author was a Visiting Scholar at the Department of Social and Developmental Psychology, University of Cambridge, UK, funded by the Spanish Ministry of Science and Innovation (Grant PR2008-0291).

References

- Beckett, C., Maughan, B., Rutter, M., Castle, J., Colvert, E., Groothues, C., Kreppner, J., Stevens, S., O'Connor, T. G. & Sonuga-Barke, E. (2006) Do the effects of early severe deprivation on cognition persist into early adolescence? *Child Development*, 77, 696–711.

- Dobrova-Krol, N. A., Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Cyr, C. & Juffer, F. (2008) Physical growth delays and stress dysregulation in stunted and non-stunted Ukrainian institution-reared children. *Infant Behavior & Development*, *31*, 539–553.
- Johnson, D. E. (2000) Medical and developmental sequelae of early childhood institutionalization in Eastern European adoptees. In: *The Effects of Early Adversity on Neurobehavioral Development* (ed. C. A. Nelson), pp. 113–162. Erlbaum, Mahwah, NJ, USA.
- Johnson, D. E., Miller, L. C., Iverson, S., Thomas, W., Franchino, B., Dole, K., Kiernan, M., Georgieff, M. & Hosteter, M. (1992) The health of children adopted from Romania. *The Journal of the American Medical Association*, *268*, 3446–3451.
- Judge, S. (2003) Developmental recovery and deficit in children adopted from Eastern European orphanages. *Child Psychiatry and Human Development*, *34*, 49–62.
- Miller, L., Chan, W., Comfort, K. & Tirella, L. (2005) Health of children adopted from Guatemala: comparison of orphanage and foster care. *Pediatrics*, *115*, 710–717.
- Miller, L., Chan, W., Litvinova, A., Rubin, A., Tirella, L. & Cermak, S. (2007) Medical diagnoses and growth of children residing in Russian orphanages. *Acta Paediatrica*, *96*, 1765–1769.
- Miller, B. S., Kroupina, M. G., Iverson, S. L., Masons, P., Narad, C., Himes, J. H., Johnson, D. E. & Petryk, A. (2009) Auxological evaluation and determinants of growth failure at the time of adoption in Eastern European adoptees. *The Journal of Pediatric Endocrinology*, *22*, 31–39.
- O'Connor, T. G., Rutter, M., Beckett, C., Keaveney, L. & Kreppner, J. M. (2000) The effects of global severe privation on cognitive competence: extension and longitudinal follow-up. *Child Development*, *71*, 376–390.
- Palacios, J., Sánchez-Sandoval, Y. & León, E. (2007) *La aventura de la adopción internacional*. Barcelona, Teresa Gallifa.
- Pomerleau, A., Malcuit, G., Chicoine, J. F., Seguin, R., Belhumeur, C., Germain, P., Amyot, I. & Jéliu, G. (2005) Health status, cognitive and motor development of young children adopted from China, East Asia, and Russia across the first 6 months after adoption. *International Journal of Behavioral Development*, *29*, 445–457.
- Rutter, M. (2006) The psychological effects of early institutional rearing. In: *The Development of Social Engagement* (eds P. J. Marshall & N. Fox), pp. 355–391. Oxford University Press, New York, NY, USA.
- Sonuga-Barke, E. J. S., Beckett, C., Kreppner, J., Castle, J., Colvert, E., Stevens, S., Hawkins, A. & Rutter, M. (2008) Is sub-nutrition necessary for a poor outcome following early institutional deprivation. *Developmental Medicine and Child Neurology*, *50*, 664–671.
- Van IJzendoorn, M. H., Juffer, F. & Klein Poelhuis, C. W. (2005) Adoption and cognitive development: a meta-analytic comparison of adopted and non-adopted children's IQ and school performance. *Psychological Bulletin*, *131*, 301–316.
- Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J. & Juffer, F. (2007) Plasticity of growth in height, weight, and head circumference: meta-analytic evidence of massive catch-up after international adoption. *Journal of Developmental and Behavioral Pediatrics*, *28*, 334–343.
- Vorria, P., Papaligoura, Z., Sarafidou, J., Kopakaki, M., Dunn, J., Van IJzendoorn, M. H. & Kontopoulou, A. (2006) The development of adopted children after institutional care: a follow-up study. *Journal of Child Psychology and Psychiatry*, *47*, 1246–1253.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.