Development and adjustment of adopted adolescents : longitudinal and concurrent factors

Jaffari-Bimmel, N.

Development and Adjustment of Adopted Adolescents: Longitudinal and Concurrent Factors

Nicole Jaffari-Bimmel

Design of cover: Daco van Houte
Children on cover: Samira, Olivia, Sophie

Printed by: Mostert & Van Onderen, Leiden

Development and Adjustment of Adopted Adolescents: Longitudinal and Concurrent Factors

Proefschrift

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van de Rector Magnificus Dr. D.D. Breimer,
hoogleraar in de faculteit der Wiskunde en
Natuurwetenschappen en die der Geneeskunde,
volgens besluit van het College voor Promoties
te verdedigen op maandag 24 oktober 2005
klokke 15.15 uur

door

Nicole Jaffari-Bimmel
geboren te Domburg
in 1977

Promotiecommissie

Promotores
Prof. dr. F. Juffer
Prof. dr. M. H. van IJzendoorn

Co-promotor
Dr. M. J. Bakermans-Kranenburg

Referent
Prof. dr. H. D. Grotevant (University of Minnesota, USA)

Overige leden
Prof. dr. M. A. G. van Aken (Universiteit Utrecht)
Dr. J. Mesman
Prof. dr. R. van der Veer
Prof. dr. W. Vollebergh

De vereniging Wereldkinderen en de stichting Kind en Toekomst leverden een financiële bijdrage aan het onderzoek beschreven in dit proefschrift.

Voor mijn twee kleine wondertjes,
Jamal en Samira

Voorwoord (Preface)

Contents

Chapter 1
General Introduction

Research on adopted children and adoptive families has two important aims. First, adoption-research is carried out in the interest of people involved in adoption, to improve the assistance and resources for the families involved. The number of international adoptions has increased substantially over the last few decades. Today, international adoption involves over a hundred countries, whether as states of origin, as receiving states, or both (Selman, 1998). The number of international adoptions has risen, worldwide, to more than 32,000 a year and will probably increase further (Selman, 2000). Because adoption involves a lot of countries, a lot of societies, and a lot of families, it is important to investigate the development of the adopted children and the possible risk and protective factors.

Research shows that although the majority of adopted children and adolescents are well adjusted (e.g., Andresen, 1992), a minority has serious adjustment or learning problems, in higher rates than their non-adopted peers (for meta-analyses, see Bimmel, Juffer, Van IJzendoorn, & Bakermans-Kranenburg, 2003 (Chapter 2); Juffer & Van IJzendoorn, 2005; Van IJzendoorn, Juffer, & Klein Poelhuis, 2005). In a meta-analysis of 62 studies on the cognitive development of adopted children (N = 17,767 adopted children), Van IJzendoorn, Juffer, and Klein Poelhuis (2005) found that adopted children did not differ from their non-adopted environmental peers or siblings in IQ, but their school performance and language abilities lagged behind. In addition, more adopted children developed learning problems. In a meta-analysis of 64 studies on behavior problems and 34 studies on mental health referrals of adopted children (N = 25,281 adopted children), Juffer and Van IJzendoorn (2005) showed that adopted children presented more behaviour problems, and were overrepresented in mental health settings. Finally, in a meta-analysis of 10 studies, Bimmel et al. (2003; Chapter 2) showed that internationally adopted adolescents exhibited more behavior problems than did non-adopted adolescents, with the difference revealed in externalizing but not in internalizing behavior problems. The meta-analyses showed that the majority of adopted children are well adjusted, although a relatively large minority of adopted children are referred to mental health services or have behavior problems in the clinical range compared with non-adopted children. As a result, there is an increasing urge for specific knowledge and tools to support the families involved. Prospective, longitudinal research is needed to examine the development of adopted children, the origins of problems, and the possible risk and protective factors.

Second, research on adopted children and adoptive families is carried out not only in the interest of those involved in adoption, but also in the interest of families with birth children in a more general sense. In families with biologically related parents and children, the associations between parent-child variables (for example, mother-child attachment) and parent variables (for example, maternal sensitive responsiveness) on the one hand and child variables (for example, the child's temperament) on the other hand, may always be affected by the genetic link between child and parent, instead of parenting influences. For example, a major disadvantage of previous studies on the influence of parenting on children's development is the confounding of parenting effects and genetic similarities (Rowe, 1993a, 1993b). Studies with adopted children make it possible to examine the unique contributions of parenting variables to children's development excluding of the influence of genetic similarities. Behavior genetic research indicates a widening gap between parents and their adopted adolescent, with a decreasing correlation between characteristics of the adopted children and their adoptive parents and an increasing correlation between characteristics of the adopted children and their birth parents (Plomin, Fulker, Corley, & DeFries, 1997). Studies on adopted adolescents allow for more conclusive evidence of child-rearing or social-interactive influences on the development of adolescents, independent of shared genetic factors between children and parents (Rowe, 1993a).

To date, only a few studies followed nationally (e.g., Fergusson, Lynskey, Horwood, 1995; Hodges & Tizard, 1989a, Hodges & Tizard, 1989b; Hoopes, 1982; O'Connor, Jenkins, Hewitt, DeFries, & Plomin, 2001; Plomin et al., 1997; Simon, 1996) or internationally (e.g., Croft, O' Connor, Keaveney, Groothues, Rutter, et al., 2001; Groza & Ryan, 2002; Rutter & O'Connor, 2004; Tieman, van der Ende, & Verhulst, 2005; Verhulst & Versluis–den Bieman, 1995) adopted children over a prolonged period of time. The findings of these longitudinal studies are inconclusive and diverse and the results should be interpreted with caution. First, considerable heterogeneity exists within the studies. For example, the children were adopted from several different countries and cultures, they have moved to different countries, and the ages on arrival were divergent (Westhues & Cohen, 1997). This may limit the accuracy of the conclusions. Secondly, most longitudinal studies on adopted children did not include very early adopted children or did not start at an early age of the adopted children. Therefore the confounding factors of prolonged or extreme deprivations before the adoption may also exert an influence on the development of the children. Also, prolonged physical and psychological suffering before the adoption may affect later adopted children more than children adopted at a very young age. In their meta-analyses, Juffer and Van IJzendoorn (2005) and Van IJzendoorn, Juffer, and Klein Poelhuis (2005) found that an abusive or otherwise deprived background before the adoption was associated with more behavior problems and less favorable school achievement.

Shorter pre-adoption time may imply shorter exposure to risk factors such as malnutrition, neglect or abuse (Van IJzendoorn et al., 2005). Moreover, assessments of the early development of the adopted children are often not available. For example, Verhulst and Versluis-den Bieman (1995) and Croft et al. (2001) included very early adopted children as well as later adopted children, but their longitudinal studies started when the children were, respectively, 10 and 4 years of age. Thirdly, the majority of the adoption studies reported almost exclusively on adopted children's behavior or cognitive problems and not on other aspects of their development, nor on the correlates of the development or, perhaps most importantly, on the influence of earlier factors (such as infant attachment) on later development. Fourthly, the longitudinal adoption studies mentioned before did not use a variety of extensive measurements, like observations, nor did they use multiple sources of information, like teachers, classmates, and the children themselves. Parent-reported questionnaires are often the preferred way of collecting the data. However, parent-reported behavior problems may be influenced by a greater tendency of adoptive parents to observe and indicate problematic child behavior (Miller, Fan, Grotevant et al., 2000; Slap, Goodman, & Huang, 2001; Warren, 1992). Fifthly, the studies often include only two times of measurement, the time-intervals are short and relatively high (selective) attrition is found (for an example of high attrition, see Groza & Ryan, 2002; Tieman, Van der Ende, & Verhulst, 2005). As a result of these shortcomings, there is an urge for more research in this domain.

The present prospective study is the first to examine the longitudinal development of children adopted internationally at a very early age, i.e., before the age of six months. All children were followed from infancy, so several indices of the child's early development and relationships were available to study the etiology and course of the adopted children's adjustment. The adopted children's development was examined from a broad longitudinal perspective with multiple indicators and with assessments in multiple contexts. Multiple methods of data-collecting were used (observations, questionnaires, interviews, Q-sorts, and socio-metric data), different times of measurement (infancy, middle childhood, and adolescence), and multiple sources of information (children themselves, parents, teachers, classmates).

Early childhood

In the first study of the present sample, starting at 6 months of age, an intervention was implemented and early attachment and competence were examined in 160 children, adopted from Sri Lanka, South-Korea and Colombia (Juffer, 1993; Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005; Juffer, Hoksbergen, Riksen-Walraven, & Kohnstamm, 1997; Juffer & Rosenboom, 1997; Juffer, Rosenboom, Hoksbergen, Riksen-Walraven, & Kohnstamm, 1997). All children were placed before the age of 6 months in adoptive families without birth children or in adoptive families with birth children. Two intervention

programs were tested in early childhood: (a) a personal book with suggestions and advice on how to parent a child in a sensitive way, and (b) the same personal book, combined with three home-based sessions offering video feedback. The control group did not receive intervention. Based on attachment theory (Bowlby, 1973, 1980), the intervention aimed at promoting maternal sensitive responsiveness, secure infant-mother attachment relationships, and infant exploratory competence. The intensive intervention program, the personal book combined with video feedback, resulted in enhanced maternal sensitive responsiveness in families with and without birth children (Juffer, 1993; Juffer et al., 2005; Juffer, Hoksbergen, et al., 1997). Children of mothers who received this intervention were less likely to be classified as disorganized attached at the age of 12 months and received lower scores on the rating scale for disorganization than children in the control group (Juffer et al., 2005). With respect to secure/insecure infant-mother attachment and infant competence, this intervention showed positive short-term effects in adoptive families *without* birth children (Juffer, 1993; Juffer, Hoksbergen, et al., 1997), but not in adoptive families *with* birth children (Juffer, Rosenboom, et al., 1997). In the least intensive intervention program, the personal book, the children showed lower disorganization ratings compared to the control group, but no effect on the number of infants with disorganized attachment classifications was found (Juffer et al., 2005), nor on secure/insecure infant-mother attachment, maternal sensitive responsiveness, and infant competence (Juffer, 1993; Juffer, Hoksbergen, et al., 1997; Juffer, Rosenboom, et al., 1997). It was concluded that the short-term preventive intervention program with video feedback lowered the rate of disorganized attachment and enhanced maternal sensitive responsiveness. The effectiveness of the intervention documented the importance of parenting in the development of infant attachment disorganization (Juffer et al., 2005).

The groups who did not receive intervention, a control group (n = 60) and a post-test-only group (n = 20), were selected to assess the infant-mother attachment relationship and the adoptive mother's sensitive responsiveness (Juffer, 1993; Juffer & Rosenboom, 1997). The results revealed 74% secure attachment relationships, a percentage comparable to that of normative studies. There were no differences regarding the child's country of origin, or the presence or absence of birth children. The adoptive mother's sensitivity was comparable to the sensitivity of nonadoptive mothers. These outcomes may be partly explained by the fact that these infants were placed for adoption at a rather young age, with relatively favorable circumstances prior to the placement. This may well indicate that adoption placement *per se*, without the cumulative effects of understimulation and lack of personal affection that older placed children often experience in institutions, does not inevitably lead to a disturbed parent-infant relationship (Juffer, 1993; Juffer & Rosenboom, 1997).

Middle childhood

At age 7, a follow-up study of the same children plus 30 adopted children recruited at this age was completed (Juffer, Stams, & Van IJzendoorn, 2004; Stams, 1998; Stams, Juffer, Rispens, & Hoksbergen, 2000; Stams, Juffer, Rispens, & Hoksbergen, 2001; Stams, Juffer, Van IJzendoorn, & Hoksbergen, 2001; Stams, Juffer, & van IJzendoorn, 2002). The results showed that despite their timely placement and normal development in early childhood (Juffer & Rosenboom, 1997) relatively many adoptive parents reported behavior problems at age 7, especially in boys (Stams, 1998; Stams et al., 2000; Stams, Juffer, Rispens et al., 2001). Notably, 30% of the adopted children had serious internalizing and/or externalizing behavior problems, which is much larger than the 10% found in normative groups. It was suggested that these results could be explained by the operation of multiple risk factors before and after adoption placement, e.g., the child's genetic disposition, prenatal and pre-adoption care, or the child's cognitive understanding of adoption in middle childhood. In addition, maternal sensitive responsiveness in adoptive families declined in the transition from early to middle childhood. In contrast to reported behavior in the home setting, the children's behavioral and socio-emotional development at school was rather favorable. Their academic achievement and intelligence were in the normal range or above-average. In particular Korean children had high IQ's: 31% of these children obtained an intelligence score above 120. It was suggested that adoptive parents seem to offer their children sufficient or even more than average cognitive stimulation. Furthermore, adopted girls scored higher in optimal ego-control, social competence, and peer group popularity than non-adopted girls from the general population: 30% of the adopted girls were rated as popular by their classmates, which compares favorably to the 13% found in the general school population (Stams, 1998; Stams et al., 2000; Stams, Juffer, Rispens, et al., 2001).

In the follow-up study at age 7, the longitudinal effects of the early attachment-based intervention on the children's social development, personality development, and incidence of behavior problems at age 7 were examined (Stams, 1998; Stams, Juffer, Van IJzendoorn, et al., 2001). In families *with* birth children, positive longitudinal effects of the intervention were found upon ego-resiliency/control in girls and internalizing problem behavior in both boys and girls at age 7. Despite positive short-term effects of the intervention found in families *without* birth children in infancy, enduring intervention effects in these families could not be traced at age 7 (Stams, 1998; Stams, Juffer, Van IJzendoorn et al., 2001).

Furthermore, longitudinal results of the study at age 7 showed that girls were better adjusted than boys, except in the domain of cognitive development, and that easy temperament in early childhood was associated with higher levels of social, cognitive, and personality development, and less behavior problems at age 7 (Stams, 1998; Stams et al., 2002). Higher quality of

early child-mother relationships, in terms of attachment security and maternal sensitivity, uniquely predicted better social and cognitive development. The combination of attachment disorganization and difficult temperament predicted less optimal ego-control and lower levels of cognitive development. The children who encountered more than two risk factors, such as difficult temperament *and* stressful life events, showed relatively lower levels of overall adjustment (a composite variable of social development, ego-resiliency and optimal ego-control, cognitive development, and externalizing and internalizing behavior problems) at age 7. In contrast, the presence of two or more protective factors, such as secure attachment relationships *and* higher levels of maternal sensitivity, predicted favorable overall adjustment at age 7. It is concluded that even in adopted children who are biologically unrelated to their adoptive parents, early mother-infant interactions and attachment relationships predict later socio-emotional and cognitive development, beyond infant temperament and gender (Stams, 1998; Stams et al., 2002).

Finally, results on the correlates of behavior problems of the adopted children at age 7 showed that: (1) resilient children were almost free of behavior problems, (2) overcontrolling children showed predominantly internalizing behavior problems at school and at home, (3) undercontrolling children showed high rates of externalizing behavior problems at school and at home, and an elevated rate of comorbidity (Juffer et al., 2004). Adopted children identified by peer report as controversial or rejected had significant higher externalizing problem scores than popular, average or neglected adopted children. Although the adopted children did not experience much (racial) discrimination, the children who wished to be white (46%) presented more mother-reported behavior problems (Juffer et al., 2004).

Adolescence

In the present study, described in this dissertation, the adopted adolescents' problem behavior and socio-emotional competence at age 14 were assessed, and the influence of early, middle childhood and concurrent factors were examined. The second chapter reviews the (behavioral) development of internationally adopted adolescents and the third and fourth chapter describe correlates and longitudinal influences on the development of the adopted adolescents. More specifically, the outline of this dissertation is as follows. In Chapter 2 the prevalence of problem behaviors in samples of adolescents who were adopted from a foreign country as infants or young children is examined and the domains in which these problems are manifested are explored. The empirical studies on this topic are summarized in a narrative review and a quantitative meta-analysis. In Chapter 3, resting heart rate and heart rate variability, and their reactivity to a stressful situation are examined in adopted adolescents with aggressive, delinquent, or internalizing behavior problems and adopted adolescents without behavior problems (N = 151). This study is the first

to assess these associations in adopted children, who are raised by their biologically unrelated adoptive parents. In Chapter 4, the continuity of the adopted children's social development is investigated and the relative influence of early, middle childhood, and concurrent factors on social development in adolescence is examined (N = 120). The emphasis is on maternal sensitivity and infant attachment security, attachment disorganization, and temperament as predictors in early childhood, and maternal sensitivity, child temperament and social development as predictors in middle childhood. Chapter 5 presents a summary and a discussion of the results. The limitations of the study and implications for future research are outlined.

References

Andresen, I. L. K. (1992). Behavioural and school adjustment of 12-13-year old internationally adopted children in Norway: A research note. *Journal of Child Psychology and Psychiatry, 33*, 427-439.

Bimmel, N., Juffer, F., Van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2003). Problem behavior of internationally adopted adolescents: A review and meta-analysis. *Harvard Review of Psychiatry*, *11*, 64-77.

Bowlby, J. (1973). *Separation*. New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3.* Loss. New York: Basic.

Croft, C., O' Connor, T. G., Keaveney, L., Groothues, C., Rutter, M. et al. (2001). Longitudinal change in parenting associated with developmental delay and catch-up. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*, 649-659.

Fergusson, D. M., Lynskey, M., & Horwood, L. J. (1995). The adolescent outcomes of adoption: A 16-year longitudinal study. *Journal of Child Psychology and Psychiatry*, *36*, 597-615.

Groza, V., & Ryan, S. D. (2002). Pre-adoption stress and its association with child behaviour in domestic special needs and international adoptions. *Psychoneuroendocrinology*, *27*, 181-197.

Hodges, J., & Tizard, B. (1989a). IQ and behavioural adjustment of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *30*, 53-75.

Hodges, J., & Tizard, B. (1989b). Social and family relationships of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *30*, 77-97.

Hoopes, J. L. (1982). *Prediction in child development: A longitudinal study of adoptive and nonadoptive families. The Delaware family study*. New York, N.Y.: Child Welfare League of America.

Juffer, F. (1993). *Verbonden door adoptie. Een experimenteel onderzoek naar hechting en competentie in gezinnen met een adoptiebaby.* [Attached through adoption. An experimental study on attachment and competence in families with an adopted baby.]. Amersfoort, The Netherlands: Academic Press.

Juffer, F., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2005). The importance of parenting in the development of disorganized attachment: Evidence from a preventive intervention study in adoptive families. *Journal of Child Psychology and Psychiatry, 46, 263-274.*

Juffer, F., Hoksbergen, R. A. C., Riksen-Walraven, J. M. A., & Kohnstamm, G. A. (1997). Early intervention in adoptive families-supporting maternal sensitive responsiveness,

infant-mother attachment, and infant competence. *Journal of Child Psychology and Psychiatry*, *38*, 1039-1050.

Juffer, F., & Rosenboom, L. G. (1997). Infant-mother attachment of internationally adopted children in the Netherlands. *International Journal of Behavioral Development*, *20*, 93-107.

Juffer, F., Rosenboom, L. G., Hoksbergen, R. A. C., Riksen-Walraven, J. M. A., & Kohnstamm, G. A. (1997). Attachment and intervention in adoptive families with and without biological children. In W. Koops, J. B. Hoeksma, & D. C. van den Boom (Eds.), *Development of interaction and attachment: Traditional and non-traditional approaches* (pp. 93-108). Amsterdam/Oxford: North-Holland.

Juffer, F., Stams, G. J. M., & Van IJzendoorn, M. H. (2004). Adopted children's problem behavior is significantly related to their ego resiliency, ego control, and sociometric status. *Journal of Child Psychology and Psychiatry*, *45*, 697-706.

Juffer, F., & Van IJzendoorn, M. H. (2005). Behavior problems and mental health referrals of international adoptees: A meta-analytic approach. *JAMA: The Journal of the American Medical Association, 293,* 2501-2515 (May 25).

Miller, B. C., Fan, X., Grotevant, H. D., Christensen, M., Coyl, D., Van Dulmen, M. (2000). Adopted adolescents' overrepresentation in mental health counseling: Adoptees' problems or parents' lower threshold for referral? *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 1504-1511.

O'Connor, T. G., Jenkins, J. M., Hewitt, J., DeFries, J. C., & Plomin, R. (2001). Longitudinal connections between parenting and peer relationships in adoptive and biological families. *Marriage and Family Review*, *33*, 251-271.

Plomin, R., Fulker, D. W., Corley, R., & DeFries, J. C. (1997). Nature, nurture, and cognitive development from 1 to 16 years: A parent-offspring adoption study. *Psychological science*, *8*, 442-447.

Rowe, D. C. (1993a). *The limits of family influence. Genes, experience, and behavior*. New York: Guilford Press.

Rowe, D. C. (1993b). Genetic perspectives on personality. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 179-195). Washington, DC: American Psychological Association.

Rutter, M, & O'Connor, T. G. (2004). Are there biological programming effects for psychological development? Findings from a study of Romanian adoptees. *Developmental Psychology*, *40*, 81-94.

Simon, R. J. (1996). Transracial adoptions: Experiences of a twenty-year study. *American Sociologist*, *27*, 79-89.

Selman, P. (1998). Intercountry adoption in Europe after the Hague Convention. In R. Sykes & P. Alcock (Eds.), *Developments in European social policy: convergence or diversity* (pp.147-170)? Bristol, England: Policy.

Selman, P. (2000). The demographic history of intercountry adoption. In P. Selman (Ed.), *Intercountry adoption: developments, trends and perspectives* (pp. 15–39). Nottingham, England: Russell.

Slap, G., Goodman, E., & Huang, B. (2001). Adoption as a risk factor for attempted suicide during adolescence. *Pediatrics, 108*.

Stams, G. J. J. M. (1998). *Give me a child until he is seven: A longitudinal study of adopted children, followed from infancy to middle childhood*. Unpublished doctoral dissertation, University of Utrecht, The Netherlands.

Stams, G. J. J. M., Juffer, F., Rispens, J., & Hoksbergen, R. A. C. (2000). The development and adjustment of 7-year-old children adopted in infancy. *Journal of Child Psychology and Psychiatry, 41*, 1025-1037.

Stams, G. J. J. M., Juffer, F., Rispens, J., & Hoksbergen, R. A. C. (2001). Het functioneren van zevenjarige kinderen die als baby uit het buitenland werden geadopteerd. [The

functioning of seven-year-old children adopted from abroad as babies.] *Kind en Adolescent*, *22*, 114-140.

Stams, G. J. J. M., Juffer, F., Van IJzendoorn, M. H., & Hoksbergen, R. A. C. (2001). Attachment-based intervention in adoptive families in infancy and children's development at age 7: Two follow-up studies. *British Journal of Developmental Psychology*, *19*, 159-180.

Stams, G. J. J. M., Juffer, F., & van IJzendoorn, M. H. (2002). Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: The case of adopted children and their biologically unrelated parents. *Developmental Psychology*, *38*, 806-821.

Tieman, W., van der Ende, J., & Verhulst, F. C. (2005). Psychiatric disorders in young adult intercountry adoptees: An epidemiological study. *American Journal of Psychiatry*, *162*, 592-598.

Van IJzendoorn, M. H., Juffer, F., & Klein Poelhuis, C. W. (2005). Adoption and cognitive development: A meta-analytic comparison of adopted and nonadopted children's IQ and school performance. *Psychological Bulletin*, *131*, 301-316.

Verhulst, F. C., & Versluis–den Bieman, H. J. M. (1995). Developmental course of problem behaviors in adolescent adoptees. *Journal of the American Academy of Child and Adolescent Psychiatry*, *34*, 151-159.

Warren, S. B. (1992). Lower threshold for referral for psychiatric treatment for adopted adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 31*, 512-517.

Westhues, A., & Cohen, J. S. (1997). A comparison of the adjustment of adolescent and young adult inter-country adoptees and their siblings. *International Journal of Behavioral Development*, *20*, 47-65.

Chapter 2
Problem Behavior of Internationally Adopted Adolescents: A Review and Meta-analysis[1]

Abstract

In this paper we examine the prevalence of problem behaviors in samples of adolescents who were adopted from a foreign country as infants or young children. We reviewed ten studies and performed a meta-analysis, comparing 2317 internationally adopted adolescents with 14,345 nonadopted adolescents. Results indicate that internationally adopted adolescents exhibit more behavior problems than do nonadopted adolescents (d = 0.08; p = 0.02), with the difference seen in externalizing (d = 0.11; p = 0.00) but not in internalizing (d = 0.05; p = 0.12) behavior problems. Significantly more total behavior problems were seen in adopted than in nonadopted girls (d = 0.10; p = 0.03), but not in adopted boys compared to nonadopted ones (d = 0.07; p = 0.22). All differences, however, were small. The differences between adopted and nonadopted adolescents were somewhat larger when we considered behavior problems in the clinical range. The majority of the adopted adolescents are well adjusted and do not display significantly more problem behaviors than do their nonadopted peers.

Introduction

International adoption is a relatively new and still-expanding practice. It developed as a consequence of World War II, when many children were orphaned. In the beginning, international adoption involved only a small number of children from relatively few countries, but recent decades have seen a substantial growth in the phenomenon. Today it involves thousands of children and over a hundred countries, whether as states of origin, as receiving

[1] This Chapter has been published as: Bimmel, N., Juffer, F., Van IJzendoorn, M. H., & Bakermans-Kranenburg, M.J. (2003). Problem behavior of internationally adopted adolescents: A review and meta-analysis. *Harvard Review of Psychiatry*, *11*, 64-77.

states, or both.[1] However, over the decades, the characteristics of the practice have changed substantially.

First, the countries of origin have changed. In the late 1940s, most of the children came from war-torn European nations. These children had lost their parents and family and were sent for adoption to other European countries or the U.S. From 1955 through the early 1980s, most adopted children came from Korea or Vietnam.[2,3] These children were war orphans or mixed-race offspring of American soldiers. In the 1990s children were adopted mainly from Romania, China, and Russia.[4] The changes in the principal countries of origin have stemmed from crises in these countries (poverty, disease, and famine, as well as war) and shifting attitudes of the government and the population toward international adoption and family planning (birth control, single parenthood).

Second, there have been changes in the number of internationally adopted children.[4] The number of children adopted depends on the situation in the countries of origin, as discussed above, but it is also affected by the situation in the receiving countries, such as the attitude toward international adoption (greater acceptance of international adoption usually increases the rate of adoption) and the possibility of and attitude toward artificial insemination for infertile couples (greater acceptance of artificial insemination may reduce the rate of adoption). In general, however, the number of international adoptions has increased substantially over the last few decades. Today, the number of international adoptions has risen, worldwide, to more than 32,000 a year and will probably increase further.[4]

In addition, parents' motivation to adopt a child has also changed. In the 1950s and 1960s, the motivation was largely charitable.[5] People adopted because they wanted to provide a home for a child who had been orphaned during the war. Most of these parents already had children of their own. However, since 1970 most applications for international adoption have come from childless couples who cannot have children of their own but still wish to build a family. Most of these adopted children are victims of poverty, rather than of war.[6]

The declining number of people who adopt a child for charitable reasons results in part from the realization that international adoption has a problematic side, too.[7] Many (internationally) adopted children have experienced a number of disadvantageous factors[8] that may influence their adjustment and the parent-child relationship. Some of these factors are pre- or perinatal, whereas others occur after birth. For example, women may suffer stress, malnutrition, or disease during pregnancy and may receive inadequate medical care, any of which can affect the developing fetus.[9] After birth, many children experience (continuing) malnutrition, discontinuous care-taking, poor adult-child relationships, abuse, and lack of both affection and adequate stimulation, as well as poor medical care.[9] These disadvantageous factors are

found especially in internationally adopted children, who come from countries where crises such as war, poverty, disease, and famine prevail, and where negative attitudes toward both international adoption and issues like unwanted pregnancy and single parenthood are common. After the children are adopted, they must become accustomed to a new environment and become familiar with new parents. In the case of international adoption, the new environment (for example the climate) can be very different from the old one. The child and the adoptive parents often have to come to terms with their different appearances, which may complicate the process of reciprocal identification. All of these factors can have long-term negative influences on the lives of both the (internationally) adopted child and the adoptive parents.

Adolescence is probably one of the most difficult periods for adopted children and their parents. Due to a variety of physical and cognitive changes (such as the shift to more-abstract concepts[10]) during this time, adolescents become more preoccupied with thinking about who they are, where they come from, and what they will become. By integrating different thoughts about themselves, they establish a sense of self. Although children learn to understand their racial identity at about the age of 7 and the meaning of adoption at about 8–12 years,[11–15] they tend to become more concerned with these issues somewhat later.[16] For adopted children, the period of adolescence and especially the process of establishing a sense of self can be very difficult for several reasons.

First, as some adoption theorists[15–17] have emphasized, establishing a stable sense of self is more complex for adoptees because they have been cut off from their origins and are often prevented from gaining information about their birth heritage. A part of their lives is missing. From clinical practice it is clear that some adopted adolescents feel as if they have lost a part of themselves.[15,16] Moreover, in thinking about their origins and biological family, adopted adolescents may have to deal with loyalty conflicts toward their adoptive parents, which may make them feel guilty about gaining information about their birth heritage.

Second, adopted adolescents have to cope with the fact that they were given up by their biological parents. Often it is unclear why they were given up, which leaves them feeling confused, tormented, and angry.[15,16] As a consequence of this lack of clarity, many adopted adolescents create fantasies about the reason for the adoption and about their biological parents' lives.[16] Some start to idealize their biological parents, often at the expense of their adoptive ones.

Third, it may be difficult for adopted adolescents to identify with their adoptive parents or brothers and sisters. Adoptees often do not know their biological family and (particularly in the case of internationally adopted children) have a different appearance and different traits from their adoptive

family.[18] This makes it difficult for them to come to terms with their identity, and it may make them feel as if they do not really belong to a family.[16]

Finally, in coming to terms with their identity, adolescents often compare themselves with their peers. In doing so, adopted adolescents have to face the fact that they are not the same as their peers. They have a different appearance and origin, and often the timing of puberty differs as well— that is, many adopted adolescents mature earlier than do their peers.[19–22] Internationally adopted adolescents have to explore what it means to be adopted and to come from another culture, and how this knowledge can be integrated into their sense of self.

The difficulties listed above may put (internationally) adopted adolescents at increased risk of developing problem behaviors. A much-discussed question in the literature is whether adopted adolescents indeed exhibit more problem behaviors than do those who were not adopted. This is an important question because of the increasing number of international adoptions. As described above, several authors[15,16] have pointed out that adolescence is often a difficult period for adopted children and their parents. However, much of their knowledge is based on clinical observations. Over the last decades, several large-scale empirical studies have examined problem behaviors of adopted adolescents in community samples, offering a more realistic perspective. However, the results of these investigations should be interpreted with caution. First, considerable heterogeneity exists within the studies. For example, the children were adopted from several different countries and cultures, the adoption procedures differed (e.g., some children stayed in institutions before placement, whereas others remained with their biological families), the ages on arrival were different, and so on. This may limit the accuracy of the conclusions. Howe,[23] for example, found that children who were adopted after the age of 6 months had more behavior problems than did those who were adopted earlier. Second, some of the variance between adopted and nonadopted adolescents may be explained by differences in parents' perceptions of their adopted children and biological children. Warren,[24] for example, found a selection bias in the referral of adopted adolescents for psychiatric treatment. She reported that (domestically) adopted adolescents were more likely than nonadopted adolescents to receive psychiatric treatment, even when the level of behavior problems was controlled for.

With meta-analytic statistical techniques, the results of a large and diverse body of studies can be summarized and interpreted. Meta-analysis has been characterized as being more precise and more objective than traditional, qualitative approaches to reviewing research.[25] Ten years ago, Wierzbicki[26] conducted a meta-analysis of 66 published studies that compared the psychological adjustment of adoptees and nonadoptees. He found that adoptees were significantly higher in maladjustment than were nonadoptees, judging

from their representation in clinical samples. (The combined effect size [*d*]—that is, the weighted mean effect size of the 66 studies—was 1.38, where *d* is the standardized difference in means between the adoptees and nonadoptees. He also found more externalizing behavior problems ($d = 0.22$) and poorer psychological functioning in adoptees of various ages than in nonadoptees (comparison of adoptees and nonadoptees on a measure of psychological functioning; $d = 0.11$). The combined effect size of the percentages of clinical cases and the group comparisons was $d = 0.72$, indicating that adoptees had significantly higher levels of maladjustment. Effect sizes were significantly larger for externalizing behavior problems than for internalizing behavior problems and were larger for adolescents than for children or adults.

However, most of the studies in Wierzbicki's meta-analysis involved nationally adopted adolescents. As mentioned above, internationally adopted adolescents may have experienced several additional disadvantageous factors. We therefore do not know whether Wierzbicki's conclusions can be generalized to internationally adopted adolescents. Nor do we know whether the effect size would be the same for studies that involve adolescents only. In this paper, we examine problem behaviors of adolescents who were internationally adopted in infancy or early childhood, and we include some studies published subsequent to Wierzbicki's meta-analysis.[26]

First, we will start with a discussion of the studies that examine problem behaviors of adolescents who were internationally adopted during infancy or early childhood. Then we will perform a meta-analysis on these studies. The purpose of this meta-analysis is to look for a general trend in the prevalence of problem behaviors in internationally adopted adolescents. On the basis of the results, we will try to determine whether internationally adopted and nonadopted adolescents differ with respect to the prevalence of problem behaviors, and if they do, in which domains these differences are manifested (i.e., internalizing vs. externalizing behavior problems). We will answer these questions for boys and girls separately. Considering the risks associated with international adoption in general, which may become more apparent during adolescence, and the results of Wierzbicki's meta-analysis conducted on mostly nationally adopted participants,[26] we expect to find substantially more problem behaviors in internationally adopted adolescents than in their nonadopted peers. In the meta-analysis we will also examine whether differences in results are related to characteristics of the studies, including both methodological variables (for example, sample selection) and characteristics of the participants (for example, mean age at adoption).

Narrative review of studies

Methods

Studies were selected by means of computerized searches (*PsycInfo, ERIC, Sociological Abstracts, Pais International,* and *Medline*) on the terms "adopted adolescents," "international adoptees," "intercountry adoption," and "adjustment," as well as manual searches of the reference lists of books, articles, and a previous review of the adjustment of adoptees.[26] Studies were included if they (1) involved an empirical investigation, (2) discussed problem behaviors (externalizing and/or internalizing) of adoptees between 12 and 20 years old, as determined by questionnaires, interviews, observations, or other measures, and (3) reported sufficient data to allow for the computation of an effect size for any difference in problem behaviors between internationally adopted adolescents and nonadopted adolescents. Because data for the Rosenwald study[27] were incomplete, we communicated with the author, who was willing to share unpublished information. The studies originated from North America, several European countries, and Australia. The characteristics of investigations from different countries can differ (for example, in age of adoption, for which every country has its own regulations and laws). However, in our meta-analysis, moderator variables take this diversity into account and allow for tests of its influence on the combined effect size. We did not exclude unpublished studies, because the inclusion of these studies in meta-analyses is considered important to prevent publication biases from inflating the results.[28,29] In addition, the total number of pertinent studies was rather small.

Two publications[30,31] included the same sample examined at different stages of a longitudinal project. Because the age of the children in the second study more closely matched the years of adolescence, we decided to include only this report in the meta-analysis.

The selection procedure produced ten studies on problem behaviors in internationally adopted and nonadopted adolescents. Investigators compared either the mean scores on measures of behavior problems (we termed such data "continuous results") or the percentage or number of children who exhibited behavior problems or scored in the clinical range ("categorical results"). Some studies presented both types of results. All samples were nonclinical, which is important because our purpose was to examine behavior problems of internationally adopted adolescents in general, rather than in a selected group of them. Besides, only one study[32] compared the adoption sample with a nonadopted clinical sample (see below). Nine of the ten studies have been published; the tenth[27] study was a paper based on an unpublished thesis.

Results and discussion

In Table 1, we present an overview of the basic characteristics of the studies that examined problem behaviors of internationally adopted adolescents. Andresen[33] studied the behavioral and emotional adjustment of 134 12- and 13-year-old internationally adopted children living in Norway. Fifty-two percent of the children came from Korea, and 48% came from other, unspecified countries. Of the families contacted, 75% participated. The adjustment of the adopted children was assessed with Norwegian translations of the Rutter Parent[34] and Rutter Teacher[35] questionnaires, brief measures that differentiate between children with and without emotional or behavioral disorders. The mean scores of the total sample of adopted children on the full scale (teacher form) differed significantly from those of a matched nonadopted comparison group: adopted children had higher problem scores than did their nonadopted classmates. However, no statistically significant difference was found between the two groups regarding the number of children with scores above the cutoff point for behavioral problems of clinical significance. Thus, although the adopted children experienced somewhat more problems than did their nonadopted classmates, the problems were rarely of sufficient consequence to classify the children as maladjusted. Of the three subscales, only hyperactivity differed markedly between the two groups, with adopted children scoring significantly higher than their nonadopted classmates. The difference was statistically significant both for the total sample and for boys, but not for girls.

Bagley[36] conducted a longitudinal study of the adjustment of adoptees from a variety of ethnic groups (Native Canadian Indian adoptees, white adoptees, and intercountry adoptees) and family situations. The sample of intercountry adoptees consisted of 20 adolescents aged 13–17 who where either Asian (55%) or South American (45%) and were then living in Canadian families. Of the randomly selected group of subjects, 84.5% participated. The adolescents and their parents were interviewed in their homes about child-parent relations and behavior problems (rebellion, school truancy, running away from home, substance use, delinquency, sexual acting-out) at the time of the interview. They also completed a measure of suicidal ideas and behavior.[37] The intercountry adoptees did not exhibit more behavior problems or report more suicidal ideas or acts than did nonadopted Caucasian adolescents.

Berg-Kelly and Eriksson[19] compared 125 13- to 18-year-old international adoptees living in Sweden with 9204 of their classmates of these adoptees in school with respect to health, health habits, and risk behavior. Most of the adopted children came from Korea and India. Nonparticipation was estimated to be around 10%—the percentage of absenteeism from school at this age level.

The adolescents completed the Q90,[38] a questionnaire concerning mental health (such as depressed feelings, nervousness, and suicidal thoughts), problem behaviors (such as fighting, school truancy, use of illicit drugs, and getting drunk regularly), and the acquisition of adult life styles (such as the use of alcohol and tobacco). The adopted girls, but not the adopted boys, reported suicidal thoughts, school truancy, and contact with illicit drugs significantly more often than did their nonadopted classmates.

Bogaerts and Van Aelst[39] studied the psychosocial adjustment of 70 15- and 16-year-olds who were adopted from India and were now living in Belgium. Of the families contacted, 82% participated. The parents completed the Child Behavior Checklist (CBCL[40]), and the adolescents completed the Youth Self-Report (YSR[41]). The CBCL and the YSR are standardized questionnaires for quantifying a broad range of children's problem behaviors, both externalizing (such as aggression and delinquency) and internalizing (such as anxiety/depression, somatic complaints, withdrawal) problem behaviors. Adopted youngsters scored higher on the total problem score than did their nonadopted counterparts from the general population. This was especially true for the adopted girls, who scored higher than nonadopted girls from the general population on both internalizing and externalizing problem behaviors: delinquency, withdrawal, anxiety/depression, and attention difficulties. The adopted boys scored higher than nonadopted boys from the general population on attention problems and on delinquent and aggressive behavior, which are all externalizing problem behaviors.

Cederblad and colleagues[42] (see also: Irhammar and Cederblad[43]) reported on the mental health of 211 adopted children who were living in Sweden and were 13 years of age or older at the time of the investigation. Most of the children were from India (36%), Thailand (15%), or Chile (15%). An additional 2% came from Ethiopia, with the remainder originating in various Asian or Latin American countries. The rate of nonrespons of the families was 19%. The adoptive mothers completed the CBCL for 133 13- to 16-year-old adopted adolescents, and the scores were compared with those of a random sample of 529 13- to 16-year-old nonadopted adolescents also living in Sweden.[44] The mental health of the adoptees was similar to that found in the comparison group. There were no differences between different age levels. The 39 17- to 19-year-old adoptees completed the Symptom Check List,[45] a widely used measure that contains a series of 90 items referring to expressions of psychosomatic and emotional distress. Their scores were compared with those from a random sample of 63 18- to 21-year-old nonadopted adolescents living in Sweden. The mental health of the two groups was similar, except that the adoptees had higher scores on "obsessive-compulsive" symptoms. The percentage of individuals who were severely disturbed did not differ between groups.

Table 1
Characteristics of Studies Examining Problem Behaviors of Internationally Adopted Adolescents

Study	Country	Sample (n)		Age of adoptees		Measure
		Adoptees	Nonadoptees	At time of study (y)*	On arrival (mo)†	
Andresen[33]	Norway	134	134	12–13 (12.5)		Rutter Teacher Questionnaire‡
Bagley[36]	Canada	20	40	13–17 (16.3)	42	Measure of suicidal ideas and behavior
Berg-Kelly & Eriksson[19]	Sweden	125	9204	13–18 (14.9)		Q90
Bogaerts & Van Aelst[39]	Belgium	70	758	16–17 (16.5)	22.5	CBCL
Cederblad et al.[42]	Sweden	133	529	13–16 (14.9)	10	CBCL
		39	63	17–19 (18)	10	SCL-90
Geerars et al.[20]	Netherlands	65	756	15–17 (16)	4	CBCL
Goldney et al.[32]	Australia	34	241	12–20 (15.2)	17	CBCL
Rosenwald[27]	Australia	67	985	12–16 (14)	50	CBCL
Sharma et al.[48]	USA	92	1719	12–18 (15)		YSR
Versluis–den Bieman & Verhulst[31]	Netherlands	1538	311	14–18 (15.3)		CBCL

CBCL: Child Behavior Checklist; *Q90:* 90-item Questionnaire on adolescent health and risk behavior; *SCL-90:* 90-item Symptom Check List; *YSR:* Youth Self-Report.
*Range (estimated mean).
†If known; estimated mean.
‡The Rutter Parent Questionnaire was also examined in this study, but only the Teacher Questionnaire was used in the meta-analysis.

Geerars and colleagues[20] (see also: Hoksbergen[46]) reported on the adjustment of 65 15- to 20-year-olds who were adopted from Thailand and were then living in the Netherlands. Of the individuals contacted, 24% declined to participate. The parents and the adoptees were asked to complete the CBCL and the YSR, respectively, and their scores were compared with those of a group of 756 12- to 16-year-old non-adopted Dutch children. Adopted boys and girls both scored higher on the total problem score of the CBCL than did the nonadopted adolescents, but the difference was statistically significant only for the girls. Adopted girls scored significantly higher for anxious/obsessive, depressed/withdrawn, schizoid, and delinquent behaviors, while boys scored significantly higher only on delinquent and aggressive behaviors.

Goldney and colleagues[32] compared the prevalence of emotional and behavioral problems in 34 adolescent adoptees from Indonesia living in South Australian families with that of 233 nonadopted adolescents. Eighty-five percent of the families contacted participated in the study. The adoptees completed the YSR, and their adoptive mothers completed the CBCL. No significant differences were found between the scores of the adopted and the nonadopted groups. This was true for both boys and girls. The authors also compared the scores of the adoptees with the scores of adolescents who were referred to mental health clinics. The adoptees had significantly fewer problems than did the adolescents from the clinic population. Because none of the other studies compared the adoption sample with a sample of clinically referred nonadopted adolescents, it was not possible to include this comparison in the meta-analyses.

Rosenwald[27] used parental reports on the CBCL to assess the well-being of 67 internationally adopted adolescents aged 12–16 who were living in Western Australia. Seventy-five percent of the children came from Korea, 7% or less each from India, Sri Lanka, Hong Kong, Mauritius, Philippines, and Fiji, and 5% from all other countries combined. Eighty-six percent of the families that were contacted participated. The author compared the adopted children with 985 nonadopted adolescents from the Western Australian Child Health Survey.[47] Twenty-three percent of the adopted boys and 20% of the nonadopted boys showed significant levels of behavior problems. Among girls, the figures were 17% and 15%, respectively.

Sharma and coworkers[48] used the YSR to compare 92 internationally adopted Asian-American (primarily Korean-American) adolescents with 1719 nonadopted adolescents aged 11–18. Of the families contacted, 54% participated. Adopted boys showed poorer adjustment than did the boys in the comparison group on the Self-Destruct scale (d = 0.36), and adopted girls showed a higher level of adjustment than did the girls in the comparison group on the Social Problems scale (d = 0.36) and the Withdrawn scale (d = 0.42). The effect sizes for the Externalizing, Internalizing, and Total Problem scales were very small. The authors also compared adopted adolescents with adolescents

born to their adoptive parents and raised in the same families, but because not all of the adoptions were international, we chose to use only the sample of internationally adopted Asian-American adolescents in the meta-analysis.

Versluis–den Bieman and Verhulst[31] conducted a large cross-sectional study of the prevalence of self- and parent-reported problems in a sample of 1538 14- to 18-year-old international adoptees who were living in the Netherlands. The youngsters came from Korea (33.9%), Colombia (14.3%), India (9.9%), Indonesia (7.7%), Bangladesh (6.8%), Lebanon (5.1%), Austria (5.0%), and other European (3.3%) and non-European (14.0%) countries. Usable parent information was obtained on 74% of the children.[31] The parents and adopted adolescents completed the CBCL and the YSR, respectively. Both parent reports and self-reports showed significantly higher problem scores for adopted boys and girls than for adolescents from the general population. According to self-reports, behavior could be regarded as deviant in 22% of the adopted boys and 18% of the adopted girls compared with about 10% of the nonadopted children. The difference between adopted and nonadopted boys was larger in the parent reports, however. According to these reports, behavior of 29% of the adopted boys versus 9% of the boys from the general population could be regarded as deviant. The largest difference between the groups was for "Delinquent Behavior syndrome": the proportion of boys scored in the deviant range was ten times as high among the adoptees as among the nonadoptees. For girls, parent reports and self-reports were quite similar, with 17% of the adopted girls and 10% of the girls from the general population manifesting deviant behavior.

Meta-analysis

Methods

The selection procedure yielded ten studies on the difference in problem behaviors between internationally adopted and nonadopted adolescents. In Cederblad and colleagues' investigation[42] the sample was split in two subsamples. Mothers completed the CBCL/4–18 for adolescents aged 13–16, and subjects over 16 years old completed the Symptom Check List. Therefore, the number of samples in the meta-analysis was 11, which included 17,057 adolescents (2317 internationally adopted, 14,740 nonadopted). Because Bogaerts and Van Aelst,[39] Geerars and colleagues,[20] and Versluis–den Bieman and Verhulst[31] all used the same comparison group (the group of adolescents used to derive the Dutch CBCL-norms[49] from), we split up the comparison group in the meta-analysis (see Table 1; Bogaerts and Van Aelst,[39] 223 comparison subjects; Geerars et al.,[20] 223; Versluis–den Bieman and Verhulst,[31]

311). (Versluis–den Bieman and Verhulst,[31] in fact, randomly selected 311 adolescents from the total comparison group.) This resulted in a total sample size for the meta-analysis of 16,662 adolescents, of whom 2317 were internationally adopted and 14,345 were not adopted.

Bogaerts and Van Aelst,[39] Goldney and colleagues,[20] and Versluis–den Bieman and Verhulst[31] used both the CBCL and the YSR, but we chose to use only the CBCL in the meta-analysis, because the YSR is a self-report instrument that may produce somewhat less reliable results. Moreover, the CBCL is used more often in the other studies, which makes comparisons among the studies more reliable. For investigations that only used self-reports, we employed these self-reports in the meta-analysis.

In primary-level studies, the unit of analysis is the participant; in a meta-analysis of several primary-level studies, the unit of analysis is the outcome of those studies. The outcomes found in the relevant studies were first transformed into a common meta-analytic indicator for effect size, the standardized difference between the means of two groups (Cohen's *d*).[28,29] For studies that reported test statistics for comparisons of internationally adopted adolescents and nonadopted adolescents, these statistics (*t,* which reflects the difference between the means of two independent samples; F, which reflects the difference among means of more than two populations simultaneously; χ^2, which shows the fit of observed frequencies with expected frequencies; or the one-directional *p* value**,** which indicates the probability of obtaining a value as extreme as that found in the sample when the null hypothesis is true) were transformed into *d* using Mullen's computer program *Advanced Basic Meta-Analysis*.[28] If a study reported only "a significant effect" or "no significant effect," we applied the usual conservative estimation procedures ($p = 0.05$ and $p = 0.50$, respectively[28,50]). A few studies did not report *t,* F, χ^2, or the one-directional *p* value, giving only the number or percentage of adolescents who exhibited behavior problems or scored in the clinical range. For these studies, χ^2 values were first computed using the statistical programs Fisher 3.0[51] and Multinom[52] and then transformed into *d*. If possible, separate effect sizes were calculated for boys and girls, and for internalizing (e.g., anxiety, depression, somatic complaints, withdrawal, suicidal ideas/thoughts, nervousness) and externalizing (aggression, delinquency, hyperactivity, antisocial behavior, physical fights) behavior problems. When the scores for internalizing and externalizing behavior problems were not reported, the effect sizes for them were calculated from the scores of the subscales that were usually included in these overall problem scales. In this way, each study contributed, at most, one effect size for each type of behavior problem, and no sample was included more than once in the meta-analysis.

Combined effect sizes, which are the weighted mean effect sizes of all studies included, were determined with the computer program *Comprehensive*

Meta-Analysis.[53] Combined effect sizes were calculated separately for the total group, boys, girls, total behavior problems, externalizing behavior problems, and internalizing behavior problems. Moreover, we distinguished between continuous results (means) and categorical results (cutoff scores or percentage/number of adolescents exhibiting behavior problems). We also calculated combined effect sizes for the total set of studies—that is, for continuous and categorical results together. If one study reported both types of results, we chose the more accurate or more precise type for these analyses. A homogeneity test was performed to determine to what extent effect sizes were constant across studies.[29]

The following predictor variables were included in the meta-analyses:

(1) Mean age of the adoptees at the time of the study (early adolescence, 12 or 13 years; mid-adolescence, 14–16 years; late adolescence, 17 or 18 years),
(2) Mean age on arrival (<12 months, 12–24 months, >24 months)
(3) Measure (whether or not the study used the CBCL)
(4) Self/other ratings (self-ratings, parent ratings, teacher ratings)
(5) Sex (boys or girls)
(6) Socioeconomic status of the sample (lower class, middle class, upper-middle class)
(7) Year of publication
(8) Country where the study was conducted
(9) Continent where the study was conducted (North America, Europe, Australia)
(10) Sample selection (comparison groups recruited randomly or age- and sex-matched with the adoption sample)
(11) Attrition (<22.1% (mean attrition of all studies) or >22.1%)
(12) Type of results (continuous or categorical results).

When a study did not conform exactly to the categories listed above, it was assigned to the category that most closely matched it. The mean intercoder reliability of the predictors was $r = 0.92$ (range, 0.73–1.00). Analyses of variance were conducted to determine whether a predictor or moderator variable was associated with the effect sizes.

Results and discussion

In Table 2, we present an overview of the types of results (for example, total number of behavior problems, externalizing problems, internalizing problems) reported in studies of internationally adopted adolescents. Table 3

summarizes the relevant meta-analytic data. The data are presented separately for externalizing, internalizing, and total behavior problems, and for boys and girls. We also distinguished between the outcomes obtained from continuous results (means) and those obtained from categorical results and show outcomes separately for the two (see Methods).

Table 2
Type of Results Examined in Studies of Problem Behaviors of Internationally Adopted Adolescents

Study	Total number of problems	Separate results: externalizing and internalizing behaviors	Separate results: boys and girls	Mean scores	Cutoff scores	Percentage or number of children with behavior problems
Andresen[25]	x	x*	x	x	x†	
Bagley[28]	x	x*				x
Berg-Kelly & Eriksson[15]	x	x*	x			x
Bogaerts & Van Aelst[31]	x	x*	x	x	x‡	
Cederblad et al.[34]	x	x*		x		
Geerars et al.[16]	x	x	x	x	x§	
Goldney et al.[39]	x	x	x	x		
Rosenwald[20]	x		x		x	
Sharma et al.[41,□]	x	x	x			
Versluis–den Bieman & Verhulst[24]	x	x	x		x	

CBCL, Child Behavior Checklist.
*We computed the scores for externalizing and internalizing behavior problems from the scores of the relevant subscales.
†We used the cutoff scores as the more-accurate results in the meta-analysis. Because the cutoff scores did not distinguish between internalizing and externalizing problems, we used the means for these problems in the meta-analysis.
‡For the means, it was not possible to calculate exact *t*- or *p*-values because we did not have exact standard deviations. Therefore, we used the cutoff scores as the more-accurate results in the meta-analysis. We compared the cutoff scores with Dutch CBCL norms.
§We compared the cutoff scores with Dutch CBCL norms, but we did not use these scores in the meta-analysis because of their extremely high effect sizes. These results would have been outliers in the meta-analysis.
□Sharma et al.[41] reported standardized effect sizes of the scores.

Table 3
Studies of Problem Behaviors of Internationally Adopted Adolescents: Meta-analytic Data†

										Predictors								
										Age	Age a	Meas	Rep	Cont	Samp	Att	Res	Sex
Type of results	Group	*k*	*Na*	*Nc*	*Ntot*	*d*	*CI*	*p*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*
Total																		
Externalizing	Boys	7	940	6495	7435	0.13	0.01~0.24	0.03	4.63	0.53	1.35	0.10	1.23	3.37	2.92	0.78	1.42	0.01
	Girls	7	1118	6234	7352	0.13	0.03~0.23	0.01	2.68	0.69	0.73	1.06	0.98	0.07	0.17	1.10	0.00	
	Total	10	2250	13360	15610	0.11	0.04~0.18	0.00	5.86	0.71	2.76	0.01	1.18	1.45	4.41*	6.25*	1.65	
Internalizing	Boys	7	940	6495	7435	0.07	-0.04~0.19	0.21	5.73	0.19	4.13	0.84	0.48	0.22	3.07	3.48	0.28	0.11
	Girls	7	1118	6234	7352	0.05	-0.05~0.15	0.34	7.57	0.09	1.93	0.79	2.81	1.28	2.86	2.57*	0.14	
	Total	10	2250	13360	15610	0.05	-0.01~0.12	0.12	11.43	0.22	6.26	1.33	1.33	0.34	4.99*	5.98*	0.44	
Total	Boys	8	953	6975	7928	0.07	-0.04~0.18	0.22	11.48	0.97	8.97*	0.22	1.05	0.43	6.90**	5.91*	0.53	0.20
	Girls	8	1172	6739	7911	0.10	0.01~0.20	0.03	3.60	0.08	0.36	0.59	2.01	1.49	1.18	0.71	0.28	
	Total	11	2317	14345	16662	0.08	0.01~0.14	0.02	9.52	0.57	5.62	0.05	1.42	1.03	6.74**	5.49*	1.16	
Continuous																		
Externalizing	Boys	5	167	1263	1430	0.08	-0.10~0.26	0.39	4.00									
	Girls	5	228	1278	1506	0.16	0.01~0.31	0.04	1.64									
	Total	7	567	3132	3699	0.08	-0.02~0.17	0.13	3.18									
Internalizing	Boys	5	167	1263	1430	0.08	-0.10~0.26	0.37	1.56									
	Girls	5	228	1278	1506	0.06	-0.09~0.22	0.41	3.91									
	Total	7	567	3132	3699	0.05	-0.05~0.15	0.31	2.09									
Total	Boys	5	167	1263	1430	0.05	-0.13~0.23	0.56	1.69									
	Girls	5	228	1278	1506	0.10	-0.06~0.25	0.22	2.77									
	Total	6	533	2891	3424	0.09	-0.01~0.19	0.07	4.84									

										Predictors								
										Age	Age a	Meas	Rep	Cont	Samp	Att	Res	Sex
Type of results	Group	*k*	*Na*	*Nc*	*Ntot*	*d*	*CI*	*p*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*	*Q*
Categorical																		
Externalizing	Boys	3	806	5341	6147	0.17	0.03~0.31	0.02	0.50									
	Girls	3	927	5070	5997	0.13	0.01~0.26	0.04	1.45									
	Total	4	1753	10451	12204	0.15	0.06~0.24	0.00	1.87									
Internalizing	Boys	3	806	5341	6147	0.10	-0.05~0.24	0.18	5.14									
	Girls	3	927	5070	5997	0.06	-0.06~0.19	0.33	4.94									
	Total	4	1753	10451	12204	0.08	-0.02~0.17	0.11	10.16*									
Total	Boys	5	883	5885	6768	0.09	-0.04~0.22	0.16	10.90*									
	Girls	5	1051	5645	6696	0.11	0.00~0.22	0.04	1.95									
	Total	6	1954	11570	13524	0.10	0.02~0.18	0.01	7.52									

Age, (estimated) mean age of the adoption group; *Age a,* (estimated) mean age at arrival of the adoption group; *Att,* attrition; *Cont,* continent; *CI,* confidence interval (lower and upper limit of the 95% confidence interval); *d,* Cohen's *d*; *k,* number of studies; *Meas,* type of measurement; *Na,* number of children in the adoption group; *Nc,* number of children in the comparison group; *Ntot,* total number of children included in the study; *p,* probability; *Q,* test of heterogeneity; *Rep,* type of report; *Res,* type of results; *Samp,* sample selection.

*$p < 0.05$; **$p < 0.01$.

†Because of the homogeneity of the results, we used fixed effects instead of random effects.

Combined effect sizes

For the complete set of studies, the combined effect size for total behavior problems of the entire group (boys and girls together) was $d = 0.08$ (one-tailed $p = 0.02$; see Table 3). According to Cohen's criteria for weak ($d = 0.20$), medium ($d = 0.50$), and strong ($d = 0.80$) effects,[54] this effect was weak. The combined effect size for externalizing behavior problems of the entire group was $d = 0.11$ ($p < 0.01$), which was somewhat larger than the combined effect size for total behavior problems but may still be considered small. The combined effect size for internalizing behavior problems was even smaller and did not reach significance ($d = 0.05$; $p = 0.12$). For boys, the combined effect size for total behavior problems did not reach significance ($d = 0.07$, p = 0.22). The combined effect sizes for externalizing and internalizing behavior problems for boys were $d = 0.13$ ($p = 0.03$) and $d = 0.07$ ($p = 0.21$), respectively. Compared with nonadopted adolescent boys, internationally adopted boys exhibited more externalizing behavior problems, but this difference was small; they did not show more internalizing behavior problems. For girls, the combined effect size for total behavior problems was $d = 0.10$ ($p = 0.03$). The combined effect sizes for externalizing and internalizing behavior problems for girls were $d = 0.13$ ($p = 0.01$) and $d = 0.05$ ($p = 0.34$), respectively. Summarizing, internationally adopted adolescents exhibited more total behavior problems than did nonadopted adolescents. If we look at boys and girls separately, only the girls exhibited more total behavior problems. Differences between the adopted and nonadopted adolescents were, in all groups (entire group, boys, and girls), revealed in externalizing but not in internalizing behavior problems. All differences were small.

No outlying effect sizes were identified in the set of studies on the basis of standardized scores (z-values) larger than 3.26 or smaller than -3.26 ($p < 0.001$).[55] To check the contribution of the largest study (the study by Versluis–den Bieman and Verhulst,[31] which showed the largest standardized z-value [1.95] for total behavior problems) on the combined effect size, we computed the overall effect sizes without this investigation. The small, but significant, combined effect sizes for all studies were no longer apparent when we excluded this particular one. Thus, without the Versluis–den Bieman and Verhulst study, adopted and nonadopted adolescents did not differ significantly with respect to the prevalence of behavior problems.

We also distinguished between continuous results and categorical results. The combined effect sizes of the continuous results were all very small (see Table 3). Only the effect size of externalizing behavior problems of girls was significant. The effect sizes of the categorical results were also small, albeit somewhat larger than those of the continuous results. Effect sizes were significant for externalizing behavior problems of all groups (boys, girls, and the entire group) and for total behavior problems of the girls and the entire group.

So, the effect sizes were larger when the percentage or number of internationally adopted adolescents who exhibited behavior problems or scored in the clinical range were compared with the percentage or number of nonadopted adolescents who did so. The effect sizes were smaller when the mean scores of internationally adopted and nonadopted adolescents were compared. This difference was again no longer apparent when we excluded the Versluis–den Bieman and Verhulst study, which compared the percentage of internationally adopted adolescents scoring in the clinical range with the corresponding percentage of nonadopted adolescents.

Homogeneity

A homogeneity test with the Q-statistic was performed to determine to what extent effect sizes were constant across studies. All sets of study results were homogeneous (see Table 3) except for two: the effect sizes for the categorical results of total behavior problems of boys ($Q = 10.90$; $p < 0.05$) and of internalizing behavior problems of the entire group ($Q = 10.16$; $p < 0.05$). Aside from these two heterogeneous outcomes, the combined or average effect sizes were therefore an adequate representation of the sets of study outcomes. Without the Versluis–den Bieman and Verhulst investigation, all sets of study results were homogeneous.

Predictor tests

Analyses of variance were conducted to determine whether the predictor variables had influence on the effect sizes. Sample selection (whether participants in the comparison groups were recruited randomly or were age- and sex-matched with the adoption sample) contributed significantly to the predictability of the combined effect sizes of the total group (both boys and girls) on externalizing ($Q = 4.41$; $p < 0.05$), internalizing ($Q = 4.99$; $p < 0.05$) and total behavior problems ($Q = 6.74$; $p < 0.01$), as well as to the predictability of the effect size for boys on total behavior problems ($Q = 6.90$; $p < 0.01$). Studies that randomly recruited participants in the comparison groups showed lower effect sizes than did those that recruited age- and sex-matched participants. Although not significant, this trend was also seen for the other outcome measures.

Mean age on arrival was correlated with the difference in the effect size of total behavior problems of adolescent boys ($Q = 8.97$; $p < 0.05$). For boys with a mean age of arrival between 12 and 24 months, the combined effect size was larger and negative ($d = -0.28$; i.e., adopted boys showed *fewer* behavior problems than did nonadopted ones); the combined effect sizes for boys with a mean arrival age between 0 and 12 months ($d = 0.02$) and boys who were older than 24 months when they were adopted ($d = 0.03$) were smaller and positive. For the other outcomes, this trend was not seen.

Attrition contributed significantly to the predictability of the combined effect sizes of the entire group (both boys and girls) on externalizing ($Q = 6.25$; $p < 0.05$), internalizing ($Q = 5.98$; $p < 0.05$), and total behavior problems ($Q = 5.49$; $p < 0.05$), for the boys on total behavior problems ($Q = 5.91$; $p < 0.05$), and for the girls on internalizing behavior problems ($Q = 2.57$, $p < 0.05$). Studies that had an attrition rate lower than 22.1% (the mean for all studies) showed smaller effect sizes than did those with a rate of 22.1% or more. None of the other predictor or moderator variables contributed significantly to the predictability of the effect sizes.

General discussion and conclusions

We investigated the prevalence of problem behaviors in samples of adolescents who were adopted as infants or young children, and we explored in which domains these problems are manifested. The narrative review shows that two studies on problem behaviors of internationally adopted adolescents (those by Versluis–den Bieman and Verhulst[31] and Bogaerts and Van Aelst[39]) reported significantly more behavior problems in such children than in nonadopted youngsters. Two studies (those by Geerars et al.[20] and Berg-Kelly and Eriksson[19]) found significantly more behavior problems only in adopted girls, and five (Bagley,[36] Goldney et al.,[32] Cederblad et al.,[42] Sharma et al.,[48] and Rosenwald[27]) showed no more behavior problems in adopted adolescents, either boys or girls, than in their nonadopted peers. Andresen[33] found a significant difference in the mean scores on behavior-problem scales between the adopted and nonadopted adolescents, but not in the number of adolescents with scores above the cutoff point. In boys, the differences were apparent mainly in externalizing behaviors (e.g., hyperactivity, aggression, and delinquent behaviors). In girls, both externalizing and internalizing behavior problems (anxiety/depression, withdrawal, schizoid and delinquent behaviors) were responsible for the differences.

Our meta-analysis showed that internationally adopted adolescents appeared to exhibit a slightly higher number of total behavior problems than did nonadopted adolescents. Considering boys and girls separately, we found that in fact only girls displayed more total behavior problems. Furthermore, in all comparisons (entire group, boys, and girls), the differences between the adopted and nonadopted adolescents were expressed in externalizing but not in internalizing behavior problems. According to Cohen's[54] criteria for weak, medium, and strong effect sizes, all effects were weak, with d ranging from >0.05 to <0.13.

Our results are consistent with those from Wierzbicki's group comparisons[26] between (mostly nationally adopted) adoptees and nonadoptees

on a measure of psychological functioning (d = 0.11). Wierzbicki also found higher maladjustment in adoptees compared with nonadoptees. In addition, he reported a stronger combined effect size for externalizing behavior problems than for internalizing ones. Wierzbicki's reported effect sizes for mostly nationally adopted adolescents do not differ appreciably from ours. He computed effect sizes of d = 0.11, 0.22, and -0.01 for total problems, externalizing behavior problems, and internalizing behavior problems (group comparisons), respectively. Accordingly, despite the many additional disadvantageous factors that internationally adopted adolescents may experience, they do not seem to exhibit more behavior problems than do mostly nationally adopted children. This finding is in line with empirical investigations comparing internationally adopted children of different races with same-race adopted children.[36,56]

The differences in behavior problems between the adopted and nonadopted adolescents are somewhat larger when we compare the percentage or number of internationally adopted adolescents who exhibit behavior problems or score in the clinical range with the corresponding percentage or number of nonadopted adolescents (categorical comparisons; effect sizes ranging from $d > 0.06$ to $d < 0.17$). Wierzbicki[26] also found that the mean effect size for comparisons between adoptees and nonadoptees on the percentage of participants showing emotional and/or behavioral problems in the clinical range (d = 1.38) was larger than the mean effect size for continuous outcomes (d = 0.11). However, our effect sizes for categorical results are not exactly comparable with Wierzbicki's effect size for clinical problems. For the computation of combined effect sizes, we included studies that reported cutoff scores or the percentage or number of adolescents exhibiting behavior problems. Wierzbicki included studies that reported the percentage of adoptees in a clinical population, which resulted in a much larger effect size. So, differences in behavior problems between adopted and nonadopted children appear to be small, but a larger number of internationally adopted adolescents show behavioral problems in the clinical range.[57] In fact, these "clinical cases" may be responsible for the elevated rate of behavior problems in the entire group of internationally adopted adolescents.[30,58] Nevertheless, according to Cohen's criteria,[54] even our findings for the categorical outcomes appear to be weak at best.

We also examined the influence of study and sample characteristics on the outcomes of the studies. Sample selection appeared to be an important predictor: studies in which the comparison group was recruited randomly showed smaller effect sizes than did those in which recruitment involved matching. Matching provides a better sample for comparison, but in our case its influence may be due to the small number of studies using matched samples and to the strong influence of the large Versluis–den Bieman and Verhulst[31] study, which employed them. The rate of attrition also appeared to be an

important predictor: studies with low attrition rates showed smaller effect sizes than did those with higher attrition. The use of volunteer subjects might affect the results if the most disturbed adolescents and families drop out. However, in our meta-analyses the studies with higher attrition rates showed larger effect sizes (the adopted children showed more behavior problems), so this potential bias was not apparent.

The other study and sample characteristics, such as mean age of the adoptees on arrival, measure, self/other ratings, sex, socioeconomic status, country of the study, and continent of the study, did not show significant association with outcomes. Howe[23] investigated studies examining the development of children who were adopted before the age of 6 months and those who were adopted later. He found that children who were adopted after the age of 6 months had more behavior problems than did those who were adopted earlier. However, our meta-analysis did not show such an effect. An explanation may be found in the heterogeneity of the ages on arrival in most of the investigations in our meta-analyses. In most studies, there was a broad range of ages on arrival (Goldney and colleagues,[32] for example, reported a range of 1 month to 7.5 years). Because of this heterogeneity, it is possible that the mean age on arrival and the category (<12 months, 12–24 months, >24 months) in which the study was placed in the current meta-analysis were not perfectly mirroring the broad range of ages in the specific sample. Also, we were able to compute a mean age on arrival for only seven of the studies. However, Howe's study of children who were placed for adoption at different ages and who had varying pre-placement experiences[59] showed that the risk factor for problem behaviors is not simply late age at placement, but rather a combination of late age at placement *and* poor pre-placement care from an early age. Only children who were placed at a late age *and* experienced poor pre-placement care from a very young age were at significant risk of showing problem behaviors during adolescence. Children who were placed at a later age but who had relatively good care during the first year or two of life showed fewer behavior problems.

Interestingly, the results of our meta-analysis changed when Versluis–den Bieman and Verhulst's study[31] was excluded from our analyses. In fact, the weak but significant increase in behavior problems in adoptees that we found when all studies were included was no longer apparent when we omitted this one. This finding may well be due to the researchers' large sample size, which comprised almost two-thirds of the adoptees in our meta-analysis. Another explanation may be found in specific sample characteristics of Versluis–den Bieman and Verhulst's study. The children in this study experienced relatively serious environmental adversity before adoption, placing them at an increased risk for later behavior problems. In several reports, these authors[31,60,61] have indeed stressed that a large proportion of the adopted children involved in their

longitudinal study had been subjected to extremely adverse conditions, and that such adversities were associated with the prevalence of behavior problems during adolescence. We suggest that international adoption, as such, may not exert a negative effect on the prevalence and rate of adolescents' behavior problems unless the children have been faced with serious adverse pre-adoption circumstances. However, we do not know whether this is a characteristic specific to Versluis–den Bieman and Verhulst's study, since the other investigations in the meta-analysis either did not mention such circumstances or provided no information at all about the adopted child's pre-placement history. Many of the children available for adoption do indeed have negative early experiences because of nonoptimal conditions in their biological family and/or country of origin.

The results of our review and meta-analysis should be interpreted with caution for several reasons. First, considerable heterogeneity exists within the population of individuals who are adopted.[57] Differences are seen not only in the personal characteristics of the adopted children, but also in the circumstances before their adoption. For example, in most of the studies included in our meta-analysis, the children were adopted from various different countries and cultures, the adoption procedures differed (e.g., some children stayed in institutions before placement, while others lived with their biological family or in a foster home), and the ages on arrival were different. Within the population of adopted children, there may be subgroups of youngsters who are at risk for the development of adjustment problems. Therefore, until additional research on adoption and adjustment in various subgroups is completed, clinicians and policy makers must be careful to avoid generalizing this risk to the entire population of adopted individuals.[57] Nevertheless, effect sizes were homogeneous across the studies, so the computation of combined effect sizes is meaningful.

Second, the meta-analytic evidence presented in this paper is comparative, and the causal nature of the association between international adoption and problem behaviors has not been established. We cannot eliminate the possibility that for some internationally adopted children, problem behaviors (or a genetic disposition for such behaviors) may have been the reason why the children were given up for adoption. In this case, problem behaviors are a cause rather than a consequence of the adoption.

Finally, some of the differences between adopted and nonadopted adolescents may be explained by different perceptions expressed by parents of adopted children and parents of biological children.[24] Adoptive parents, due to higher socioeconomic status and education, may notice or identify problems sooner.[62] In addition, adoptive parents have already had contact with social service agencies, and they know (and perhaps sometimes expect) that adoption

can bring problems, which may also make them more sensitive to behavioral difficulties.

Although many studies show more behavior problems in adopted adolescents, the elevated problem rate may be caused by a small minority of adopted adolescents.[15,57] We found that the largest —although still rather small—differences between adopted and nonadopted adolescents emerged when differences in percentage of children scoring in the clinical range were examined. Differences between groups of adopted and nonadopted children may reflect the presence of a small number of severely disturbed children, possibly with extremely adverse pre-placement histories. The majority of the adopted adolescents are well adjusted and do not show more problem behaviors than do their nonadopted peers.[15,57] And like most of the problems experienced in adolescence, adoptees' problems may well diminish or disappear in early adulthood. The finding that the majority of internationally adopted adolescents are well adjusted is important from the perspective of adoption policy, too. Contrary to the expectation that, because of the potential additional risks, internationally, transracially adopted adolescents will present many behavior problems, the internationally adopted adolescents in our meta-analysis appeared to be relatively problem-free. Moreover, the rates of problem behavior seen in these adolescents were comparable to those found in national, mostly same-race adoptions.[26] Thus, no additional risks were found for international, transracial adoptions. This positive finding should contribute to the longstanding debate on the supposed negative outcomes of international and transracial adoptions.[5,63,64]

Finally, it should be stressed that adoption itself is not a risk factor in the adjustment of children.[57,65] Adoption may even be considered a protective factor. Researchers have compared adopted children with children who were born illegitimately but remained with their biological mothers,[66,67] with children who were placed in an institution,[68–70] and with children who were given up for adoption but later restored to their biological parents.[69–72] In these investigations the adopted children appeared to be better adjusted than were the children against whom they were compared. Moreover, children who experienced severe deprivation in an institutional setting showed substantial developmental recovery after adoption placement.[73,74] Therefore, adoption may often be the best solution for a child who would otherwise be raised in an institution under miserable circumstances,[75–77] despite the problems that some adopted children experience in adolescence. Nevertheless, parents, social workers, and other professionals should be aware of the disadvantages that many adopted children have experienced, and of the influence that such disadvantages may exert on the adopted children's behavior, so that they can understand them better, interpret their behavior problems in an adequate way, and foster a warm and

stable relationship[78] that supports the adoptees' development through the turbulent phase of adolescence into adulthood.

References

1. Selman P. Intercountry adoption in Europe after the Hague Convention. In: Sykes R, Alcock P, eds. Developments in European social policy: convergence or diversity? Bristol, England: Policy, 1998: 147-170.
2. Resnick RP. Latin American children in intercountry adoption. In: Bean P, ed. Adoption: essays in social policy, law, and sociology. London, England: Tavistock, 1984: 273-287.
3. Hoksbergen RAC. Intercountry adoption coming of age in the Netherlands: basic issues, trends and developments. In: Altstein H, Simon RJ, eds. Intercountry adoption: a seven country perspective. New York: Praeger, 1990: 141-160.
4. Selman P. The demographic history of intercountry adoption. In: Selman P, ed. Intercountry adoption: developments, trends and perspectives. Nottingham, England: Russell, 2000:15–39.
5. Tizard B. Intercountry adoption: a review of the evidence. J Child Psychol Psychiatry 1991;32:743–56.
6. Hoksbergen RAC, Juffer F, Waardenburg BC. Adopted children at home and at school: the integration after 8 years of 116 Thai children in Dutch society. Lisse, Netherlands: Swets & Zeitlinger, 1987.
7. Riben M. Shedding light on the dark side of adoption. Detroit: Harlo, 1988.
8. Rutter M, Garmezy N. Developmental psychopathology. In: Mussen PH, ed. Handbook of child psychology. 4th ed. New York: Wiley, 1983:775–911.
9. Verhulst FC. The development of internationally adopted children. In: Selman P, ed. Intercountry adoption: developments, trends and perspectives. Nottingham, England: Russell, 2000:126–42.
10. Fischer KW. A theory of cognitive development: the control and construction of hierarchies of skills. Psychol Rev 1980;87:477–531.
11. McRoy RG, Zurcher LA, Lauderdale ML, Anderson RE. The identity of transracial adoptees. Social Casew 1984;65:34–9.
12. Brodzinsky DM, Singer LM, Braff AM. Children's understanding of adoption. Child Dev 1984;55:860–78.
13. Gardell I. A Swedish study on intercountry adoptions: a report from Allmänna barnhuset. Stockholm: Liber Tryck, 1979.

14. Kirk HD. Shared fate: a theory and method of adoptive relationships. 2nd ed. Port Angeles, Washington: Ben-Simon, 1984.
15. Brodzinsky DM. Adjustment to adoption: a psychosocial perspective. Clin Psychol Rev 1987;7:25–47.
16. Brodzinsky DM, Schechter MD, Henig RM. Being adopted: the lifelong search for self. New York: Doubleday, 1992.
17. Hoopes JL. Adoption and identity formation. In: Brodzinsky DM, Schechter MD, eds. The psychology of adoption. New York: Oxford University Press, 1990:144–66.
18. Grotevant HD, McRoy RG. Adopted adolescents in residential treatment: the role of the family. In: Brodzinsky DM, Schechter MD, eds. The psychology of adoption. New York: Oxford University Press, 1990:167–186.
19. Berg-Kelly K, Eriksson J. Adaptation of adopted foreign children at mid-adolescence as indicated by aspects of health and risk taking—a population study. Eur Child Adolesc Psychiatry 1997;6:199–206.
20. Geerars H, Hoksbergen R, Rooda J. Geadopteerden op weg naar volwassenheid: de integratie van 68 Thaise jongeren in de Nederlandse samenleving. Utrecht: Adoptie Centrum, 1995.
21. Oostdijk W, Yap YN, Slijper FME, Wit JM, Drop SLS. Puberteit en eindlengte bij uit het buitenland geadopteerde kinderen. Tijdschr Kindergeneesk 1996;64:39–43.
22. Proos LA, Hofvander Y, Tuvemo T. Menarcheal age and growth pattern of Indian girls adopted in Sweden, I: Menarcheal age. Acta Paediatr Scand 1991;80:852–8.
23. Howe D. Patterns of adoption: nature, nurture, and psychosocial development. Oxford, England: Blackwell, 1998.
24. Warren SB. Lower threshold for referral for psychiatric treatment for adopted adolescents. J Am Acad Child Adolesc Psychiatry 1992;31:512–7.
25. Cook TD. Meta-analysis for explanation: a casebook. New York: Russell Sage Foundation, 1992.
26. Wierzbicki M. Psychological adjustment of adoptees: a meta-analysis. J Clin Child Psychol 1993;22:447–54.
27. Rosenwald T. Intercountry adoptive families in Western Australia: the well-being of their four to sixteen year-old adoptees. Paper presented in Utrecht, The Netherlands at the Adoption Center, Utrecht University, July 15, 1995.
28. Mullen B. Advanced BASIC meta-analysis. Hillsdale, New Jersey: Erlbaum, 1989.
29. Rosenthal R. Meta-analytic procedures for social research. Newbury Park, California: Sage, 1991.

30. Verhulst FC, Althaus M, Versluis–den Bieman HJM. Problem behavior in international adoptees, I: An epidemiological study. J Am Acad Child Adolesc Psychiatry 1990;29:94–103.
31. Versluis–den Bieman HJM, Verhulst FC. Self-reported and parent reported problems in adolescent international adoptees. J Child Psychol Psychiatry 1995;36:1411–28.
32. Goldney RD, Donald M, Sawyer MG, Kosky RJ, Priest S. Emotional health of Indonesian adoptees living in Australian families. Aust NZ J Psychiatry 1996;30:534–9.
33. Andresen ILK. Behavioural and school adjustment of 12–13-year old internationally adopted children in Norway: a research note. J Child Psychol Psychiatry 1992;33:427–39.
34. Rutter M. Appendix 6: A children's behaviour questionnaire for completion by parents. In: Rutter M, Tizard J, Whitmore K, eds. Education, health and behaviour. London, England: Longman, 1970:412–8.
35. Rutter M. A children's behaviour questionnaire for completion by teachers: preliminary findings. J Child Psychol Psychiatry 1967;8:1–11.
36. Bagley C. Adoption of Native children in Canada: a policy analysis and a research report. In: Altstein H, Simon RJ, eds. Intercountry adoption: a multinational perspective. New York: Praeger, 1991:55–79.
37. Ramsay R, Bagley C. The prevalence of suicidal behaviors, attitudes and associated social experiences in an urban population. Suicide Life Threat Behav 1985;15:151–67.
38. Berg-Kelly K. Normative developmental behavior with implications for health and health promotion among adolescents: a Swedish cross-sectional survey. Acta Paediatr 1995;84:278–88.
39. Bogaerts S, Van Aelst G. Adolescentie en interculturele adoptie: psycho-sociale integratie in Vlaamse gezinnen. Leuven, Belgium: Garant, 1998.
40. Achenbach TM. Manual for the CBCL/4-18 and 1991 profile. Burlington, Vermont: University of Vermont Department of Psychiatry, 1991.
41. Achenbach TM. Manual for the YSR and 1991 profile. Burlington, Vermont: University of Vermont Department of Psychiatry, 1991.
42. Cederblad M, Höök B, Irhammar M, Mercke AM. Mental health in international adoptees as teenagers and young adults: an epidemiological study. J Child Psychol Psychiatry 1999;40:1239–48.
43. Irhammar M, Cederblad M. Outcome of intercountry adoption in Sweden. In: Selman P, ed. Intercountry adoption: developments, trends and perspectives. Nottingham, England: Russell, 2000:143–163.

44. Larsson B, Frisk M. Social competence and emotional/behaviour problems in 6–16 year-old Swedish school children. Eur Child Adolesc Psychiatry 1999;8:24–33.
45. Derogatis LR, Cleary PA. Confirmation of the dimensional structure of the SCL-90: a study in construct validation. J Clin Psychol 1977;33:981–9.
46. Hoksbergen RAC. Turmoil for adoptees during their adolescence? Int J Behav Dev 1997;20:33–46.
47. Silburn S, Zubrick S, Garton A, Burton P, Dalby R. Turning the century: the Western Australian Child Health Survey. Perth: Australian Bureau of Statistics, 1995.
48. Sharma AR, McGue MK, Benson PL. The psychological adjustment of United States adopted adolescents and their nonadopted siblings. Child Dev 1998;69:791–802.
49. Verhulst FC, Koot JM, Akkerhuis GW, Veerman JW. Praktische handleiding voor de CBCL. Assen, Netherlands: Van Gorcum, 1990.
50. Cooper HM, Hedges LV. The handbook of research synthesis. New York: Russell Sage Foundation, 1994.
51. Verbeek A, Kroonenberg PM. Fisher 3.0: testing independence in rxc tables. Groningen, Netherlands: iec ProGAMMA, 1990.
52. Kroonenberg PM. The Three-Mode Company [Available on the World Wide Web at http://www.fsw.leidenuniv.nl/~kroonenb/], 1998.
53. Borenstein M, Rothstein D, Cohen J. Comprehensive meta-analysis: a computer program for research synthesis. Englewood, New Jersey: Biostat, 2000.
54. Cohen J. Statistical power analysis for the behavioral sciences. Hillsdale, New Jersey: Erlbaum, 1988.
55. Tabachnick BG, Fidell LS. Using multivariate statistics. Fourth edition. Boston: Allyn & Bacon, 2001.
56. Benson PL, Sharma AR, Roehlkepartain EC. Growing up adopted: a portrait of adolescents and their families. Minneapolis: Search Institute, 1994.
57. Haugaard JJ. Is adoption a risk factor for the development of adjustment problems? Clin Psychol Rev 1998;18:47–69.
58. Juffer F. Adoptie: een optie voor kind en gezin? Inaugural speech presented in Leiden, The Netherlands at Leiden University, February 1, 2002.
59. Howe D. Parent-reported problems in 211 adopted children: some risk and protective factors. J Child Psychol Psychiatry 1997;38:401–11.
60. Verhulst FC. Internationally adopted children: the Dutch longitudinal adoption study. Adoption Q 2000;4:27–44.

61. Verhulst FC, Althaus M, Versluis–den Bieman HJM. Damaging backgrounds: later adjustment of international adoptees. J Am Acad Child Adolesc Psychiatry 1992;31:518–24.
62. Ingersoll BD. Psychiatric disorders among adopted children: a review and commentary. Adoption Q 1997;1:57–73.
63. Rushton A, Minnis H. Annotation: transracial family placements. J Child Psychol Psychiatry 1997;38:147–59.
64. Simon RJ, Altstein H, Melli MS. The case for transracial adoption. Washington, DC: American University Press, 1994.
65. Stams GJJM, Juffer F, Rispens J, Hoksbergen RAC. The development and adjustment of 7-year-old children adopted in infancy. J Child Psychol Psychiatry 2000;41:1025–37.
66. Maughan B, Pickles A. Adopted and illegitimate children growing up. In: Robins LN, Rutter M, eds. Straight and devious pathways from childhood to adulthood. Cambridge, England: Cambridge University Press, 1990:36–61.
67. Seglow J, Pringle MLK, Wedge P. Growing up adopted: a long-term national study of adopted children and their families. Slough, England: National Foundation for Education Research in England and Wales, 1972.
68. Bohman M, Sigvardsson S. Outcome in adoption: lessons from longitudinal studies. In: Brodzinsky DM, Schechter MD, eds. The psychology of adoption. New York: Oxford University Press, 1990:93–106.
69. Colombo M, De la Parra A, López I. Intellectual and physical outcome of children undernourished in early life is influenced by later environmental conditions. Dev Med Child Neurol 1992;34:611–22.
70. Tizard B, Hodges J. The effect of early institutional rearing on the development of eight-year-old children. J Child Psychol Psychiatry 1978;19:99–118.
71. Hodges J, Tizard B. IQ and behavioural adjustment of ex-institutional adolescents. J Child Psychol Psychiatry 1989;30:53–75.
72. Hodges J, Tizard B. Social and family relationships of ex-institutional adolescents. J Child Psychol Psychiatry 1989;30:77–97.
73. Rutter M, Andersen-Wood L, Beckett C, Bredenkamp D, Castle J, Dunn J, et al. Developmental catch-up, and deficit, following adoption after severe global early privation. J Child Psychol Psychiatry 1998;39:465–76.
74. Morison SJ, Ames EW, Chisholm K. The development of children adopted from Romanian orphanages. Merrill-Palmer Q 1995;41:411–30.
75. Johnson DE. Medical and developmental sequelae of early childhood institutionalization in Eastern European adoptees. In: Nelson CA, ed.

The effects of early adversity on neurobehavioral development. Mahwah, New Jersey: Erlbaum 2000:113–162.

76. Kaler SR, Freeman BJ. Analysis of environmental deprivation: cognitive and social development in Romanian orphans. J Child Psychol Psychiatry 1994;35:769–81.

77. Spira A, Scippa L, Berthet C, Meuret C, Besozzi R, Cramer B. L'hospitalism en l'an 2000: développement psychologique d'enfants dans un orphelinat Roumain. Psychiatrie de l'enfant 2000;43:587–646.

78. Stams GJJM, Juffer F, Van IJzendoorn MH. Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: the case of adopted children and their biologically unrelated parents. Dev Psychol 2002;38:806–21.

Chapter 3
Problem Behavior and Heart Rate Reactivity in Adopted Adolescents: Longitudinal and Concurrent Relations[2]

Abstract

The present longitudinal study examined resting heart rate and heart rate variability and their reactivity to a stressful gambling task in adopted adolescents with aggressive, delinquent, or internalizing behavior problems and adopted adolescents without behavior problems (total *N* = 151). Early-onset delinquent adolescents showed heart rate *hypo*reactivity to the stress-eliciting gambling task compared to late-onset delinquent adolescents and adolescents without behavior problems. Heart rate, heart rate variability, and reactivity to stress were not related to environmental factors such as early-childhood parental sensitivity, parental socioeconomic status, or children's health status in the first year of life. The differentiation between delinquency and aggression, and between childhood-onset and adolescence-onset delinquency (Moffitt, 1993) was found to be important in investigating stress reactivity in adolescents.

Introduction

Genetic and biological processes have been found to play an etiological role in the development of aggressive and antisocial behavior (Eley, Lichenstein, & Stevenson, 1999; Ge et al., 1996; Raine, 1993; Slutske et al., 1997) and environmental processes may produce physiological changes in both the central nervous system (CNS) and the autonomic nervous system (ANS) functioning in a way that can predispose to aggressive and antisocial behavior (Suomi, 2000; Raine, 1997). The present longitudinal study examined resting heart rate and its reactivity to a stressful situation in adolescents with and without aggressive, delinquent, or internalizing behavior problems. This study is the first to assess these associations in adopted children, who are raised by their biologically unrelated adoptive parents. In adoptive families, genetic influences that predispose children for developing behavior problems are less likely to be intensified by a problematic rearing environment compared to non-adoptive families (Golombok, MacCallum, & Goodman, 2001; Golombok, MacCallum, Goodman, & Rutter, 2002).

[2] This Chapter is being prepared for publication as: Jaffari-Bimmel, N., Van IJzendoorn, M. H., Bakermans-Kranenburg, M.J., Juffer, F., & De Geus, E. J. C. (in prep.). Problem behavior and heart rate reactivity in adopted adolescents: Longitudinal and concurrent relations.

Psychophysiological correlates of antisocial behavior and other behavior problems

The psychophysiological correlates of aggressive, antisocial, and violent behavior are somewhat ambiguous, and there have been mixed results in studies relating tonic levels of autonomic activity to behavior problems (Dettling, Gunnar, & Donzella, 1999; Fishbein, Lozovosky, & Jaffe, 1989; Lahey, McBurnett, Loeber, & Hart, 1995; Patrick, Zempolich, & Levenston, 1997; Raine, 1993; Susman, Granger, Murowchick, Ponirakis, & Worrall, 1996; Volavka, 1995). In contrast to the inconsistent findings relating global arousal to aggressive and antisocial behavior, low resting heart rate is the best-replicated biological correlate of antisocial and aggressive behavior in child and adolescent populations (Raine, 2002). In a meta-analysis incorporating 29 independent samples, the average effect size was d = .56 (Raine, 1996). This combined effect size is robust in that it is found in both female (d = .63) and male samples (d = .50), and when heart rate is taken from a pulse reading (d = .49) as well as when it is measured from a Grass polygraph (d = .53). More recently, Ortiz and Raine (2004) conducted a meta-analysis on 45 independent effect sizes obtained from 40 studies on the association between heart rate and antisocial behavior in children and adolescents. A significant overall effect size was found for resting heart rate. Antisocial children had significantly lower resting heart rates (d = .44). These findings suggest that antisocial and aggressive behavior may be associated with ANS underarousal in terms of low sympathetic and high parasympathetic nervous system activity. This pattern of underarousal may trigger individuals to seek out stimulation, for example by engaging in antisocial or criminal behaviors (Fox, Schmidt, & Henderson, 2000).

In addition to tonic levels of autonomic arousal, antisocial behaviors have been related to unique patterns of autonomic *reactivity* to various environmental stimuli or situations. Raine, Venables, and Williams (1990a) found that heart rate hyporeactivity to auditory stimuli in 15-year-old male subjects predicted criminal behavior at age 24. This pattern of hyporesponsivity was predictive over and above the predictive effects of tonic heart rate levels, suggesting that hyporesponsivity was not simply a function of overall physiological arousal but may be a risk factor for later criminal behavior (Fox, Schmidt, & Henderson, 2000). In their meta-analysis on heart rate and antisocial behavior in children and adolescents, Ortiz and Raine (2004) also found that antisocial behavior was negatively associated with heart rate in a stress condition (d = .76). It was hypothesized that antisocial individuals are lacking in anxiety, are fearless, and are particularly unresponsive to aversive social contexts.

Even though low resting heart rate is the best-replicated biological correlate of antisocial and aggressive behavior and reduced heart rate reactivity predicts criminal behavior, some studies did not find such a relation between heart rate or heart rate reactivity on the one hand and aggressive or anti-social behavior problems on the other hand (for a recent example see Van Hulle, Corley, Zahn-Waxler, Kagan, & Hewitt, 2000). Different definitions and measurements of aggression and anti-social behavior may be responsible for

these diverging results. For example, most studies have assessed antisocial behavior in general without differentiating between aggressive and non-aggressive forms of antisocial behavior. Besides such different *types* of antisocial behavior, there are groups of individuals with different developmental *courses* of these problem behaviors (Caspi & Moffitt, 1995; Loeber, 1982; Loeber & Coie, 2001; Moffit, 1993; Moffitt & Caspi, 2001). Raine, Venables and Williams (1995) found a difference in heart rate and heart rate reactivity between adolescence-limited and life-course persistent antisocial individuals. Adolescent-limited antisocial individuals had higher resting heart rates and greater electrodermal orienting responses than their persistent antisocial peers. Adolescence-limited antisocial individuals had also higher heart rates and greater electrodermal orienting responses than non-antisocial adolescents, but these differences did not reach statistical significance. Adolescence-limited antisocial individuals may thus respond in the same way as their non-antisocial peers do, or their greater autonomic arousal may reflect a unique protective mechanism against committing crime (Fox et al., 2000). Life-course persistent offenders have been hypothesized as having early neurobiological deficits (Moffitt, 1993), and Moffit and Caspi (2001) recently reported that low resting heart rate assessed at ages 7, 9, and 11 years is particularly characteristic of life-course persistent offenders. Differences in heart rate and heart rate reactivity between adolescence-limited and life-course persistent antisocial individuals may be essential in studying stress reactivity in antisocial adolescents.

Whereas aggressive and antisocial problem behaviors have been linked to low resting heart rate and hyporeactivity to stress, other problem behaviors have been linked to higher resting heart rates and/or hyperreactivity. These relations have been found particularly for behavior problems of an internalizing nature, such as anxiety (Mezzacappa et al., 1997; Rogeness, Cepeda, Macedo, Fisher, & Harris, 1990), inexpressive emotion regulation (Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996), behavioral inhibition (Garcia-Coll, Kagan, & Reznick, 1984; Kagan, 1989; Kagan, Reznick, & Snidman, 1987, 1988; Scarpa, Raine, Venables, & Mednick, 1997), and emotional disturbances (Garralda, Connell, & Taylor, 1991). Kagan et al. (1987, 1988) suggested that heightened physiological responsivity in inhibited individuals may reflect a tendency to respond to uncertainty and novel situations with stress which, in turn, may lead to future anxiety disorders.

Heart rate and heart rate reactivity in adolescents with and without behavior problems

The current study has some additional strength in comparison with previous studies on heart rate and behavior problems. We compared adolescents with behavior problems to adolescents without these problems, but we also distinguished between individuals with late-onset and individuals with early-onset delinquent and aggressive behavior problems. Both resting heart rate and heart rate *reactivity* during a stressor were examined. For example, antisocial and aggressive behavior may be associated with ANS underarousal in terms of low resting heart rate because it may cause individuals to seek out stimulation by

engaging in antisocial or criminal behaviors (Fox et al., 2000), but it has not been tested whether individuals with low resting heart rate are also unresponsive to aversive social contexts or stressful situations (Raine, 1993). If they are unresponsive to stress, heart rate *reactivity* during stress will be lower than heart rate reactivity in non-antisocial individuals.

A limitation of many studies on the relation between heart rate and antisocial behavior is that they do not distinguish between aggressive and non-aggressive forms of antisocial behavior (Ortiz & Raine, 2004). Therefore, it is unclear whether low heart rate is more specific to aggressive or non-aggressive forms of antisocial behavior. In the present study, a distinction was made between adolescents with aggressive behavior problems (for example, fighting, attacking others, teasing) and adolescents with delinquent behavior problems (for example, stealing, setting fire to something, vandalism). Moreover, only a few studies have investigated behavior problems of an internalizing nature (but see for example Cole et al., 1996; Scarpa et al., 1997) or compared internalizing and externalizing problems within the same sample (Mezzacappa et al., 1997). The present study investigated both internalizing and externalizing behavior problems within the same sample of adolescents. We investigated continuous and categorical measures of behavior problems. The continuous score represents behavior problem rate, and the categorical measure indicates the severity of a particular behavior problem, that is, whether the incidence of behavior problems of a particular individual exceeds a cutoff score and equals the incidence of behavior problems of children who have been referred to clinical settings (cutoff scores distinguishing deviant from non-deviant children). In previous studies the lack of differential reactivity for children with problem behaviors might be related to the use of continuous scores for behavior problems that mask differences between groups in the clinical range.

To date most studies on the phenomenon of life-course-persistent antisocial behavior included only males. Moffitt, Caspi, Rutter, and Silva (2001) argued that the biological mechanisms underlying antisocial behavior are the same in males and females, but Mednick, Kirkegaard-Sorensen, Hutchings, Knop, Rosenberg and Schulsinger (1977) hypothesized that biological correlates of antisocial behavior are stronger in females than in males. In the meta-analysis of Ortiz and Raine (2004) gender did not moderate the relation between heart rate and antisocial behavior. Because in our sample males and females were included in comparable proportions, we were able to investigate whether the relations between heart rate and different behavior problems hold for male and female adolescents.

Ortiz and Raine (2004) reported that in their meta-analysis on the association between heart rate and antisocial behavior only two out of 40 studies controlled for increased cigarette smoking in antisocial children, although smoking is associated with heart rate (Farrington, 1997). The present study not only examined the influence of cigarette smoking on heart rate, but also the potential influence of physical conditioning through sports participation (De Geus, Boomsma, & Snieder, 2003; Katona, Mc Lean, Dighton, & Guz, 1982;

Vander, Sherman, & Luciano, 2001) and associations with IQ (Farrington, 1997; Raine, Venables, & Williams, 1990b).

The current study is the first to assess the association between heart rate and behavior problems in adopted adolescents. All studies in the meta-analysis of Ortiz and Raine (2004) concerned non-adoptive families. The parents of these families may transmit a genetic predisposition for antisocial behavior to their children, *and* also provide a rearing environment that provokes antisocial behaviors. The adoptive parents in the current study are predominantly from middle-class or upper middle-class backgrounds and were screened for the absence of a criminal past before the adoption. The adopted children were neither selected by nor matched to the characteristics of their future adoptive parents.

Decades of research have documented associations between antisocial behavior and adverse environments, both within the family and beyond. Antisocial behavior has been related, among others, to parental insensitivity or maltreatment, low socioeconomic status, and the child's health (see Maughan, 2001, for a review of environmental influences and disruptive behavior problems). As the adolescents of the present study participated in a longitudinal study which began in infancy, information regarding pertinent characteristics of their rearing environments was available. It was thus possible to test empirically whether problem behaviors and resting heart rate or heart rate reactivity were related to environmental factors such as parental sensitivity, parental socioeconomic status or children's health status in the first year of life.

In sum, the present study focused on the following questions: First, how are rates of aggressive, delinquent, and internalizing problem behaviors associated with resting heart rate? We expected to find positive correlations between resting heart rate and internalizing behavior problems (Kagan, Reznick, & Snidman, 1987). Because the continuous measures for aggression and delinquency may confound early- and late-onset of the behavior problems we did not expect to find a similarly clear-cut association between externalizing problems and resting heart rate. Second, do adolescents with aggressive, delinquent, and internalizing behavior problems (categorical syndromes) and adolescents without behavior problems show different resting heart rate? We expected to find lower resting heart rate in adolescents with early-onset persistent delinquent and aggressive problem behaviors compared with all other groups and higher heart rate in adolescents with internalizing behavior problems. Third, do adolescents with aggressive, delinquent, and internalizing behavior problems and adolescents without behavior problems show different heart rate *reactivity* to a stress-eliciting task (change in heart rate from baseline to a stress-eliciting task)? We expected to find heart rate *hypo*reactivity in adolescents with early-onset persistent delinquent and aggressive behavior problems compared with all other groups and heart rate *hyper*reactivity in adolescents with internalizing behavior problems. Measures of heart rate reflect the contribution of parasympathetic *and* sympathetic nervous system influences

to resting heart rate and heart rate reactivity. *Para*sympathetic influences to resting heart rate and heart rate reactivity can be easily obtained in a non-invasive design as used here, by time- or frequency domain based measures of heart rate *variability* (Task Force of the European Society of Cardiology the North American Society of Pacing Electrophysiology, 1996). With respect to heart rate *variability*, we expected to find lower resting heart rate variability, i.e. lower parasympathetic tone, in adolescents with internalizing behavior problems (Porges, 1995, 2001) and higher resting heart rate variability, i.e. higher parasympathetic tone in adolescents with early-onset persistent delinquent and aggressive problem behaviors. We expected to find an increase in heart rate variability from baseline to a stress-eliciting task in adolescents with early-onset persistent delinquent and aggressive behavior problems compared with the other groups, and a decrease in heart rate variability in adolescents with internalizing behavior problems. A final question to be addressed is whether environmental factors such as parental sensitivity and parental socioeconomic status are related to behavior problems, to heart rate, heart rate variability and their reactivity to stress. We expected to find significant effects of these environmental factors on behavior problems, on heart rate, and on heart rate reactivity.

Method

Participants

Participants were 151 14-year-old internationally adopted children (67 boys and 84 girls), participating in a longitudinal study which began in infancy with 160 children (Juffer, Hoksbergen, Riksen-Walraven, & Kohnstamm, 1997; Juffer, Van IJzendoorn, & Bakermans-Kranenburg, in press; Stams, Juffer, Rispens, & Hoksbergen, 2000; Stams, Juffer, & Van IJzendoorn, 2002). All adoptive families were randomly recruited through Dutch adoption organizations. The children were adopted before the age of 6 months (M = 9.9 weeks; SD = 5.33) and they were adopted from Sri Lanka (n = 93), South Korea (n = 38), and Colombia (n = 20). The adoptive parents were Caucasian white and screened for the absence of a criminal past before the adoption. The adoptive families were predominantly from middle-class or upper middle-class (Stams et al., 2002). At the time of the birth of the children the mean age of the adoptive fathers was 35.0 (SD = 3.26) and of the adoptive mothers 32.9 (SD = 3.06).

Procedure

Families were visited at home at 5, 6, 9, and 12 months. Mothers and children came to the laboratory at 12, 18, and 30 months. At 7 years, families were visited at home to conduct an interview with the mother and to administer the Child Behavior Checklist (CBCL; Achenbach, 1991b). At 14 years, the families were visited at home again to measure heart rate of the adolescents during completion of a questionnaire in absence of the experimenter that served

as a baseline, and during a stressful gambling task with the experimenter present. The gambling task and the questionnaire were completed in the bedroom of the adolescent. The experimenter connected the adolescent to the ECG recording device (the Vrije Universiteit Ambulatory Monitoring System, VU-AMS; Klaver, De Geus, & De Vries, 1994) and explained each step of the process in nontechnical language. Participants were told that their heart rate would be monitored during the episodes in order to examine if a particular episode or situation was more exciting than other episodes. All teenagers were visited by the same experimenter. During the home visit the adoptive mother completed the CBCL.

Measures

Behavior problems. Mothers completed the Child Behavior Checklist (CBCL; Achenbach, 1991b) to assess the adolescent's behavior problems. The CBCL has shown satisfactory reliability and good validity (Achenbach, 1991a, 1991b; Verhulst, Van der Ende, & Koot, 1996, 1997b). It consists of 118 items describing behavioral/emotional problems. The problem items are scored on similar 3-point scales: a 0 is given if the problem is *not true* for the child, a 1 if the item *somewhat or sometimes true* and a 2 if the item *very true or often true*. A total problem score is computed by summing all scores. The present paper examined the following syndromes: aggression and delinquency (being part of the broad-band syndrome externalizing behavior problems), and the broad-band syndrome internalizing behavior problems.

Besides continuous scores for the different syndromes cutoff scores are available to distinguish deviant from non-deviant scoring children. On the basis of these criteria, it is possible to determine the percentage of adolescents falling in the borderline clinical and clinical range for each of the syndromes. The incidence of behavior problems in children exceeding the clinical cutoff criterion is likely to equal the incidence of behavior problems in children who have been referred to clinical settings. Children in the borderline clinical range also show substantial and serious behavior problems (Achenbach, 1991b, 1991c; Verhulst et al., 1996). We used cutoff points that were based on a sample of 2227 children and adolescents, drawn from the Dutch general population in 1993 (Verhulst et al., 1996). Achenbach (1991b) found that for the specific syndrome scales the 95th percentile and for the broad-band syndrome scales the 82nd percentile were the best cutoff points for the differentiation between children in the normal range on the one hand and children in the borderline clinical and clinical range on the other hand. These cutoffs reflect differences in scores between groups of children that were referred to mental health clinics and groups of children that were not referred (Achenbach, 1991b). Adolescents without behavior problems (hereafter: 'normal adolescents') were teenagers who did not exceed the cutoff point of any of the behavior problem syndromes (aggression, delinquency, and internalizing behavior problems). In the analyses, individuals who were deviant on a particular syndrome were compared with these adolescents without any behavior problems. Early-onset delinquents were also compared with late-onset

delinquents and early-onset aggressive adolescents were compared with late-onset aggressive adolescents. We did not compare adolescents with a particular syndrome with adolescents with another syndrome because of the high comorbidity of the syndromes and therefore the low sample sizes in case the comorbid adolescents were left out of those analyses. The comorbid adolescents were included in both syndrome groups in the comparisons with the adolescents without any behavior problems. In order to control for co-occurring symptoms of delinquency and aggression, the continuous scores for the syndrome scales were used as a covariate in the analyses (ANCOVAs), e.g., in the comparisons of early-onset and late-onset delinquents and normal adolescents, the continuous score of aggression was used as a covariate. Gender differences in the number of deviant adolescents were found for the syndromes delinquency and aggression: More boys than girls were deviant on these syndrome scales (χ^2 (1, N = 148) = 6.67, p = .01, and χ^2 (1, N = 148) = 10.41, p < .01, respectively). There were no differences between children from Sri Lanka, South Korea or Colombia (p > .10). In order to distinguish between early-onset and late-onset delinquent and aggressive behavior problems, we examined the cutoff scores at 7 years and at 14 years. Moffitt and Caspi (2001) suggested that life-course-persistent antisocial behavior originates early in life (early-onset behavior problems) and that adolescence-limited antisocial behavior emerges alongside puberty (late-onset behavior problems). In the present study, the terms early- and late-onset delinquent or aggressive adolescents were used because delinquent and aggressive behavior was assessed at the age of 7 and 14 years and not after adolescence. Early-onset adolescents were individuals that were deviant on the syndrome delinquent or aggressive at both 7 and 14 years and late-onset adolescents were individuals that were deviant at 14 years but not at 7 years.

Heart rate. For the recording of heart rate by the VU-AMS device, three disposable ECG electrodes were placed on the adolescent's chest. Before placing the electrodes, the skin was rubbed firmly with alcohol (by the adolescent her or himself). One electrode was placed at the jugular notch of the sternum between the collarbones, the other one below the left breast, 4 cm (1.5") under the nipple (between two ribs), and the third at the right side of the chest, between the lower two ribs. After placing the electrodes the resulting signal quality and the electrode attachment were checked by online-monitoring of the HR. The VU-AMS was secured unobtrusively in a little carrying bag attached to a waist belt, allowing the participants to move about freely. Very little inconvenience is generally reported from wearing the device, even over prolonged periods of time (De Geus & van Doornen, 1996). Although changes in posture and physical activity are powerful determinants of ambulatory recorded physiological signals, the questionnaire and the gambing task were administered while the adolescents were seated, so their gross body movement was close to zero.

The device was programmed to continuously record all inter beat intervals. From the interbeat interval time series, an average HR was extracted each 10-second period and written to device memory. The experimenter recorded the time when the various experimental conditions were started or

stopped by pressing a key on the device that measured heart rate. Mean heart rates and heart rate variability (MSSD; mean square of standard differences in interbeat intervals) for resting and stress conditions were computed from all 10-sec periods falling between these condition start and stop times. This yielded the following heart rate measures: (1) resting heart rate defined as the mean heart rate and heart rate variability during completion of a questionnaire (nonstressful situation), (2) heart rate during stress defined as the mean heart rate and heart rate variability during the gambling task, and (3) heart rate reactivity defined as the change in heart rate from rest to stress. The registration of heart rate was successful in all adolescents. The correlation between mean heart rates and heart rate variability was -.56. The standard deviations for MSSD were large (a common phenomenon with MSSD, see also Vrijkotte, van Doornen, & De Geus, 2000). However, no extreme outliers (HR mean < 30 or > 200 and MSSD > 200) were found on inspection of the raw data. Also, no outlying means were identified on the basis of standardized scores (*z*-values) larger than 3.29 or smaller than -3.29 ($p < .001$; Tabachnick & Fidell, 2001).

Gambling task (cost benefit reasoning task). The ECG of the adolescents was recorded during a gambling task (Bechara, Damasio, Damasio, & Anderson, 1994). In this gambling task the subjects sat in front of four decks of cards and were given € 20 loan of play money (10 coins of € 1,-; 40 coins of € 0.20; and 40 coins of € 0.05). The subjects were told that they had to choose a number of cards, one card at a time, from any of the four decks, until they were told to stop. Turning each card carried an immediate reward (€ 1,- in decks A and B and € 0.50 in decks C and D). Unpredictably, however, the turning of some cards also carried a penalty (which was large in decks A and B and small in decks C and D). The subjects were free to switch from any deck to another, as often as they wished and at any time. They were told that they had to maximize profit on the loan of play money and that they were not told ahead of time how many cards they had to pick (the task was stopped after a series of 100 cards). The subjects had no way of predicting when a penalty would arise in a given deck and no way to calculate with precision the net gain or loss from each deck. Decks A and B were disadvantageous because they led to the largest losses in the long run (because of the higher penalties compared to the rewards) and decks C and D were advantageous because they resulted in an overall gain in the long run (because of the lower penalties compared to the rewards).

Intelligence. Because intelligence may affect heart rate (but see Farrington, 1997 and Raine, Venables, & Williams, 1990b for an exception), the adolescents completed the abbreviated Groningen Intelligence Test (GIT; Luteijn & van der Ploeg, 1983). We used the following subtests of the GIT: cipher, enumerate words, and word matrices.

Physical condition and smoking. Because physical condition and smoking affect heart rate (De Geus, Boomsma, & Snieder, 2003; Farrington, 1997; Katona, Mc Lean, Dighton, & Guz, 1982; Vander, Sherman, & Luciano, 2001), the adolescents were asked which sports they played during the previous year and how much time they had spent on each sport (less, the same or more compared

to peers). Participants were also asked if they smoked and if so, how much they smoked (1 = never, 2 = a few times, 3 = now and then, 4 = regularly, 5 = often). The same question was asked for smoking soft drugs.

Health condition on arrival. Health condition on arrival was an index of the infant's health condition from the time of birth until arrival (Stams et al., 2002). The information was gathered in the first interview with the parents at the child's age of 5 months. Health condition on arrival was computed by the standardized summation of three variables: birth weight, incidence of prematurity, and health problems on arrival (reversed). Health problems on arrival included variables such as symptoms of malnourishment, dehydration, anaemia or paratyphoid. A high score represents a good health condition.

Early-childhood maternal sensitive responsiveness (12, 18, and 30 months). Maternal sensitive responsiveness was assessed in early childhood by observations of videotaped free-play or task episodes of mother-child interaction at home and in the laboratory. At 12 and 30 months, maternal sensitive responsiveness consisted of seven variables (Stams et al., 2002). Sensitivity and cooperation were assessed during an 8-min free-play situation with the Ainsworth scales (Ainsworth, Bell, & Stayton, 1974). Emotional support, respect for the child's autonomy, structure and limit setting, hostility, and quality of instruction were assessed in a task situation (e.g., making a simple puzzle) with the five Erickson scales (Egeland, Erickson, Clemenhagen-Moon, Hiester, & Korfmacher, 1990; Erickson, Sroufe, & Egeland, 1985). At 18 months, maternal sensitive responsiveness was measured in a task situation (e.g., building a tower of blocks) with the five Erickson scales (Erickson et al., 1985). The 12-, 18-, and 30-months scores were the standardized summation of all variables divided by their number. The correlation between the 12- and 18-months score was .45 ($p <$ .01), between the 12- and 30-months score .27 ($p <$ .01), and between the 18- and 30-months score .31 ($p <$ .01). Principal-components analysis was performed on the three scores, which resulted in a one-dimensional solution. The explained variance was 58%. Cronbach's standardized item alpha was satisfactory (a = .62). The three scores were therefore combined into one overall score. The overall score of early-childhood sensitive responsiveness ranged from -2.06 to 1.41 (M = -.05, SD = 0.78). Validity data on the sensitive responsiveness scores have been reported in previous studies (see Stams et al., 2002).

Socioeconomic status. At 7 years the socioeconomic status (SES) of the adoptive families was assessed. SES was a combination of the educational and vocational background of both parents and was computed on the basis of sample-specific factor loadings and standard deviations (Stams, et al., 2002). Mean scores correspond to socioeconomic strata in the following way: 3 to 9, lower class; 9 to 12, middle class; and 12 to 16, upper class (Bernstein & Brandis, 1970). The mean score of parental socioeconomic status was 10.03 (SD = 2.68, range = 2.99 to 14.73).

Results

Descriptive statistics and background variables and their relations with behavior problems and heart rate

Table 1 presents descriptive statistics and background variables for each of the syndromes and for the group of adolescents without behavior problems ('normal'). There were no significant differences between adolescents with and without different behavior problems in age on arrival, health condition on arrival, number of card selections from advantageous/disadvantageous decks during the gambling task, number of sports, using soft drugs, and age of the adoptive fathers and mothers (see Table 1). With respect to age at study, adolescents without behavior problems were somewhat older than adolescents with early- and late-onset aggressive behavior problems (see Table 1). Early-onset aggressive adolescents were somewhat younger than adolescents with late-onset delinquent behavior problems. More boys than girls were deviant on early- and late-onset aggression and early-onset delinquency compared with the group of children without behavior problems (see Table 1). Early-onset aggressive and early-onset delinquent adolescents had lower IQ than children without behavior problems. Late-onset delinquents smoked more than all other groups (see Table 1).

Resting heart rate and heart rate variability nor reactivity of heart rate and heart rate variability were associated with health condition on arrival, age on arrival, age at time of the present study, gender, number of card selections from advantageous/disadvantageous desks during the gambling task, IQ, number of sports, smoking behavior, and age of the adoptive fathers and mothers. Because age at study, gender, IQ, and smoking were associated with behavior problems, we used these variables as covariates in the analyses. None of the variables were significant covariates. *P*-values ranged from .07 (in the comparison of heart rate reactivity of early-onset aggressive versus normal adolescents with IQ as a covariate) to .99 (in the comparison of resting heart rate of internalizing versus normal adolescents with IQ as a covariate). These descriptive and background variables were not included, therefore, in further analyses.

How are aggressive, delinquent, and internalizing problem behaviors associated with resting heart rate?

There were no significant correlations between aggressive, delinquent, and internalizing problem behaviors on the one hand and resting heart rate and heart rate variability on the other hand. Table 2 presents resting heart rate and heart rate variability with standard deviations for adolescents with (early-onset and late-onset) aggressive, (early-onset and late-onset) delinquent, and internalizing problem behaviors and for adolescents without problem behaviors (categorical syndromes). There were no significant differences in resting heart rate and heart rate variability between the different behavior problem groups and the adolescents without behavior problems.

Table 1

Descriptive Statistics: Demographics and Background Variables (N = 151)[1]

	Normal (*n* = 92)		Aggressive (*n* = 19)				Delinquent (*n* = 25)				Internalizing (*n* = 46)	
			Early-onset (*n* = 10)		Late-onset (*n* = 9)		Early-onset (*n* = 10)		Late-onset (*n* = 15)			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Health condition on arrival	0.38	0.13	0.41	0.11	0.44	0.06	0.40	0.09	0.34	0.12	0.35	0.13
Age on arrival (in weeks)	10.0	5.3	12.5	7.3	10.9	6.4	11.3	6.5	11.5	6.5	9.5	5.6
Age at time of study	14.6^{a}	0.6	14.0^{c}	0.0	14.1^{bc}	0.3	14.4^{abc}	0.5	14.5^{ab}	0.5	14.3^{abc}	0.4
IQ	100.4^{ab}	11.9	90.6^{cd}	17.1	112.8^{e}	17.2	90.8 ^{c}	16.0	102.2^{bd}	14.1	98.7	15.8
Number of sports	1.6	0.9	1.5	1.0	1.6	1.0	1.9	0.9	1.9	1.1	1.7	1.0
Smoking[2]	2.0^{a}	1.3	2.2^{a}	1.3	2.9^{a}	1.8	2.2^{a}	1.3	3.6 ^{b}	1.5	2.0^{a}	1.4
SES	10.0^{ab}	2.8	10.0^{ab}	1.8	11.4^{ac}	1.6	11.2^{c}	1.4	8.5^{b}	3.4	10.2^{ab}	2.5
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Sexe (*N* male)	40^{a}	39.0	8^{c}	80.0	7^{bc}	77.8	8^{bc}	80.0	9^{abc}	60.0	23^{abc}	50.0
Country of origin												
Sri Lanka	67	64.6	6	60	4	44.4	5	50.0	7	46.7	29	63.0
South Korea	26	25.6	0	0	3	33.3	2	20.0	6	40.0	9	19.6
Colombia	10	9.8	4	40	2	22.2	3	30.0	2	13.3	8	17.4

Note. Different superscripts indicate significant differences between means for different behavior problems at $p < .05$. For example: age at time of the study of adolescents without behavior problems ('normals') deviates significantly from age at time of the study of early-onset and late-onset aggressive adolescents, but not from age at time of the study of adolescents with early-onset and late-onset delinquent adolescents.

[1]Total sample size is 151; because of comorbidity the summation of all *n*'s is larger than 151.

[2]Smoking: 1 = never, 2 = a few times, 3 = now and then, 4 = regularly, 5 = often.

Do adolescents with aggressive, delinquent, and internalizing behavior problems and adolescents without behavior problems show different heart rate reactivity to a stress-eliciting task?

Table 2 also presents *reactivity* of heart rate and heart rate variability: the *changes* from baseline level to the stressful situation (gambling task). The early-onset delinquents showed large differences in both heart rate and heart rate variability when compared to both the adolescents without behavior problems and the late-onset delinquents. With respect to heart rate, early-onset delinquents showed a decrease in heart rate from baseline to the gambling task, whereas adolescents without behavior problems and late-onset delinquents showed an increase in heart rate ($F(1, 111) = 7.17$, $p < .01$, $d = 0.51$ and $F(1, 21) = 11.72$, $p < .01$, $d = 1.49$, respectively). In both comparisons, aggression was not a significant covariate ($F(1, 111) = .67$, $p > .10$ and $F(1, 21) = .49$, $p > .10$, respectively). The decrease in heart rate in the early-onset delinquents was associated with an increase in the measure of parasympathetic tone. Their heart rate variability showed an increase from baseline to the gambling task, whereas in adolescents without behavior problems and late-onset delinquents a decrease in heart rate variability was seen, although the difference was significant only for the late-onset delinquency group ($F(1, 21) = 5.68$, $p < .05$, $d = 1.04$). Aggression was a significant covariate ($F(1, 21) = 4.92$, $p < .05$). Figure 1 and 2 graphically present the changes in heart rate (Figure 1) and heart rate variability (Figure 2) for normal adolescents, for the combined delinquent group, and for the early-onset and late-onset delinquent groups.

Table 2
Behavior Problems, Resting Levels of Heart Rate and Heart Rate Variability, and Their Reactivity to a Stress-Eliciting Task (N = 151)[1]

		Resting levels				Reactivity			
		Heart rate		Heart rate variability		Heart rate		Heart rate variability	
	N	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Normal	92	77.74	8.68	55.75	27.97	1.84	3.60	-4.70	20.31
Aggressive	19	80.94	8.27	52.70	29.27	1.26	2.90	-1.71	11.44
Early-onset	10	80.38	8.60	50.01	26.46	1.21	2.66	-2.90	14.93
Late-onset	9	81.56	8.36	55.69	33.48	1.31	3.30	-0.38	6.31
Delinquent	25	78.67	8.44	56.83	33.12	1.17	3.77	-5.56	15.38
Early-onset	10	77.42	7.00	41.59	11.78	-1.65[2]	3.03	2.47[3]	7.07
Late-onset	15	79.43	9.35	65.97	38.53	2.86	3.15	-10.37	17.14
Internalizing	46	79.15	8.68	54.74	32.37	1.50	3.94	-6.10	24.08

[1]Total sample size is 151; because of comorbidity the summation of all *n*'s is larger than 151.
[2] Early-onset delinquent adolescents differ significantly from late-onset delinquent and normal adolescents.
[3]Early-onset delinquent adolescents differ significantly from from late-onset delinquent adolescents.

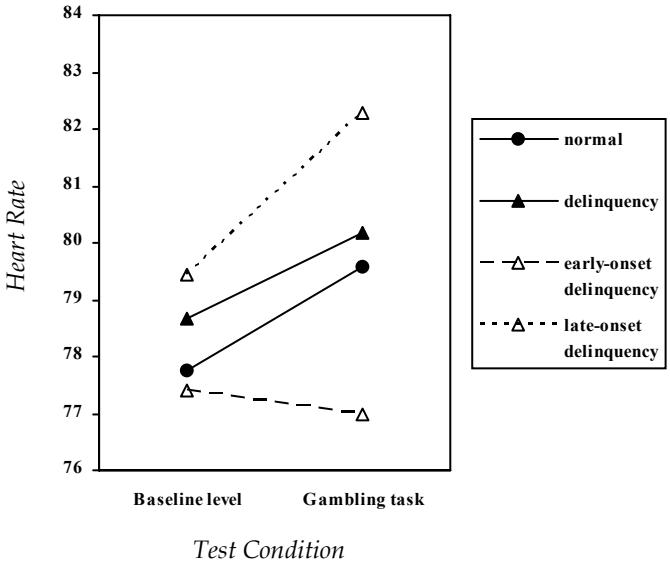

Figure 1. Heart rate in different forms of delinquency.

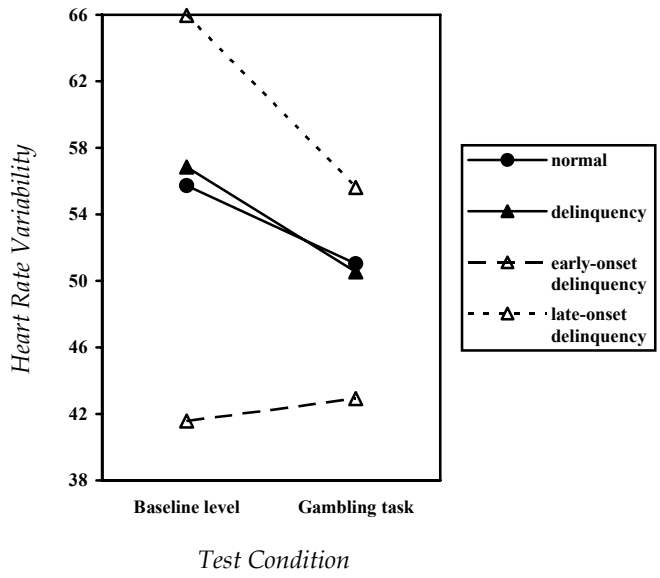

Figure 2. Heart rate variability for different forms of delinquency.

Are environmental factors related to behavior problems, to heart rate, heart rate variability, and their reactivity to stress?

There were no significant correlations between early-childhood maternal sensitive responsiveness and parental socioeconomic status on the one hand and heart rate, heart rate variability, and their reactivity to stress on the other hand. Early-childhood sensitive responsiveness did not differ between the different groups of behavior problems. Parental socioeconomic status, however, differed significantly: Parents of late-onset delinquent adolescents had a lower SES than parents of adolescents with early-onset delinquent (t (20) = -2.31, p < .05) and late-onset aggressive (t (10) = 2.04, p < .01) problems (see Table 1). Parents of early-onset delinquent adolescents had a higher SES than parents of adolescents without behavior problems (t (85) = -1.28, p < .05) and parents of adolescents with late-onset delinquent (t (20) = -2.31, p < .05) and early-onset aggressive (t (8) = 2.55, p < .05) problems.

Discussion

Resting heart rate and heart rate reactivity to a stressful situation were assessed in adolescents with and without aggressive, delinquent, and internalizing behavior problems. Although there were no significant differences between the groups in resting heart rate, heart rate reactivity to a stressful situation showed rather strong differences. Early-onset delinquents showed heart rate *hypo*reactivity to a stress-eliciting task compared with late-onset delinquent adolescents and adolescents without behavior problems. According to Cohen's criteria for weak (d = 0.20), medium (d = 0.50), and strong (d = 0.80) effects (Cohen, 1988), the effect size for the comparison of early-onset with late-onset delinquent adolescents was large and the effect size for the comparison with adolescents without behavior problems was medium. In their meta-analysis on heart rate and antisocial behavior in children and adolescents, Ortiz and Raine (2004) found a comparable effect size (d = 0.76) for heart rate reactivity during a stressor.

Heart rate *variability* suggested that these differences were in part mediated by differential responses of the *para*sympathetic nervous system. Heart rate variability showed an increase from baseline to the gambling task in the early-onset delinquents, whereas all other groups showed a decrease in heart rate variability. The early-onset delinquents differed strongly from late-onset delinquents. The difference with adolescents without behavior problems was not significant, but pointed to the same direction.

Our results show that the differentiation between early-onset and late-onset delinquency (Moffitt, 1993) is important in studying stress reactivity in adolescents. Without this differentiation, delinquents did not show a deviant stress reactivity pattern (see Figures 1 and 2). Early-onset delinquents appeared to be less aroused by stress. Ortiz and Raine (2004) suggested that antisocial individuals are lacking in anxiety, are fearless, and are particularly unresponsive

to aversive social contexts. Quay (1993) suggested that subjects with undersocialized conduct disorder are less anxious or inhibited in the presence of cues for rewards and also less sensitive to cues for punishment. They display deviant sympathetic nervous system activity, with lower levels of noradrenergic function and electrodermal responsiveness. Here we extend these findings by showing similar deviation in the responsiveness of the *para*sympathetic system during a stress-eliciting gambling task, which also dealt with rewards and punishments. All group differences in heart rate responses to this task were paralleled by reciprocal differences in our measure of heart rate variability, which is known to reflect cardiac *para*sympathetic tone (Task Force of the European Society of Cardiology the North American Society of Pacing Electrophysiology, 1996).

We found no indications for less adequate child rearing or socialization practices (although our measure was restricted to maternal parenting) in the delinquent adolescents, at least not in early childhood, pointing to possible neurobiological or genetic biases towards hyporeactivity in these individuals (Bock & Goode, 1996; Carey, 1994). The differences in heart rate reactivity between the late-onset delinquents and adolescents without behavior problems were not significant, which is in line with the results found by Raine et al. (1995). Early-onset delinquent adolescents also differed from late-onset delinquents and individuals without behavior problems with respect to IQ: early-onset delinquents had a lower IQ (see also Aguilar, Sroufe, Egeland, & Carlson, 2000; Moffitt, 1993; and Moffitt & Caspi, 2001), but IQ was not associated with the various heart rate measures. Moffitt (1993) hypothesized that life-course persistent antisocial behavior is embedded in neuropsychological deficiencies (such as heart rate and cognitive abilities). Adolescence-onset delinquents may develop in the same way as their non-antisocial peers (Fox et al., 2000), except for a period in which they are more affected by the typical exploratory and limit-testing behavior of puberty, for example delinquent or antisocial behavior (Caspi & Moffitt, 1995; Moffitt, 1993; Moffitt & Caspi, 2001). Caspi and Moffitt (1995) hypothesized that adolescence-limited antisocial behavior can be seen as a normative attempt by these adolescents to gain independence and autonomy by displaying "mature" behaviors. Note that in our study late-onset delinquents smoked more compared with all other groups, which may also be considered indicative of exploratory or risk-taking behavior characteristic for puberty. These adolescents may mimic the antisocial behavior of deviant peers because they believe they acquire a mature status this way (Aguilar, Sroufe, Egeland, & Carlson, 2000). After puberty these behaviors may decrease to normative levels of behavior problems (Moffitt, 1993; Moffitt & Caspi, 2001). Early-onset delinquent behavior may point to a neurobiological or genetic risk for antisocial behavior in children, whereas late-onset delinquent behavior may be more strongly related to environmental risk factors. Several studies have shown that the genetic component is greater in the case of antisocial behavior that persist into adult life than in antisocial behavior confined to the teenage period (DiLalla & Gottesman, 1989; Lyons et al., 1995; Rutter et al., 1997).

Continuous measures of behavior problems showed disappointingly weak associations with heart rate or heart rate reactivity. Heart rate reactivity appears to differ for behavior problems only when categorical classifications are used. Reactivity differences may surface only in those individuals who belong to the extreme end of the continuum of problem behaviours. The categorical approach may therefore show larger effect sizes than are usually found in correlational designs. A limitation of the categorical approach is, however, the rather low number of participants in the various problem behaviour groups, which in itself decreases the power for finding significant effects.

One could argue that the associations between problem behaviors and resting heart rate or heart rate reactivity might be related (also) to adoption-specific aspects or the rearing environment of the adoptive parents. In our study adoption-specific aspects (country of origin, health condition on arrival, age on arrival) did not differentiate between the groups and were not related to heart rate, heart rate variability, and their reactivity to stress. Early-childhood maternal sensitive responsiveness and parental socioeconomic status were not related either to heart rate, heart rate variability, and their reactivity to stress. The comparison between early- and late-onset delinquency did, however, show an environmental risk factor for the late-onset delinquents: the families of these adolescents had a lower socioeconomic status. In contrast, the socioeconomic status of the families of the early-onset delinquents was higher than the socioeconomic status of the families of either late-onset delinquents or adolescents without behavior problems. High socioeconomic status is generally considered a protective factor (Rutter, 1990). However, risk and protective factors are not static but depend on when they occur in a person's development, in what social context, and under what circumstances (Rutter, 1989). In the case of adopted adolescents the discrepancy between the adoptive parents' socioeconomic status and the background of the adoptees may be larger and more difficult to process for both parents and adolescents when the parents belong to a higher social stratum than the child's original background, and the children are old enough to realize this discrepancy (see also Bohman, 1970; Tieman, Van der Ende, & Verhulst, 2004; Verhulst, Althaus, & Versluis-Den Bieman, 1989).

Research with adoptive families has many strengths (Rutter et al., 1990) but inevitably some limitations, too. It is often claimed that adoptees are broadly comparable with the general population, but this is not the case (Rutter, Silberg, O'Connor, & Simonoff, 1999). First, adoptees differ with respect to adoption-specific aspects. However, in our study adoption-specific aspects (e.g., age at adoption placement) did not differentiate between the groups. Second, adoptive parents differ from other parents in being better educated and more socially advantaged, as was the case in our sample. The birth parents and the adoptive parents may also differ with respect to particular forms of psychopathology (Rutter et al., 1999), that are more common in birth parents of adopted children (Bohman, 1996; Brennan, Mednick, & Jacobsen, 1996; O'Connor et al., 1998). The findings of adoption studies are likely to be affected by the fact that the

biological pairs include a disproportionately high percentage of individuals with genetic risk characteristics, and that the adoptive parents under-represent the proportion of high-risk environments found in the general population (Rutter et al., 1999). To the extent that the adoptive families provide an under-representation of high-risk environments, the consequence will be to underestimate the strength of environmental effects, which may be the reason that we hardly found any environmental risk factors in our sample (except for a lower socioeconomic status in the families of the late-onset delinquents and a higher socioeconomic status in the families of the late-onset delinquents). Interactions between genetic vulnerability and parental maltreatment in the development of antisocial behavior problems, such as reported by Caspi et al. (2002), may be difficult to replicate in a homogeneously high-functioning sample of adoptive parents.

The different forms of aggression (early-onset and late-onset aggression) did not show any significant differences in heart rate reactivity. The aggression and delinquency syndromes of the CBCL appear to refer to divergent patterns of problem behavior. The antisocial behavior assessed in the Raine et al. (1995) and Moffit and Caspi (2001) studies, with different results for early- and late-onset antisocial individuals, may be more similar to the CBCL delinquency syndrome than to the aggression syndrome. CBCL delinquency is also more similar to antisocial behavior as studied by Moffit and Caspi (2001) with respect to sex ratio. In our study, the male-to-female ratio was 4:1 for early-onset delinquency and only 1.5:1 for late-onset delinquency. For aggression a male-to-female ratio of 4:1 was found for early-onset aggression and a similar sex ratio of 3.5:1 for late-onset aggression. Moffit and Caspi (2001) reported a male-female ratio for childhood-onset antisocial behavior of 10:1, and for adolescent-onset antisocial behavior a ratio of 1.5:1. The male-female ratio of the aggression syndrome may show stability over the life-span, whereas the male-female ratio of antisocial behavior or CBCL delinquency decreases in adolescence-limited delinquency, maybe because in adolescence boys as well as girls are provoked by their peers to mimicry their daring behaviors in order to acquire more status in the peer group. The divergent definitions and measurements of aggression and anti-social or delinquent behavior complicate the interpretation of findings from different studies in this research area.

Taken together, our findings show that delinquency and aggression may follow different developmental trajectories, and that early-onset delinquency –but not aggression– is characterized by stress hyporeactivity. The differentiation between delinquency and aggression, and between childhood-onset and adolescence-onset delinquency is crucial for our understanding of the development of externalizing problem behaviors.

References

Achenbach, T. M. (1991a). *Manual for the Youth Self-Report and 1991 profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M. (1991b). *Manual for the Child Behavior Checklist/ 4-18 and 1991 profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M. (1991c). *Integrative Guide for the 1991 CBCL/4-18, YSR, and TRF Profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Ainsworth, M. D. S., Bell, S.M., & Stayton, D. J. (1974). Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals. In M. P. M. Richards (Ed.), *The integration of a child into a social world* (pp. 99-135). London: Cambridge University Press.

Aguilar, B., Sroufe, L. A., Egeland, B., & Carlson, E. (2000). Distinguishing the early-onset/persistent and adolescence-onset anisocial behavior types: From birth to 16 years. *Development and Psychopathology*, *12*, 109-132.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*, 7-15.

Bernstein, B., & Brandis, W. (1970). Social class differences in communication and control. In W. Brandis & D. Henderson (Eds.), *Social class, language, and communication* (pp. 93-124). London: Routledge.

Bock, G. R., & Goode, J. A. (Eds.). (1996). *Genetics of criminal and antisocial behavior*. Chichester, England: Wiley.

Bohman, M. (1996). Predisposition to criminality: Swedish adoption studies in retrospect. In G. R. Bock & J. A. Goode (Eds.), *Genetics of criminal and antisocial behavior* (pp. 99-114). Chichester, England: Wiley.

Bohman, M. S. (1970). *Adopted children and their families. A follow-up study of adopted children, their background, environment and adjustment*. Stockholm: Proprius.

Boomsma, D. I., & Plomin, R. (1986). Heart rate and behavior in twins. *Merrill Palmer Quarterly*, *32*, 141-151.

Boomsma, D. I., Van de Bree, M. B., Orlebeke, J. F., & Molenaar, P. C. (1989). Resemblances of parents and twins in sports participation and heart rate. *Behavioral Genetics*, *19*, 123-141.

Brennan, P. A., Mednick, S. A., & Jacobsen, B. (1996). Assessing the role of genetics in crime using adoption cohorts. In G. R. Bock & J. A. Goode (Eds.), *Genetics of criminal and antisocial behavior* (pp. 115-128). Chichester, England: Wiley.

Carey, G. (1994). Genetics and violence. In A. J. Reiss, Jr., K. A. Miezek, & J. A. Roth (Eds.), *Understanding and preventing violence* (pp. 21-58). Washington, DC: National Academy Press.

Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., Taylor, A., & Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, *297*, 851-854.

Caspi, A., & Moffitt, T. E. (1995). The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior. In D. Cicchetti & D. Cohen (Eds.), *Manual of developmental psychopathology* (pp. 472-511). New York: Wiley.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, New Jersey: Erlbaum.

Cole, P. M., Zahn-Waxler, C., Fox, N. A., Usher, B. A., & Welsh, J. D. (1996). Individual differences in emotion regulation and behavior problems in preschool children. *Journal of Abnormal Psychology*, *105*, 518-529.

De Geus, E. J. C., Boomsma, D. I., & Snieder, H. (2003). Genetic correlation of exercize with heart rate and respiratory sinus arrhythmia. *Official journal of the American College of Sports Medicine*, *35*, 1287-1295.

De Geus, E. J. C., & van Doornen, L. J. P. (1996). Ambulatory assessment of parasympathetic/sympathtic balance by impedance cardiography. In J. Fahrenberg & M. Myrtek (Eds.), *Ambulatory assessment: Computer-assisted psychological and psychophysiological methods in monitoring and field studies* (pp. 141-163). Kirkland, WA, US: Hogrefe & Huber Publishers.

Dettling, A. C., Gunnar, M. R., & Donzella, B. (1999). Cortisol levels of young children in full-day childcare centers: Relations with age and temperament. *Psychoneuroendocrinology*, *24*, 519-536.

DiLalla, L. F., & Gottesman, I. I. (1989). Heterogeneity of causes for delinquency and criminality: Lifespan perspectives. *Development and Psychopathology*, 1, 339-349.

Ditto, B. (1993). Familial influences on heart rate, blood pressure, and self-report anxiety responses to stress: results from 100 twin pairs. *Psychophysiology*, *30*, 635-645.

Eley, T. C., Lichenstein, P., & Stevenson, J. (1999). Sex differences in the etiology of aggressive and nonaggressive antisocial behavior: Results from two twin studies. *Child Development*, *70*, 155-168.

Egeland, B., Erickson, M. F., Clemenhagen-Moon, J., Hiester, M. K., & Korfmacher, J. (1990). *24 months tools coding manual: Project steep - revised 1990 from Mother-Child Project scales*. Minneapolis: University of Minnesota, Institute of Child Development.

Erickson, M. F., Sroufe, L. A., & Egeland, B. (1985). The relationship between quality of attachment and behavior problems in preschool in a high-risk sample. In I. Bretherton & E. Waters (Eds.), Growing points of attachment: Theory and research. *Monographs of the Society for Research in Child Development*, *50*, 147-166.

Farrington, D. P. (1997). The relationship between low resting heart rate and violence. In A. Raine, P. Brennan, D. P. Farrington, & S. A. Mednick (Eds.), *Biosocial Bases of Violence* (pp. 89-106). New York: Plenum.

Fishbein, D. H., Lozovosky, D., & Jaffe, J. H. (1989). Impulsivity, aggression, and neuroendocrine responses to serotonergic stimulation in substance users. *Biological Psychiatry*, *25*, 595-611.

Fox, N. A., & Card, J. A. (1999). Psychophysiological measures in the study of attachment. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment* (pp. 226-245). New York: The Guilford Press.

Fox, N. A., Schmidt, L. A., & Henderson, H. A. (2000). Developmental psychophysiology: Conceptual and methodological perspectives. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 665-686). Cambridge: Cambridge University Press.

Garcia-Coll, C., Kagan, J., & Reznick, J. S. (1984). Behavioral inhibition in young children. *Child Development*, *55*, 1005-1019.

Garralda, M. E., Connell, J., & Taylor, D. C. (1991). Psychophysiologic anomalies in children with emotional and conduct disorders. *Psychological Medicine*, *21*, 947-957.

Ge, X., Cadoret, R. J., Conger, R. D., Neiderhiser, J. M., Yates, W., Troughton, E., & Steward, M. A. (1996). The developmental interface between nature and nurture: A mutual influence model of child antisocial behavior and parent behaviors. *Developmental Psychology*, *32*, 574-589.

Golombok, S., MacCallum, F., & Goodman, E. (2001). The "Test-Tube" Generation: Parent-Child Relationships and the Psychological Well-Being of In Vitro Fertilization Children at Adolescence. *Child Development*, *72*, 599-608.

Golombok, S., MacCallum, F., Goodman, E., & Rutter, M. (2002). Families with children conceived by donor insemination: A follow-up at age twelve. *Child Development*, *73*, 952-968.

Juffer, F., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (in press). The importance of parenting in the development of disorganized attachment: Evidence from a preventive intervention study in adoptive families. *Journal of Child Psychology and Psychiatry.*

Juffer, F., Hoksbergen, R.A.C., Riksen-Walraven, J.M.A. & Kohnstamm, G.A. (1997). Early intervention in adoptive families: Supporting maternal sensitive responsiveness, infant-mother attachment, and infant competence. *Journal of Child Psychology and Psychiatry, 38,* 1039 - 1050.

Kagan, J. (1989). Temperamental contributions to social behavior. *American Psychologist*, *44*, 668-674.

Kagan, J., Reznick, J. S., & Snidman, N. (1987). The physiology and psychology of behavioral inhibition. *Child Development*, *58*, 1459-1573.

Kagan, J., Reznick, J. S., & Snidman, N. (1988). Biological bases of childhood shyness. *Science*, *240*, 167-171.

Katona, P. G., Mc Lean, M., Dighton, D. H., & Guz, A. (1982). Sympathetic and parasympathetic cardiac control in athletes, and non-athletes at rest. *Journal of Applied Physiology*, *52*, 1652-1657.

Klaver, C. H. A. M., de Geus, E. J. C., & de Vries, J. (1994). Amulatory Monitoring System. In F. J. Maarse, L. J. M. Mulder, & W. P. B. Sjouw

(Eds.), *Computers in Psychology 5: Applications, methodes, and instrumentation* (pp. 254-268). Lisse: Swets & Zeitlinger.

Lacey, J. I., & Lacey, B. C. (1958). The relationship of resting autonomic activity to motor impulsivity. *Research Publications of the Association for Research in Nervous and Mental Disease*, *36*, 144-209.

Lahey, B. B., McBurnett, K., Loeber, R., & Hart, E. L. (1995). Psychobiology. In G. Sholevar (Ed.), *Conduct disorders in children and adolescents*. Washington, DC: American Psychiatric Press.

Loeber, R. (1982). The stability of antisocial and delinquent child behavior: A review. *Child Development*, *53*, 1431-1446.

Loeber, R., & Coie, J. (2001). Continuities and discontinuities of development, with particular emphasis on emotional and cognitive components of disruptive behaviour. In J. Hill & B. Maughan (Eds.), *Conduct disorders in childhood and adolescence*. Cambridge: Cambridge University Press.

Luteijn, F., & van der Ploeg, F. A. E. (1983). *Groninger Intelligentie Test* [Groningen Intelligence Test]. Lisse, The Netherlands: Swets & Zeitlinger.

Lyons, M. J., True, W. R., Eisen, S. A., Goldberg, J., Meyer, J. M., Faraone, S. V., Eaves, L. J., & Tsuang, M. T. (1995). Differential heritability of adult and juvenile antisocial traits. *Archives of General Psychiatry*, *52*, 906-915.

Maughan, B. (2001). Conduct disorder in context. In J. Hill & B. Maughan (Eds.), *Conduct disorders in childhood and adolescence*. Cambridge: Cambridge University Press.

Mednick, S. A., Kirkegaard-Sorensen, L., Hutchings, B., Knop, J., Rosenberg, R., & Schulsinger, F. (1977). An example of biosocial interaction research: The interplay of socioenvironmental and individual factors in the etiology of criminal behavior. In S. A. Mednick & K. O. Christianson (Eds.), *Biosocial bases of criminal behavior* (pp. 9-24). New York: Grdner.

Mezzacappa, E., Tremblay, R. E., Kindlon, D., Saul, J. P., Arseneault, L., Seguin, J., Pihl, R. O., & Earls, F. (1997). Anxiety, antisocial behavior, and heart rate regulation in adolescent males. *Journal of Child Psychology and Psychiatry*, *38*, 457-469.

Moffitt, T. E. (1993). Adolescence-limited and life-course persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674-701.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescent-limited pathways among males and females. *Development and Psychopathology*, *13*, 355-375.

Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). *Sex differences in antisocial behavior: Conduct disorder, delinquency, and violence in the Dunedin longitudinal study*. Cambridge, England: Cambridge University Press.

O'Connor, T. G., Deater-Deckard, K., Fulker, D., Rutter, M., & Plomin, R. (1998). Genotype-environment correlations in late childhood and early

adolescence: Antisocial behavioral problems and coercive parenting. *Developmental Psychology*, *34*, 970-981.

Ortiz, J., & Raine, A. (2004). Heart rate level and antisocial behavior in children and adolescents: A meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 154-162.

Patrick, C. J., Zempolich, K. A., & Levenston, G. K. (1997). Emotionality and violent behavior in psychopaths: A biosocial analysis. In A. Raine, P. A. Brennan, D. P. Farrington, & S. A. Mednick (Eds.), *Biosocial bases of violence* (pp. 145-161). New York: plenum.

Porges, S. W. (1995). Orienting in a defensive world: Mammalian modifications of our evolutionary heritage: A Polyvagal Theory. *Psychophysiology*, *32*, 301-318.

Porges, S. W. (2001). The polyvagal theory: Phylogenetic substrates of a social nervous system. *International Journal of Psychophysiology*, *42*, 123-146.

Quay, H. C. (1993). The psychobiology of undersocialized aggressive conduct disorder: A theoretical perspective. *Development and Psychopathology*, *5*, 165-180.

Raine, A. (1993). *The psychopathology of crime: Criminal behavior as a clinical disorder*. San Diego: Academic Press.

Raine, A. (1996). Autonomic nervous system activity and violence. In D. M. Stoff & R. B. Cairns (Eds.), *Neurobiological approaches to clinical aggression research* (pp. 145-168). Mahwah, NJ: Lawrence Erlbaum.

Raine, A.(1997). Psychophysiology and antisocial behavior: A biosocial perspective and a prefrontal dysfunction hypothesis. In D. Stoff, J. Breiling, & J. D. Maser (Eds.), *Handbook of antisocial behavior* (pp. 289-304). New York: Wiley.

Raine, A. (2002). Annotation: The role of prefrontal deficits, low autonomic arousal, and early health factors in the development of antisocial and aggressive behavior in children. *Journal of Child Psychology and Psychiatry*, *43*, 417-434.

Raine, A., Venables, P. H., & Williams, M. (1990a). Autonomic orienting responses in 15-year-old male subjects and criminal behavior at age 24. *American Journal of Psychiatry*, *147*, 933-937.

Raine, A., Venables, P. H., & Williams, M. (1990b). Relationships between central and autonomic measures of arousal at age 15 years and criminality at age 24 years. *Archives of General Psychiatry*, *47*, 1003-1007.

Raine, A., Venables, P. H., & Williams, M. (1995). High autonomic arousal and elektrodermal orienting at age 15 years as protective factors against criminal behavior at age 29 years. *American Journal of Psychiatry*, *152*, 1595-1600.

Rogeness, G. A., Cepeda, C., Macedo, C. A., Fisher, C., & Harris, W. R. (1990). Differences in heart rate and blood pressure in children with conduct disorder, major depression, and separation anxiety. *Psychiatry Research*, *33*, 199-206.

Rutter, M. (1989). Pathways from childhood to adult life. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *30*, 23-51.

Rutter, M. (1990). Psychosocial resilience and protective mechanisms. In J. E. Rolf (Ed.), *Risk and protective factors in the development of psychopathology* (pp. 181-214). Cambridge: Cambridge University Press.

Rutter, M., Bolton, P., Harrington, R., Le Couteur, A., Macdonald, H., & Simonoff, E. (1990). Genetic factors in child psychiatric disorders: I. A review of research strategies. *Journal of Child Psychology and Psychiatry*, *31*, 3-37.

Rutter, M., Maughan, B., Meyer, J., Pickles, A., Silberg, J., Simonoff, E., & Taylor, E. (1997). Heterogeneity of antisocial behavior: Causes, continuities, and consequences. In R. Dienstbier (Series Ed.) & D. W. Osgood (Vol. Ed.), *Nebraska Symposium on Motivation: Vol. 44. Motivation and delinquency*. Lincoln: University of Nebraska Press.

Rutter, M., Silberg, J., O'Connor, T., & Simonoff, E. (1999). Genetics and child psychiatry: I Advances in quantitative and molecular genetics. *Journal of Child Psychology and Psychiatry*, *40*, 3-18.

Scarpa, A., Raine, A., Venables, P. H., & Mednick, S. A. (1997). Heart rate and skin conductance in behaviorally inhibited Mauritian children. *Journal of Abnormal Psychology*, *106*, 182-190.

Slutske, W., Heath, A., Dinwiddie, S., Madden, P., Bucholz, K., Dunne, M., Statham, D., & Martin, N. (1997). Modeling genetic and environmental influences in the etiology of conduct disorder: A study of 2,682 adult twin pairs. *Journal of Abnormal Psychology*, *106*, 266-279.

Stams, G.J.J.M., Juffer, F., Rispens, J., & Hoksbergen, R.A.C. (2000). The development and adjustment of 7-year old children adopted in infancy. *Journal of Child Psychology and Psychiatry*, 41, 1025-1037.

Stams, G. J. M., Juffer, F., Van IJzendoorn, M. H. (2002). Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: The case of adopted children and their biologically unrelated parents. *Developmental Psychology*, *38*, 806-821.

Stokstad, E. (2002). Violent effects of abuse tied to gene. *Science*, *297*, p. 752.

Suomi, S. J. A. (2000). Biobehavioral perspective on developmental psychopathology: Excessive aggression and serotonergic dysfunction in monkeys. In A. J. Sameroff & M. Lewis (Eds.), *Handbook of developmental psychopathology* (2nd edn, pp.237-256). New York: Kluwer Academic/Plenum Publishers.

Susman, E. J., Granger, D. A., Murowchick, E., Ponirakis, A., & Worrall, B. K. (1996). Gonadal and adrenal hormones: Developmental transitions and aggressive behavior. *New York Academy of Sciences*, *794*, 16-30.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Boston: Allyn & Bacon.

Task Force of the European Society of Cardiology the North American Society of Pacing Electrophysiology. (1996). Heart Rate Variability: Standards of

Measurement, Physiological Interpretation, and Clinical Use. *Circulation*, *93*, 1043-1065.

Tieman, W., Van der Ende, J., & Verhulst, F. C. (2004, March). *Adoptiekinderen als volwassenen: vervolg-onderzoek naar het functioneren van interlandelijk geadopteerden* [Adopted children in adulthood: longitudinal research on the development of internationally adopted children]. Paper presented at the meeting of the Adoption Triad Research Center, Leiden University, Leiden, The Netherlands.

Van Hulle, C. A., Corley, R., Zahn-Waxler, C., Kagan, J., & Hewitt, J. K. (2000). Early childhood heart rate does not predict externalizing behavior problems at age 7 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 1238-1244.

Vander, A., Sherman, J., & Luciano, D. (2001). *Human physiology: the mechanisms of body function*. New York: McGraw-Hill.

Verhulst, F. C., Althaus, M., & Versluis-Den Bieman, H. J. M. (1989). Problem behavior in international adoptees: I. An epidemiological study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *29*, 94-103.

Verhulst, F. C., Van der Ende, J. (1993). 'Comorbidity' in an epidemiological sample: A longitudinal perspective. *Journal of Child Psychology and Psychiatry*, *34*, 767-784.

Verhulst, F. C., Van der Ende, J., & Koot, H. M. (1996). *Handleiding voor de CBCL/4-18*. [Manual for the Child Behavior Checklist/4-18, Dutch version.] Rotterdam, The Netherlands: Erasmus University Rotterdam.

Verhulst, F. C., Van der Ende, J., & Koot, H. M. (1997b). *Handleiding voor de Youth Self Report-YSR*. [Manual for the Youth Self Report-YSR, Dutch version.] Rotterdam, The Netherlands: Erasmus University Rotterdam.

Volavka, J. (1995). *Neurobiology of violence*. Washington, DC: American Psyciatric Association.

Vrijkotte, T. G. M., Van Doornen, L. J. P, & De Geus, E. J. C. (2000). Effects of work stress on ambulatory blood pressure, heart rate, and heart rate variability. *Hypertension*, *35*, 880-886.

Chapter 4
Social Development from Infancy to Adolescence: Longitudinal and Concurrent Factors in an Adoption Sample[3]

Abstract

In the present longitudinal study, early adopted children (*N* = 120) were followed from infancy to adolescence to assess the continuity of the children's social development. This study allowed for more conclusive evidence of the influence of early and concurrent factors on adolescent's social development, independent of shared genetic factors between children and parents. Results showed that social development was stable, even after controlling for background variables and temperament. Concurrent temperament and maternal sensitivity influenced middle childhood and adolescent social development. Early parent-child relationships were indirectly associated with social development in adolescence, through the influence on social development in middle childhood. Bowlby's (1973, 1980) thesis that adaptation is a product of both developmental history *and* current circumstances is supported.

Introduction

The goal of the present prospective, longitudinal study is to investigate the continuity of children's social development and to examine the relative influence of early, middle childhood, and concurrent factors on social development in adolescence. The emphasis is on maternal sensitivity and infant attachment security, attachment disorganization, and temperament as predictors in early childhood, and maternal sensitivity, child temperament and social development as predictors in middle childhood. The adolescents involved in the study are biologically unrelated to their adoptive parents and the study thus allows for more conclusive evidence of child-rearing or social-interactive influences on adolescent's development, independent of shared genetic factors between children and parents (Rowe, 1993a).

Since decades, people speculate on the role of early and current experiences in shaping human development. Some researchers view current experiences as more important than previous ones, others assign greater

[3] This Chapter is being prepared for publication as: Jaffari-Bimmel, N., Juffer, F., Van IJzendoorn, M. H., & Bakermans-Kranenburg, M.J. (in prep.). Social development from infancy to adolescence: Longitudinal and concurrent factors in an adoption sample.

importance to early experiences. Jerome Kagan (1984), for example, used a tape-recording analogy. The tape remains the same if current experiences are the same as past experiences, but it changes if current behavior leads to different consequences. Lewis (1997) argued that life is not orderly or predictable and that the behavior of a child reflects the context in which it occurs. If the environment changes from good to bad, than the behavior of the child changes from good to bad. In these views, current experiences are more important in predicting development or behavior than early or past experiences. In contrast, Erikson (1963) stated that each stage of psychosocial development is influenced by the previous stage. For example, basic trust gained through close relationships with adults in infancy influences development in toddlerhood (DeHart, Sroufe, & Cooper, 2004). Bowlby (1973, 1980) assigned an important role to both early and current experiences. In his view, adaptations are the product of previous patterns of adaptation *and* of new experiences. For example, in attachment theory, an important role is assigned to early patterns of attachment, with consequences for later social development (Bowlby, 1973, 1980; Sroufe, 2000). Following this theory, a developmental approach should examine both prior and concurrent experiences and adjustment (Sroufe, 2000; Sroufe, Egeland, & Kreutzer, 1990).

Previous longitudinal studies on biologically related parent-child dyads found evidence for the predictive value of attachment, parenting, and temperament on later social development. Attachment research showed that infant-mother attachment security is an antecedent of children's social functioning over time (e.g., Berlin, Cassidy, & Belsky, 1995; Elicker, Englund, & Sroufe, 1992; Fagot, 1997; Kerns, 1994; Shulman, Elicker, & Sroufe, 1994; Thompson, 1999; Volling & Belsky, 1992; Youngblade & Belsky, 1992; Zimmermann, Maier, Winter, & Grossmann, 2001). Parental sensitive responsiveness has also been shown to be a precursor of social development (e.g., Belsky, 1981, 1984; Belsky, Lerner, Spanier, 1984; Borkowski, Ramey, & Bristol-Power, 2002; Fagot, 1997; Sroufe, Egeland, & Carlson, 1999; Volling & Belsky, 1992; Youngblade & Belsky, 1992). Research on temperament showed links between temperament and social development (e.g., Rothbart, Ahadi, & Hershey, 1994).

However, relations between early childhood factors and later adjustment may be indicative of coherence in individual development and continuity in childrearing context (Lamb, 1984; Lewis, 1997; Sroufe, 1979; Sroufe, Carlson, Shulman, 1993). Lewis (1997) argued that the child's concurrent environment is rarely observed. For example, insecure attachment of a child may be explained by early inadequate parenting of the mother, but it may also be explained by continued and concurrent poor parenting. If this is true, current experiences may be more important in predicting development or behavior than early or past experiences. Moreover, a major disadvantage of studies on biologically related parents and children is that associations between parent-child variables (for example, mother-child attachment) and parent variables (for example, maternal sensitive responsiveness) on the one hand and child

variables (for example, the child's adjustment) on the other hand, may always be (partly) determined by genetic associations. For example, a major disadvantage of much previous work on the influence of parenting on children's adjustment is the confounding of parenting effects and genetic similarities (Rowe, 1993a, 1993b). Longitudinal studies on adopted children make it possible to examine the interplay of individual child characteristics and parenting style across time independent of genetic similarities.

To date, only few studies followed adopted children over a prolonged period of time (Fergusson, Lynskey, Horwood, 1995; Hodges & Tizard, 1989a, Hodges & Tizard, 1989b; Hoopes, 1982; O'Connor, Jenkins, Hewitt, DeFries, & Plomin, 2001; Plomin, Fulker, Corley, & DeFries, 1997; Simon, 1996; Verhulst & Versluis–den Bieman, 1995). The findings of these longitudinal adoption studies are inconclusive as they suffer from various shortcomings. First, most longitudinal adoption studies did not start at an early age of the adopted children and included both early and later adopted children. Because of this, the confounding factors of prolonged or extreme deprivation before the adoption may also exert an influence on the development of the children. Also, prolonged physical and psychological suffering before the adoption may affect later adopted children more. Moreover, assessments of the early development of the adopted children are often not available. Second, previous longitudinal adoption studies often do not use a variety of intensive measurements, like observations. Parent- or self-report questionnaires are the most frequently used measurements. Third, the studies often include only two times of measurement and the time-intervals are short. Finally, most of the time, the sources of information are restricted to the adoptive mothers and the children themselves.

The present study is the first to examine the role of infant attachment, maternal sensitive responsiveness and child temperament on the social development of adolescents adopted internationally at an early age (before the age of six months). All children were followed from infancy, so several indices of the child's early development and relationships were available to study the etiology and course of the adopted children's social development. The adopted children's social development was examined from a broad longitudinal perspective with multiple indicators and with assessments in multiple contexts. Different measures were used (observations, questionnaires, interviews, Q-sorts, and socio-metric data), different times of measurement (infancy, middle childhood, and adolescence), and multiple sources of information (the children themselves, mothers, teachers, classmates).

Findings from a previous study of the present sample at age 7 showed that easy temperament in early childhood was associated with more positive social development at 7 years (Stams, Juffer, & Van IJzendoorn, 2002). Higher quality of both early and contemporaneous parent-child relationships, in terms of infant attachment security and early- and middle-childhood maternal sensitivity, was also predictive of favorable social development at age 7. Children who encountered more than two risk factors, such as difficult temperament and stressful life events, showed lower levels of adjustment at age

7. In contrast, the presence of two or more protective factors, such as secure attachment and higher levels of maternal sensitivity, predicted favorable adjustment at age 7 (Stams et al., 2002).

In the present follow up, at age 14, the continuity of the adopted children's social development is assessed, and the relative influence of early, middle childhood, and concurrent factors on adolescent social development is examined. We expect to find continuity in social development from middle childhood to adolescence. From the theoretical framework of attachment theory, we predict that secure child-mother attachment relationships in early childhood and higher maternal sensitive responsiveness in early and middle childhood are related to higher levels of social development of adopted children in adolescence. In this model stressful life events and changes in childrearing environment might affect the child's social development (Main & Hesse, 2003; Waters, Hamilton, & Weinfield, 2000). Less secure and more disorganized child-mother attachment relationships in early childhood and lower maternal sensitive responsiveness in early and middle childhood may increase the risk for less optimal social adaptation. In the absence of genetic associations between parent and child, we expect children's social development to be (partly) determined by concurrent as well as earlier parenting and child characteristics. The influence of early experiences on later development can only be determined when concurrent environmental influences and early and later child characteristics are taken into account. We examined, therefore, whether the quality of the parent-infant relationship predicted adolescents' social development over and above the effects of constitutional factors such as gender and temperament, over and above the effects of concurrent parent-child relationships and child characteristics, and independent of genetic similarities between children and parents.

Method

Participants

In the present longitudinal study, 160 internationally adopted children were prospectively followed from infancy to age 14. For 120 families (51 boys and 69 girls) data were available from the study in infancy, middle childhood, and adolescence (attrition rate of 18%). In the first stage of the study an intervention was tested in 130 of the 160 families, starting when the child was 5 months of age. This short-term early intervention was implemented in three sessions at home between 6 and 9 months in a randomly assigned experimental group, and results were compared with a control group. The adoptive families were randomly recruited through Dutch adoption organizations and the adopted children were not selected on present or expected future problems. The parents were not aware of the intervention when they entered the study. The intervention was not repeated during the following years. The results of the intervention study were reported elsewhere (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005; Juffer, Hoksbergen, Riksen-Walraven, & Kohnstamm,

1997; Stams, Juffer, Van IJzendoorn, & Hoksbergen, 2001). In the present study, we controlled for possible effects of the intervention on adolescents' social development. The children were adopted from Sri Lanka (n = 64), South Korea (n = 38), and Colombia (n = 18) and were placed in the adoptive families before the age of 6 months (M = 10.45 weeks; SD = 5.35). The adoptive parents were Caucasian white, and in all families the mother was the primary caregiver. At the time of the birth of the children the mean age of the adoptive fathers was 34.91 (SD = 3.37) and of the adoptive mothers 32.73 (SD = 3.29). The adoptive families were predominantly from middle-class or upper middle-class backgrounds (Stams et al., 2002). The adoptive children were neither selected by nor matched to the characteristics of their future adoptive parents. Placement of a particular child in an adoptive family was contingent upon the adoptive parents' place on the waiting list of an adoption organization.

Parents and adolescents gave various reasons for not participating at 14 years. The major reasons were disinterest and health problems of family members, and some mothers or adolescents had no time available because of their full-time employment outside the home (adoptive mothers) or because of school, homework, sports and/or friends (adolescents). Four families did not participate because the adolescent was living in a mental health setting. Six mothers had died of incurable illnesses. A series of separate Bonferroni-corrected statistical tests, with the initial level of significance set at $p < .10$, confirmed the absence of selective attrition with respect to the outcome and background variables.

Procedure

Families were visited at home at 5, 6, 9, and 12 months and came to the laboratory at 12, 18, and 30 months. At age 7, families were visited at home to observe mother-child interaction, to interview the mother, and to administer questionnaires. The school was visited in order to have a questionnaire and a Q-sort completed by the adopted child's teacher and to interview classmates. At age 14, families were visited at home again to observe mother-child interaction, to interview the adolescent and the adoptive parents, and to administer questionnaires and a Q-sort. Parents and adolescents were asked for consent to send the adolescents' teacher a questionnaire. Teachers were sent questionnaires by mail.

Measures

Whenever possible, measures used at prior assessments were repeated in order to support the longitudinal approach. For example, maternal sensitive responsiveness at 14 years was coded with the same rating scales used at 12, 18, 30 months and 7 years (Egeland/Erickson scales; Erickson, Sroufe, & Egeland, 1985). If necessary, we used comparable instruments, or adapted tasks, in order to have age-adequate measures. Some instruments were adapted to make them age-adequate (see below). Table 1 presents a summary of the assessments at the different ages.

Health condition on arrival (5 months). At the child's age of 5 months, adoptive parents reported about their child's health condition on arrival. Health condition on arrival was an index of the infant's health condition from the time of birth until arrival in the adoptive family (Stams et al., 2002). The health score was computed by a standardized summation of three variables: birth weight, incidence of prematurity, and health problems on arrival (reversed). A high score represented a good health condition. Principal components analysis showed a one-dimensional solution with an explained variance of 51%. The standardized item reliability was .51 (N = 120). The health scores ranged from 0.00 to 0.68 (M = 0.38, SD = 0.13, N = 120).

Table 1
Assessments at Different Ages of the Longitudinal Study

5-30 months	7 years	14 years
Background variables		
Gender of the child		
Country of origin		
Age on arrival		
Health condition on arrival		
Mixed vs. all-adoptive families		
Experimental vs. control		
Attachment security		
Attachment disorganization		
Perceived temperament	Perceived temperament	Perceived temperament
Maternal sensitivity	Maternal sensitivity	Maternal sensitivity
	Socioeconomic status	Socioeconomic status
	Stressful life events	Stressful life events
	Social development	Social development

Infant-mother attachment security (12 months). At 12 months, attachment assessments were conducted using Ainsworth's standardized Strange Situation laboratory procedure (Ainsworth, Blehar, Waters, & Wall, 1978). This procedure activates the infant's attachment system as a response to the presence of an unfamiliar adult and two brief separations from the parent, followed by a reunion. On the basis of videotaped recordings of their Strange Situation behavior, infants were assigned into one of three patterns of attachment: insecure avoidant (A), secure (B), and insecure resistant/ambivalent (C). *Secure* infants are eager to explore the laboratory playroom in the presence of the attachment figure but show signs of missing the attachment figure when he or she leaves. On reunion, these infants actively seek interaction, are comforted immediately by contact, and soon return to exploration and play. *Avoidant* infants show little or no response to leave taking. Even in absence of the attachment figure, they continue to explore the environment and, on reunion, they avoid the parent, look away and turn toward the toys. *Ambivalent* infants remain relatively uninterested in exploration. They show great distress on

separation and a mixture of contact-seeking and resistant behavior on reunion. They are difficult to comfort following stress.

Each videotape was scored independently by two out of three observers. Coders were trained by an experienced rater and were blind to other information concerning the dyad. Interrater reliability for the three main attachment classifications (A, B, and C) ranged from .80 to 1.0 (Cohen's kappas). In the case where a different classification was given, consensus was reached after discussion. The attachment classifications were distributed as follows: 76% secure (n = 91), 22% avoidant (n = 26), and 3% resistant (n = 3). A continuous scale for attachment security was used in our analyses because there was insufficient representation of ambivalent children among attachment classifications to conduct robust analyses, and in order to gain statistical power in regression analyses. The continuous scores for attachment security were computed according to a rule that was derived from propositions by Main, Kaplan, and Cassidy (1985) and Van IJzendoorn, Sagi, and Lambermon (1992). A high score on the continuous scale indicated that the infant was able to use the mother as a secure base when exploring the environment and when distressed. Intercoder reliability for the continuous scale ranged from .81 to .95 (intraclass correlations), using four pairs of raters. The mean score was 3.35 (SD = 1.19, N = 120).

The Main and Solomon (1990) coding system was used to assess disorganization of attachment (D). *Disorganized/disoriented* infants show temporary loss of a consistent strategy for dealing with the stress involved in the Strange Situation and display (briefly) disorganized or disoriented behavior in the parents' presence (e.g., stereotypical movements, anomalous movements, or the freezing of all movement with a disoriented expression). The coding of the continuous rating scale for intensity of disorganized behavior showed a satisfactory intercoder reliability on 20 cases (r = .86; Juffer et al., 2005). The mean score was 2.89 (SD = 1.98, N = 120). A continuous 6-point scale for security of attachment was constructed, based on the continuous scale for the three-way system designed by Main, Kaplan and Cassidy (1985) and Van IJzendoorn, Sagi and Lambermon (1992), extended with the D classifications (Van Londen, Juffer, & Van IJzendoorn, in prep.). The most secure category (B3) received a score of 6, and the other B-classifications without D components a score of 5 (B1, B2, and B4). The classifications B/A, B/C and B/D received a score of 4. An A or C classification without disorganized attachment received a score of 3. The classifications D/B, A/D and C/D were coded 2, and the most insecure categories (D/A and D/C) were given a score of 1. The mean score was 4.23 (SD = 1.41, N = 120).

Maternal sensitive responsiveness (12, 18, and 30 months, 7 and 14 years). At 12, 18, 30 months, 7 and 14 years, the mother's behavior was assessed in terms of sensitive responsiveness. At the first assessments (12, 18, and 30 months), maternal sensitive responsiveness was assessed in free-play and task situations (e.g., making a simple puzzle, building a tower of blocks), both in the child's home and at the laboratory. The Ainsworth scales were used to code sensitivity

and cooperation (Ainsworth, Bell, & Stayton, 1974), and the Egeland/Erickson scales (Egeland, Erickson, Clemenhagen-Moon, Hiester, & Korfmacher, 1990; Erickson, Sroufe, & Egeland, 1985) were used to code emotional support, respect for the child's autonomy, structure and limit setting, hostility, and quality of instruction. The averaged Cohen's kappa's for agreement within one scale point were .91 (12 months), .90 (18 months), and .97 (30 months) (Stams et al., 2002). Principal-components analyses revealed a one-dimensional solution with an explained variance of 42% (12 months), 60% (18 months), and 50% (30 months). The internal consistencies, in terms of Cronbach's standardized item alpha's, were .71 (12 months; N = 117), .82 (18 months; N = 111), and .81 (30 months; N = 105). For each age (12, 18, and 30 months) an overall score for maternal sensitive responsiveness was computed, which was the standardized summation of all scale scores divided by their number. Principal-components analysis on these three scores revealed a one-dimensional solution with an explained variance of 60%. Cronbach's standardized item alpha was .66 (N = 120). The three scores for maternal sensitive responsiveness were combined into one overall early childhood score, which ranged from -2.03 to 1.42 (M = -0.01, SD = 0.78, N = 120).

At 7 years, maternal sensitive responsiveness was assessed in two task situations (solving a difficult puzzle and making a drawing together on the same sheet of paper) in the child's home. The Egeland/Erickson scales (Egeland et al., 1990; Erickson et al., 1985), and the Emotional Availability Scales, Middle Childhood Version (EAS; Biringen & Robinson, 1991; Biringen, Robinson, & Emde, 1993) were used to code supportive presence, intrusiveness, sensitivity and timing, hostility, clarity of instruction (Egeland/Erickson scales), sensitivity, structuring/intrusiveness, and hostility (Emotional Availability Scales). Intercoder reliability, in terms of Cohen's kappa for agreement within one scale point, was established on 60 tapes. The averaged kappa's ranged from .78 (sensitivity-Emotional Availability Scales) to .97 (hostility-Egeland/Erickson scales) (Stams et al., 2002). Principal-components analysis revealed a one-dimensional solution, with an explained variance of 44%. Cronbach's standardized item alpha was .76 (N = 116). The overall score for maternal sensitive responsiveness was obtained by averaging the scores after standardization and ranged from -1.73 to 1.59 (M = -0.01, SD = 0.69, N = 116).

At 14 years, maternal sensitive responsiveness was assessed in a problem-solving task in the family's home. The mother got solutions of several difficult puzzles and was asked to assist her child in solving the puzzles. An episode of 10 minutes was videotaped. Again, the Egeland/Erickson scales (Egeland et al., 1990; Erickson et al., 1985) were used to code supportive presence, intrusiveness, sensitivity and timing, and clarity of instruction. The scale hostility was not included because of the small variance at 14 years. Intercoder reliability was established on 30 tapes. Intra-class correlations ranged from .91 (sensitivity and timing) to .95 (intrusiveness and clarity of instruction). Principal-components analysis revealed a one-dimensional solution, with an explained variance of 67%. Cronbach's standardized item alpha was .87 (N = 120). The overall score for maternal sensitive responsiveness was obtained by

averaging the scores after standardization and ranged from -2.27 to 1.43 (M = -0.01, SD = 0.80, N = 120).

Although the Egeland/Erickson scales (Egeland et al., 1990; Erickson et al., 1985) were developed for rating maternal sensitive responsiveness in early childhood, we used these scales in middle childhood and adolescence. We used age-adequate tasks at all assessments and took into account the more frequent verbal interaction between mother and child in middle childhood and adolescence compared with the more frequent physical contact between mother and child in early childhood. Also, the same person (the second author) was responsible for the training of the coders at all assessments (infancy, middle childhood and adolescence). For a detailed description of the use of the Egeland/Erickson scales in middle childhood, see the method section of Stams et al. (2002, p. 810). Test-retest reliability and convergent validity in middle childhood were satisfactory (Stams et al., 2002).

Perceived temperament (12, 18, and 30 months, 7 years, 14 years). At 12, 18, and 30 months, and 7 and 14 years, temperament was assessed with the Dutch Temperament Questionnaire (Kohnstamm, 1984), which is an adaptation of the Infant Characteristics Questionnaire (Bates, Freeland, & Lounsbury, 1979; Bates, 1980, 1987). The child's behavior was rated by the adoptive mothers on nineteen 7-point scales. A high score on the scale indicated that the mother perceived her child as relatively difficult on aspects such as sociability, persistence, adaptability, and mood. Although the Dutch Temperament Questionnaire (Kohnstamm, 1984) was developed for rating temperament in early childhood, we used this questionnaire in middle chilhood and adolescence as well. A few words were rephrased to make the questionnaire age-adequate. Principal components analysis revealed a one-dimensional solution with an explained variance of 78% in infancy, 33% at 7 years, and 37% at 14 years. Cronbach's alpha's were .86 (N = 120), .72 (N = 119), and .74 (N = 118), respectively. On the basis of moderate to high correlations between different measurement points in infancy (.55 < r < .72), an overall score for the child's perceived difficulty during early childhood was computed (Stams et al., 2002). The overall score ranged from –3.27 to 2.51 (M = 0.00, SD = 1.00, N = 120) in infancy, from -1.74 to 2.90 (M = 0.00, SD = 1.00, N = 119) at 7 years, and from -1.95 to 3.51 (M = 0.00, SD = 1.00, N = 118) at 14 years.

In infancy, two factors were extracted: mood and resistence (Juffer, 1993). In middle childhood and adolescence, temperament consisted of three scales: aggression, reactivity, and restlessness (Stams et al., 2002). Principal components analysis revealed one-dimensional solutions with explained variances which ranged from 42% (restlessness at 14 years) to 61% (aggression at 7 years). Cronbach's alpha's were, respectively, .86, .80, and .82 at 7 years and .90, .88, and .75 at 14 years.

Sociometric status (7 years). At age 7, sociometric status of the adopted child was assessed in individual interviews at school with all classmates. None of the children knew which child we were focusing on (the adopted target child). Each child named three classmates as most liked, and three classmates as most

disliked. The 'like' score was the total number of times a child was rated as liked and the 'dislike' scores was the total number of times a child was rated as disliked. The standardized difference of the standardized like score and the standardized dislike score, the standardized preference score, was considered as indicative of the child's sociometric status or peer group popularity (Cillessen & Ten Brink, 1991).

School Behavior Assessment List (7 years). At 7 years, the socio-emotional behavior of the adopted child at school was assessed with the School Behavior Assessment List (SCHOAL; Bleichrodt, Resing, & Zaal, 1993) completed by the teacher. The SCHOAL consists of 52 items, measured on 6-point scales, with pairwise comparisons of opposite adjectives that describe personality characteristics. In the present study, one scale from the 7-years assessment was used: agreeable behavior. Cronbach's alpha for this scale was .86 (N = 120).

California Child Q-set (7 and 14 years). The California Child Q-set (CCQ; Block & Block, 1980; Van Lier, Haselager, Hoeben, & Van Lieshout, 1992; Van Lieshout, Riksen-Walraven, Ten Brink, Siebenheller, Mey, Koot, Janssen, & Cillessen, 1986) was administered to the child's mother and teacher at 7 years and to the mother at 14 years. It consists of 100 cards, with descriptions of behavioral, affective and cognitive characteristics of a child. Mothers and teachers had to sort the items into a nine-category, forced distribution that ranged from (1) extremely uncharacteristic to (9) extremely characteristic of the child. Scale scores were calculated for prosocial competence, antisocial competence, and social esteem (Van Lier et al, 1992; Van Lieshout et al., 1986). Profile scores were calculated for adult or peer acceptance and rejection, and were obtained by correlating the actual Q-sort with expert profiles for each construct (Van Lier et al, 1992; Van Lieshout et al., 1986). At 7 years, Cronbach's alpha's ranged from .52 (social esteem) to .87 (prosocial competence; N = 120). At 14 years, Cronbach's alpha's ranged from .66 (social esteem) to .84 (prosocial competence; N = 120).

Child Behavior Checklist/Teacher's Report Form (7 and 14 years). At 7 and 14 years, the Child Behavior Checklist (CBCL; Achenbach, 1991a; Verhulst, Van der Ende, & Koot, 1996) and the Teacher Report Form (TRF; Achenbach, 1991b; Verhulst, Van der Ende, & Koot, 1997) were administered to respectively the adoptive mother and the teacher of the child. These measurements are standardized questionnaires to assess the adolescent's behavior problems and competence. The questionnaires have satisfactory reliability and good validity (Achenbach, 1991a, 1991b; Verhulst, Van der Ende, & Koot, 1996, 1997; Verhulst, Koot, & Van der Ende, 1994). The CBCL and TRF contain 118 items describing behavioral/emotional problems. The problem items are scored on similar 3-point scales: a 0 is given if the problem is *not true* for the child, a 1 if the item *somewhat or sometimes true* and a 2 if the item *very true or often true*. Syndrome scores were obtained for social problems. At 7 and 14 years, Cronbach's alpha's for the CBCL were .82 and .84 (N = 120), and for the TRF .74 and .76 (N = 99), respectively. Appropriate school behavior was assessed with the TRF. Teachers

indicated on a 7-point rating scale the degree to which the child behaved appropriately.

Stressful life events (7 and 14 years). A 4-point scale was developed to assess the degree to which the family had experienced stressful life-events during the last two years. The instrument was completed by the adoptive mother and consisted of nine items: physical health problems of relatives, mental health problems of relatives, bereavement, unemployment, divorce, financial problems, marital problems, problems at work, and conflict with relatives, neighbours or neighbourhood. Cronbach's alpha was .68 (N = 116) at 7 years and .68 (N = 118) at 14 years. The overall score for stressful life events was the standardized summation of all items divided by their number and was transformed to normal by an inverse method (Tabachnick & Fidell, 2001). The scores ranged from 0.01 to 0.77 (M = 0.21, SD = 0.20, N = 116) at 7 years and 0.00 to 2.40 (M = 0.47, SD = 0.46, N = 118) at 14 years.

Socioeconomic status (7 and 14 years). At 7 and 14 years, socioeconomic status was assessed as a combination of the educational and vocational background of both parents. It was computed on the basis of sample-specific factor loadings and standard deviations. Mean scores correspond to socioeconomic strata in the following way: 3 to 9, lower class; 9 to 12, middle class; and 12 to 16, upper class (Bernstein & Brandis, 1970). Principal-components analysis revealed a one-dimensional solution with an explained variance of 69% at 7 years and 62% at 14 years. Cronbach's alpha was .82 at 7 years and .79 at 14 years. The mean score was 10.03 (SD = 2.75, N = 120, range 2.99 to 14.73) and 9.53 (SD = 2.36, N = 119, range 3.05 to 14.02), respectively, which means that the sample can be considered as middle class.

Composite score. At 7 and 14 years, a composite score was calculated for social development. General scores were obtained rather than scores from single measurements or informants, in order to reduce the number of dependent variables, thereby preventing change capitalization, to ensure high quality data, and to minimize sources of error and subject loss. The scores were derived from different measures (questionnaires, Q-sorts, and socio-metric data), and from multiple sources (mothers, teachers, classmates), and were averaged after standardization (see Kochanska & Murray, 2000 for a similar approach). At 7 and 14 years, social development consisted of respectively nine and seven variables. Rejection (reversed), acceptance, prosocial competence, antisocial competence (reversed), and social esteem were derived from the CCQ. At 7 years, the mother and teacher scores were averaged. Social problems (reversed) and appropriate school behavior were derived from the CBCL and the TRF. At 7 years, two additional variables were included: the child's peer group popularity was derived from the sociometric measure, and agreeable behavior at school was derived from the SCHOAL. At both ages, principal-components analysis revealed a one-dimensional solution, with an explained variance of 59% at 7 years and 62% at 14 years. Cronbach's standardized item alpha was .90 and .89 respectively. The composite score for social development was the standardized summation of all variables divided by their number and was transformed to

normal by means of a square rote transformation (Tabachnick & Fidell, 2001). The transformed social development score ranged from 0.00 to 1.33 (M = .82, SD = 0.25, N = 120) at 7 years and from 0.00 to 2.17 (M = 1.90, SD = 0.27, N = 120) at 14 years.

Statistical analyses

The results were based on all families for whom longitudinal data were available from the study in infancy, middle childhood, and adolescence (N = 120). First, bivariate associations between the variables were examined, in order to select the relevant predictors for the multivariate analyses to follow. Second, multivariate longitudinal effects were examined by a hierarchical multiple regression analysis. Finally, longitudinal structural models were tested to assess the continuity of social development and the relative influence of early and middle childhood, and of concurrent factors on the adopted adolescents' social development.

Results

Preliminary analyses

Table 2 presents means and standard deviations of the predictor variables of early childhood, middle childhood and adolescence. Table 2 also presents the correlations between these predictor variables and social development at 14 years. The following predictors were significantly correlated with adolescent social development: child gender, early and middle childhood maternal sensitivity, early, middle childhood, and adolescent perceived difficult temperament, middle childhood social development, and stressful life events at age 7 to 14. The background variables age on arrival, country of origin, health condition on arrival, mixed versus all-adoptive families, experimental condition, stressful life events at age 5 to 7, and socioeconomic status in middle childhood and adolescence did not significantly correlate with adolescent social development. We excluded the non-significant background variables from further analyses, except for experimental condition which is included in the structural equation modeling because of its influence on attachment security and disorganization (Juffer et al., 2005; Juffer et al., 1997).

Table 3 presents the correlations between the predictor variables. The correlation between temperament at 7 years and social development at 7 years was relatively high (r = -.66, p < .01). Therefore middle childhood temperament was entered in the regression analyses before middle childhood social development to examine the influence of middle childhood social development, controlling for the effects of middle childhood temperament. The correlations between early, middle childhood, and adolescent temperament were also substantial (early to middle childhood: r = .40, p < .01; early childhood to adolescence: r = .36, p < .01; middle childhood to adolescence: r = .64, p < .01). Middle childhood and adolescent temperament were entered in the regression

analysis before early childhood temperament to examine the influence of early temperament, controlling for the effects of middle childhood and adolescent temperament. Adolescent temperament was entered in the regression analysis before middle childhood temperament to examine the influence of middle childhood temperament, controlling for the effects of concurrent adolescent temperament.

Table 2
Correlations Between Predictors and Adolescent Social Development

Predictor	*M*	*SD*	Social development
Infancy			
Sex of the child	1.58	0.50	.29**[1]
Country of origin	1.53	0.50	-.09[1]
Age on arrival	10.45	5.35	.01
Health condition on arrival	0.38	0.13	.02
Mixed vs. all-adoptive families	1.38	0.49	-.10
Experimental vs. control	1.34	0.48	-.02
Attachment security	3.35	1.19	.11
Attachment disorganization	2.89	1.98	-.04
Maternal sensitivity	-0.01	0.78	.19*
Perceived difficult temperament	0.00	1.00	-.26**
Middle childhood			
Stressful life events at age 5-7	0.21	0.20	-.05
Socioeconomic status	10.03	2.75	-.01
Maternal sensitivity	-0.01	0.69	.24**
Perceived difficult temperament	0.00	1.00	-.50**
Social development	0.82	0.25	.64**
Adolescence			
Stressful life events at age 7-14	0.47	0.46	-.21*
Socioeconomic status	9.53	2.36	.06
Maternal sensitivity	-0.01	0.80	.00
Perceived difficult temperament	0.00	1.00	-.67**

Note. Sex of the child: 1 = male, 2 = female; Country of origin: 1 = Korea & Colombia, 2 = Sri Lanka; Mixed vs. all-adoptive families: 1 = all-adoptive family, 2 = mixed family.
[1] a *t* Test and one-way *ANOVA* are the preferred ways for analyzing these data, however, the significance tests showed similar results.
* $p < .05$. ** $p < .01$ (two-tailed).

Table 3
Correlations Between Predictor Variables

Variable	1	2	3	4	5	6	7	8	9	10
Infancy										
1. Sex of the child	1.00									
2. Attachment security	-.01	1.00								
3. Attachment disorganization	.02	-.08	1.00							
4. Maternal sensitivity	.02	.13	-.31**	1.00						
5. Perceived temperament	-.08	-.01	.18	-.15	1.00					
Middle childhood										
6. Maternal sensitivity	-.09	-.09	-.10	.22*	.08	1.00				
7. Perceived temperament	-.20*	-.08	.16	-.05	.40**	-.02	1.00			
8. Social development	.18	.18*	-.18	.24**	-.31**	.26**	-.66**	1.00		
Adolescence										
9. Stressful life events age 7-14	-.16	.06	.03	-.03	.19*	-.02	.28**	-.10	1.00	
10. Perceived temperament	-.24**	.10	.17	-.09	.36**	-.18	.64**	-.54**	.41**	1.00

* $p < .05$. ** $p < .01$.

Multivariate longitudinal effects: regression analyses

We performed a hierarchical multiple regression analysis on social development at 14 years to explore the continuity of development and the longitudinal effects of maternal sensitivity, attachment security and disorganization, and perceived difficult temperament, with forced entry of predictors. The following predictors were entered in subsequent steps in the analysis: (1) gender of the child, (2) stressful life events at age 7-14, (3) difficult temperament at 14 years, (4) difficult temperament at 7 years, (5) social development at 7 years, (6) maternal sensitivity at 7 years, (7) early difficult temperament, and (8) early parent child relationships (early maternal sensitivity, early attachment security and disorganization). The results are presented in Table 4. R^2 and adjusted R^2 indicate the total amount of variance accounted for by the variables in the regression equation, ΔR^2 indicates the increase in the amount of variance accounted for after addition of a variable, and β indicates the association of each variable with the outcome variables, controlling for the previous predictors. The results showed a significant regression equation for social development at 14 years, F (10, 109) = 19.18, $p < .01$. The total amount of variance accounted for was 63%. The significant predictors were child gender, accounting for 12% of the variance, stressful life events at age 7 to 14, adding 7% to the variance accounted for, difficult temperament at 14 years, adding 33%, and social development at 7 years, adding 11%. Girls scored higher on social development than boys, more stressful life events were associated with lower

levels of social development, and lower levels of difficult temperament at age 14 and higher levels of social development at age 7 were associated with favorable social development at 14 years.

Table 4
Hierarchical Multiple Regression Analyses on Adolescent Social Development at Age 14

Predictor	R^2	Adj R^2	ΔR^2	*B*
1. Sex of the child	.12	.11	.12**	.17**
2. Stressful life events at age 7-14	.18	.17	.07**	-.03
3. Difficult temperament at 14 years	.52	.50	.33**	-.53**
4. Difficult temperament at 7 years	.53	.51	.01	.11
5. Social development at 7 years	.64	.62	.11**	.40**
6. Sensitivity at 7 years	.64	.62	.00	.03
7. Early difficult temperament	.65	.62	.01	-.07
8. Early parent-child relationships	.66	.63	.01	
Early sensitivity				.10
Early attachment security				-.05
Early attachment disorganization				.08

Note. $N = 120$. Adj R^2 = adjusted R^2. * $p < .05$. ** $p < .01$.

Multivariate longitudinal effects: structural equation modeling

Figure 1 presents a longitudinal structural model with social development as the dependent variable. The Egeland/Erickson scales were used at all measurement points (infancy, middle childhood, and adolescence) and these scales were therefore used as indexes of maternal sensitive responsiveness in the model. The scale hostility was not included in the model, because of the small variance in hostility at 14 years. Structural equation modelling techniques were employed to test the model and examine relations among the different latent and observed variables. Analyses were completed using EQS 6.1 for Windows (Bentler, 1995). Additionally, a series of model comparisons incorporating systematic deletion of (non-significant) paths (Models 1 to 2), variables (Models 3 and 4), and developmental data (Model 5 and 6) were conducted to further test the continuity of social development and the relative influence of early parent- and/or child-variables. A good-fitting model is indicated by a non-significant chi-square, but also by the ratio of the chi-square to the degrees of freedom (Tabachnick & Fidell, 2001), the non-normed fit index (NNFI; Bentler & Bonett, 1980), the incremental fit index (IFI; Bollen, 1989), the comparative fit index (CFI; Bentler, 1988), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). A good fitting model is indicated by, respectively, a ratio less than 2 (χ^2/df), values greater than .90 (NNFI and IFI), values greater than .95 (CFI), and values of .06 or less (RMSEA) (Tabachnick & Fidell, 2001).

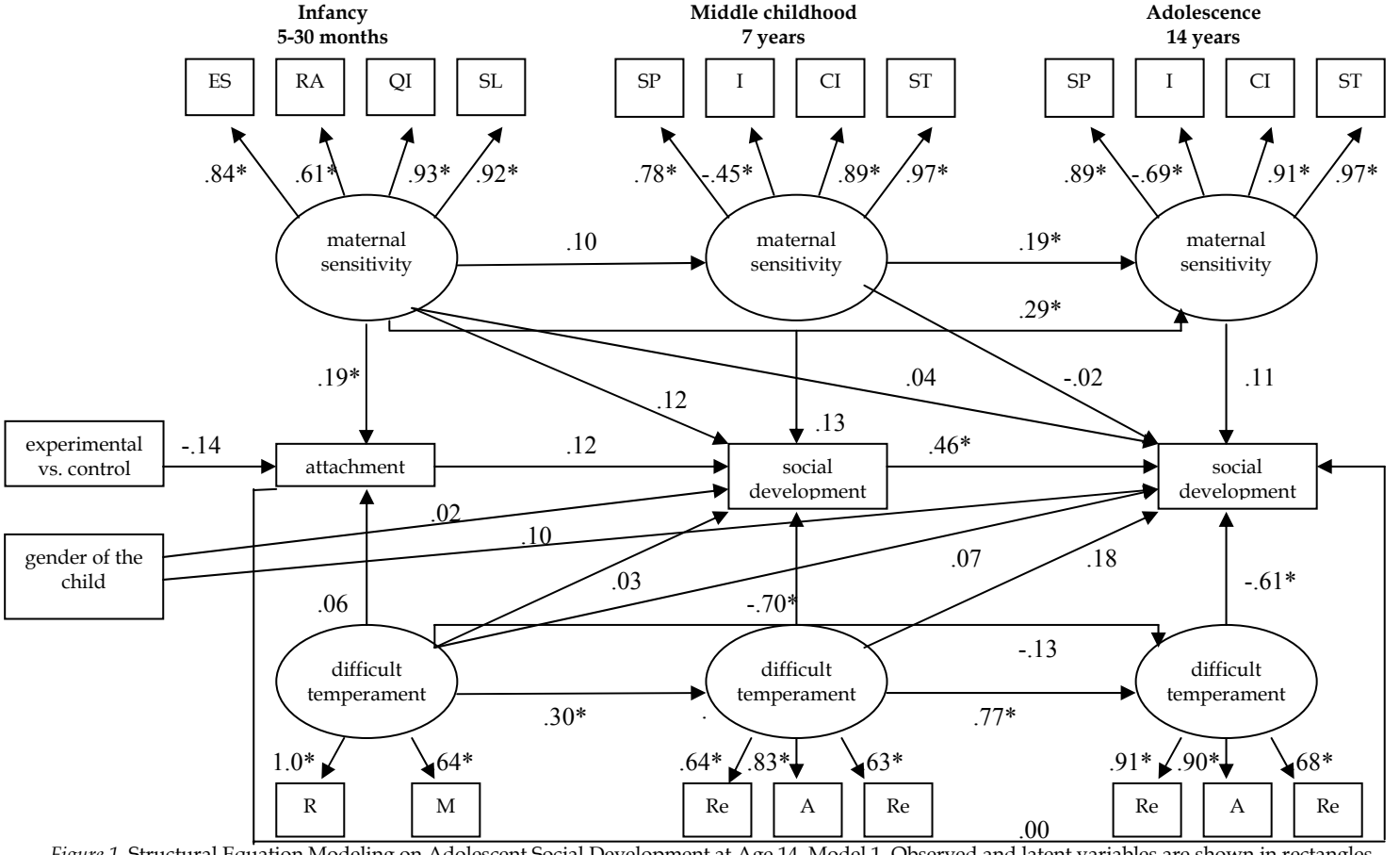

Figure 1. Structural Equation Modeling on Adolescent Social Development at Age 14. Model 1. Observed and latent variables are shown in rectangles and ellipses, respectively. ES = Emotional support; RA = Respect for the child's autonomy; SL = Structure and limit setting; QI = Quality of instruction; SP = Supportive Presence;
I = Intrusiveness; ST = Sensitivity and timing; CI = clarity of instruction; R = Resistance; M = Mood; Re = Reactivity; A = Aggression; Res = Restlessness.
* $p < .05$.

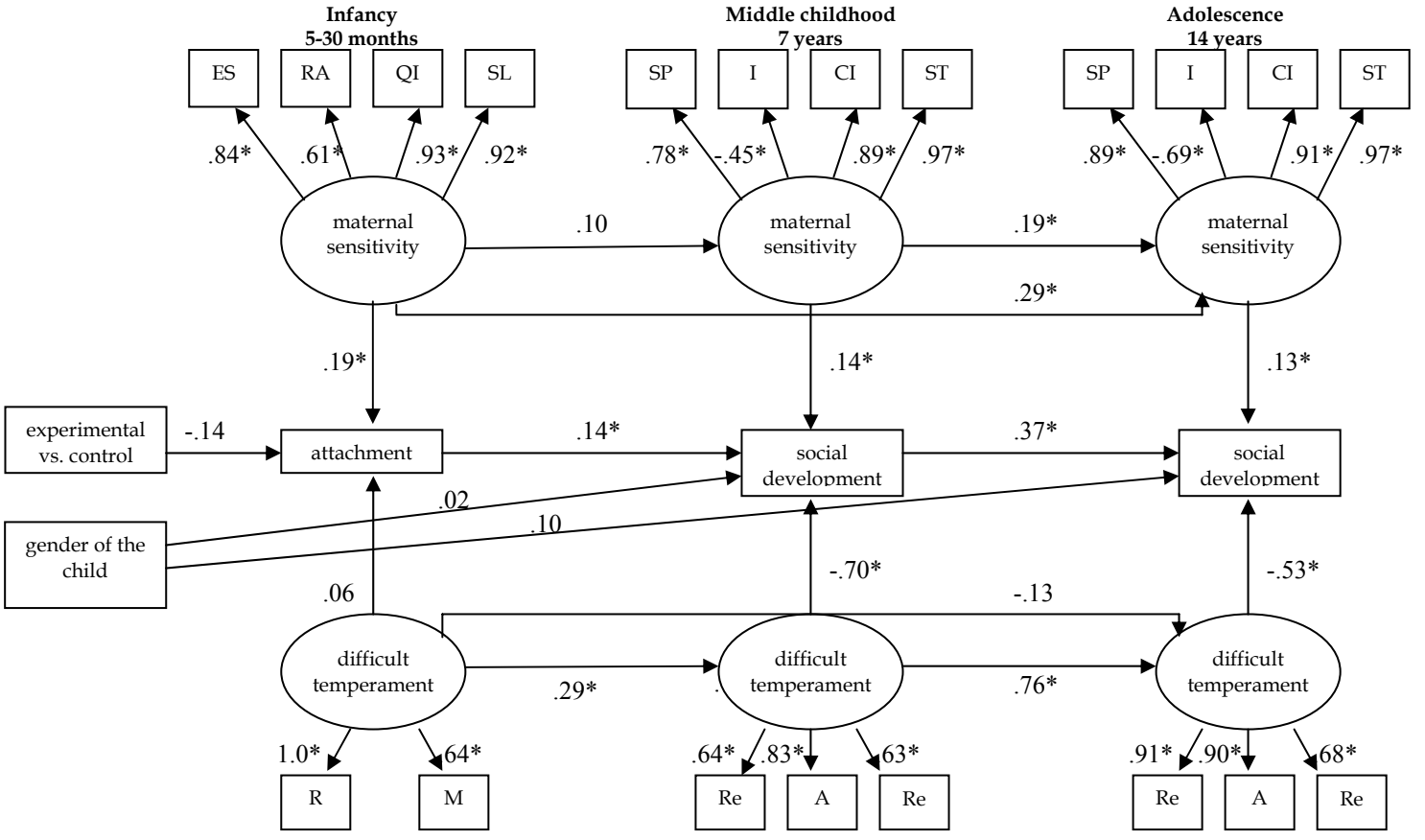

Figure 2. Structural Equation Modeling on Adolescent Social Development at Age 14. Model 2. Observed and latent variables are shown in rectangles and ellipses, respectively. ES = Emotional support; RA = Respect for the child's autonomy; SL = Structure and limit setting; QI = Quality of instruction; SP = Supportive Presence;
I = Intrusiveness; ST = Sensitivity and timing; CI = clarity of instruction; R = Resistance; M = Mood; Re = Reactivity; A = Aggression; Res = Restlessness.
* $p < .05$.

The independence model that tests the hypothesis that the variables are uncorrelated with one another was rejected, χ^2 (300) = 2080.28, p < .001. Model 1 (see Figure 1) included all relations between the variables. The model provided an acceptable fit to the data, χ^2/df = 1.26, NNFI = .96, IFI = .97, CFI = .97, RMSEA = .05 (see Table 5). A chi-square difference test (Tabachnick & Fidell, 2001) indicated a significant improvement in fit between the independence model and Model 1, $\Delta\chi^2$ (58) = 1775.48, p < .001. Factor loadings of parent indicators (maternal sensitivity) and child indicators (temperament) ranged from .45 (Egeland/Erickson scale intrusiveness measured at 7 years) to .97 (Egeland/Erickson scale sensitivity and timing measured at 7 and 14 years). The paths between temperament in infancy and middle childhood and between temperament in middle childhood and adolescence were significant (t = 2.86, p < .01, and t = 6.71, p < .01, respectively). The path between temperament in infancy and adolescence was not significant. For maternal sensitivity, the paths between maternal sensitivity in infancy and adolescence and between maternal sensitivity in middle childhood and adolescence were significant (t = 3.13, p < .01, and t = 2.04 p < .05, respectively). The path between maternal sensitivity in infancy and middle childhood was not significant. Social development in middle childhood was significantly related to social development in adolescence (t = 4.93, p < .01). The path between maternal sensitivity and attachment security and disorganization in infancy was significant (t = 2.10, p < .01). Temperament in infancy, middle childhood, and adolescence showed significant concurrent, but not predictive relations with social development in middle childhood and adolescence (t = -6.15, p < .01, and t = -5.99, p < .01, respectively). Maternal sensitivity in infancy, middle childhood, and adolescence did not show significant concurrent or predictive relations with social development in middle childhood and adolescence. The paths from the combined variable of attachment security and disorganization in infancy to social development in middle childhood and adolescent were not significant.

In Model 2 (see Figure 2), *predictive* paths (paths from previous experience/adaptation to later development) between maternal sensitivity and temperament on the one hand and social development in middle childhood and adolescence on the other hand, were omitted. The model represented the data well, χ^2/df = 1.26, NNFI = .96, IFI = .96, CFI = .97, RMSEA = .05 (see Table 5). According to the chi-square difference test (Tabachnick & Fidell, 2001), Model 2 did not show significant deterioration over Model 1 fit, $\Delta\chi^2$ (6) = 7.37, p > .05. The other fit indices remained similar as well. However, the concurrent paths from maternal sensitivity in middle childhood and adolescence to social development in middle childhood and adolescence were significant in Model 2 (t = 2.03, p < .05, and t = 2.36, p < .05, respectively). Moreover, the path from the combined variable of attachment security and disorganization in infancy to social development in middle childhood was significant (t = 1.99, p < .05). Other parallel paths among constructs in Model 1 and Model 2 remained similar.

Table 5
Fit Statistics for Structural Models on Adolescent Social Development at Age 14

Model	χ^2	*df*	χ^2/df	NNFI	IFI	CFI	RMSEA
Null model	2080.28***	300	6.93				
Nested models							
Model 1 full model	304.80**	242	1.26	.96	.97	.97	.05
Model 2 omitting *predictive* paths between sensitivity/ temperament and social development	312.18**	249	1.25	.96	.97	.97	.05
Non-nested models							
Model 3 omitting attachment security and disorganization from Model 2	268.18**	206	1.30	.96	.97	.97	.05
Model 4 omitting *concurrent* paths from sensitivity to social development from Model 4	371.04***	210	1.77	.89	.91	.91	.08
Model 5 omitting all infancy data	156.06***	104	1.50	.95	.96	.96	.07
Model 6 omitting all middle childhood data	138.08*	109	1.27	.97	.97	.98	.05

Note. NNFI = non-normed fit index; IFI = incremental fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation.
*p<.05. **p<.01. ***p<.001.

Non-nested structural models. A series of model comparisons incorporating systematic deletion of developmental variables were conducted to further examine the continuity of development and the relative influence of early parent- and/or child-variables across differing developmental periods to predict social development in adolescence. In Model 3, the combined variable of attachment security and disorganization in infancy was omitted from Model 2. Model 3 provided an acceptable fit to the data, χ^2/df = 1.30, NNFI = .96, IFI = .97, CFI = .97, RMSEA = .05 (see Table 5). The χ^2/df ratio showed some deterioration of Model 3 over Model 2. The other fit indices remained similar. Parallel paths among constructs in Model 3 and Model 2 remained similar.

In Model 4, the *concurrent* paths (paths from experience/adaptation to concurrent development) from maternal sensitivity in middle childhood and adolescence to social development in middle childhood and adolescence were omitted from Model 3. Only marginal support was found for Model 4, χ^2/df = 1.77, NNFI = .89, IFI = .91, CFI = .91, RMSEA = .08 (see Table 5). According to the chi-square difference test (Tabachnick & Fidell, 2001), Model 4 showed significant deterioration over Model 3 fit, $\Delta\chi^2(4) = 102.86$, $p < .01$. Moreover, all other fit indices showed deterioration of Model 4 over Model 2 and 3 (see Table 5). Parallel paths among constructs in Model 4 and Model 3 remained similar.

Model 5 examined relations from middle childhood to adolescence (omitting all infancy variables) and Model 6 examined relations from infancy to adolescence (omitting all middle childhood variables). Model 5 and 6 showed acceptable fit to the data, χ^2/df = 1.50, NNFI = .95, IFI = .96, CFI = .96, RMSEA = .07, and χ^2/df = 1.27 NNFI = .97, IFI = .97, CFI = .98, RMSEA = .05, respectively (see Table 5). However, all fit indices showed deterioration of Model 5 over Model 1 (see Table 5). The χ^2/df ratio, the NNFI, and the CFI showed

deterioration of Model 6 over Model 1 (see Table 5). Compared with Model 1, the concurrent path from maternal sensitivity in adolescence to social development in adolescence was significant in Model 5 ($t = 2.00$, $p < .05$). The path from sex of the child to social development in adolescence was significant in Model 6 ($t = 2.00$, $p < .05$). Other parallel paths among constructs in Model 1 and Model 5 and 6 remained similar.

Best fitting and most parsimonious model(s). These results showed that omitting *predictive* paths (paths from previous experience/adaptation to later development) between maternal sensitivity and temperament in infancy and middle childhood on the one hand and social development in middle childhood and adolescence on the other hand from Model 1 (Model 2, see Figure 2) resulted in a non-significant change of the model fit. These paths could therefore be deleted to get a more parsimonious model without loosing adequate model fit. Model 2 was a parsimonious model with adequate model fit. Omitting the combined variable of attachment security and disorganization from Model 2 (Model 3) resulted in deterioration of the χ^2/df ratio. Omitting the *concurrent* paths (paths from experience/adaptation to concurrent development) between maternal sensitivity and temperament in middle childhood and adolescence on the one hand and social development in middle childhood and adolescence on the other hand from Model 3 (Model 4) also resulted in significant deterioration of the model. The model that omitted all infancy data (Model 5) and the model that omitted all middle childhood data (Model 6) showed deterioration of the model fit.

The best fitting and most parsimonious model was the model that omitted predictive paths between sensitivity / temperament and social development from the first model (Model 2, see Figure 2). In this model, temperament in infancy was significantly and positively associated with temperament in middle childhood, whereas temperament in middle childhood was significantly and positively associated with temperament in adolescence. Maternal sensitivity in infancy was not significantly related to maternal sensitivity in middle childhood. However, maternal sensitivity in middle childhood was significantly and positively related to maternal sensitivity in adolescence. Social development in middle childhood was significantly and positively related to social development in adolescence. Maternal sensitivity and temperament in infancy, middle childhood, and adolescence showed significant concurrent, but not predictive relations with social development in middle childhood and adolescence: higher sensitivity of the adoptive mother and less difficult temperament of the adopted child were related to favorable concurrent social development. Higher maternal sensitivity was related to more secure and less disorganized infant attachment, which in turn was related to more optimal social development in middle childhood and adolescence.

Discussion

In the present longitudinal study, 120 internationally adopted children placed before the age of 6 months were followed from infancy to age 14 to assess the continuity of their social development and to examine the relative influence of early, middle childhood, and concurrent factors on social development in adolescence. The study controlled for concurrent contextual (parenting) and constitutional (gender, temperament) factors in examining the influence of early experiences on later social development. For example, the predictive value of the quality of the early parent-child relationship on later social development was examined over and above the effects of child characteristics, over and above the effects of concurrent parent-child relationships, and because of the use of an adoption sample, over and above the effects of genetic similarities between children and parents.

Regression analysis showed that adopted children's social development was rather stable from 7 to 14 years of age, even after controlling for significant background variables (gender of the child and stressful life events) and temperament at 7 and 14 years. Early attachment security and attachment disorganization were not associated with social development in adolescence. Early maternal sensitivity and early temperament were associated with social development at 14 years, but they did not predict social development at 14 years after controlling for the same variables measured at 7 years. Girls were found to be better adjusted than boys, and stressful life events between 7-14 years predicted lower levels of social development.

Structural equation modeling showed that *predictive* paths (paths from previous experiences/child characteristics to later development) between maternal sensitivity and temperament in infancy and middle childhood on the one hand, and social development in middle childhood and adolescence on the other hand, did not contribute significantly to the model. Attachment and maternal sensitivity in infancy were not directly associated with social development in adolescence but its indirect influence through earlier social development was confirmed. The *concurrent* paths from maternal sensitivity and temperament in middle childhood and adolescence to concurrent social development in middle childhood and adolescence were also essential for the resulting model. The best fitting and most parsimonious model represented continuity in temperament and social development measured in infancy, middle childhood, and adolescence, and concurrent relations between temperament and maternal sensitivity on the one hand and social development on the other hand. Most importantly, the model also included significant paths from early maternal sensitivity through early attachment to social development in middle childhood and adolescence. In sum, continuity of social development from middle childhood to adolescence was high. Early parent-child relationships were indirectly associated with social development in adolescence, through the influence on social development in middle childhood.

To date, only a few studies examined the association between infant attachment and maternal sensitive responsiveness on the one hand and social development in adolescence on the other hand (e.g., Carlson, Sroufe, and Egeland, 2004; Sroufe et al., 1993; Sroufe et al., 1999). Most studies report significant associations of infant attachment and maternal sensitive responsiveness with social development in early or middle childhood, even after controlling for concurrent experiences (for an example of a previous study of the present sample, see Stams et al., 2002; see also Sroufe et al., 1990). Some studies examined the association of early parent-child relationships and adjustment in adolescence, but most of them examined the relation between infant attachment and young adults' attachment representations (such as Hamilton, 2000, and Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). It may be difficult to find *direct* significant influences of infant attachment and early maternal sensitive responsiveness on other developmental domains over such a long period. In their structural equation model, Carlson et al. (2004) found a non-significant standardized coefficient of .02 for the *direct* path from early experience (a latent variable with the observed variables attachment quality and toddler experience) to adolescent social functioning. The present study found a comparable standardized coefficient for the *direct* path from the combined variable of attachment security and disorganization to adolescent social functioning. It is also possible that it is difficult to find significant *direct* results of early relational predictors, such as infant attachment and maternal sensitive responsiveness, in a period when children are trying to become autonomous and independent of parents, as in adolescence. These predictors may have a *direct* association with development in middle childhood or adulthood, and *indirect* associations with development in adolescence. Moreover, an explanation for the absence of a *direct* influence of early parent-child relationships on adolescent social development can be found in the strong influences of later and concurrent experiences and behavior. In the present study, these later and concurrent influences eclipsed the predictive value of the *direct* associations between early parent-child relationships and adolescent social development. Finally, significant *direct* associations between early parent-child relationships and later adjustment may be indicative of coherence in individual development (Sroufe, 1979; Sroufe, Carlson, Shulman, 1993) or of the confounding of parenting effects and genetic similarities between children and parents (Rowe, 1993a, 1993b).

In the present study, we found *indirect* influences of early parent-child relationships on adolescent social development. The different steps of the indirect path from early parent-child relationships to adolescent social development found in our study are supported by attachment theory and previous empirical studies. Early maternal sensitivity or early parental behavior has been found to be associated with infant attachment security and disorganization (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; De Wolff & Van IJzendoorn, 1997; Main & Hesse, 1990; Pederson, 1990; Schuengel, Bakermans-Kranenburg, & Van IJzendoorn, 1999), early maternal sensitive responsiveness and infant attachment security and disorganization have been found to be

associated with social development in middle childhood (e.g., Belsky, 1981, 1984; Belsky, Lerner, Spanier, 1984; Berlin, Cassidy, & Belsky, 1995; Borkowski, Ramey, & Bristol-Power, 2002; Elicker, Englund, & Sroufe, 1992; Fagot, 1997; Kerns, 1994; Shulman, Elicker, & Sroufe, 1994; Stams et al, 2002; Thompson, 1999; Volling & Belsky, 1992; Youngblade & Belsky, 1992; Zimmermann, Maier, Winter, & Grossmann, 2001), and social development in middle childhood has been found to be rather stable and associated with social development in adolescence (e.g. Elicker, Englund, & Sroufe, 1992; Schneider, Attili, Nadel, & Weissberg, 1989). Together, these paths may constitute *indirect* influences of early parent-child relationships on adolescent social development. Carlson et al. (2004) also found an *indirect* association between early experience and adolescent social functioning. In their study early experience had an influence on relationship representation and social behavior in early childhood, which in turn influenced later relationship representation and social behavior and which finally influenced adolescent social functioning.

The present study resembles Carlson et al.'s (2004) study in that both studies found indirect, but not direct influences of early (attachment) experiences on adolescent social functioning. The present study found these results in a sample of adopted children who are biologically unrelated to their adoptive parents. Therefore, this study expands previous outcomes with the finding that early parent-child relationship are indirectly related to adolescent social functioning, independent of the confounding of parenting effects and genetic similarities between children and parents (Rowe, 1993a, 1993b). Sroufe (2000) emphasized early experience as the foundation for later child development. Early relationship experiences are the first models for patterns of self-regulation to be incorporated and to generalize from. In his view, the childhood years are important for development and developmental trajectories may be altered at many points, for example, by changes in social support, life stress, or level of depression of caregivers (Sroufe, Carlson, Levy, & Egeland, 1999). Early experiences do not determine in final form the development of the child, but they are incorporated into a pattern of adaptation that provides the basis for healthy or deviant development.

Some limitations of the present study should be mentioned. A first limitation is the rather high percentage of securely attached children (76%, which is higher than the regular percentage in nonclinical samples; Van IJzendoorn & Kroonenberg, 1988), and the low percentage of resistant children (3%, which is lower than the regular percentage in nonclinical samples; Van IJzendoorn & Kroonenberg, 1988). The lack of resistant children precluded analyses by attachment classification. Second, we only assessed mother-child-interactions. Future studies should include father-child-interactions (Grossmann, 1997; Grossmann et al., 2002) and, because of the growing influence of peers in adolescence, peer-interactions as well. Sroufe, Egeland, & Carlson (1999) showed that peer relationships at any given age predicted later social competence and that such predictive peer competencies were themselves predicted by qualities of parent-child relationships that preceded them. In their study, peer and parent-

child relationships together predicted later social functioning better than either domain alone (Sroufe et al., 1999). Third, it is often claimed that adoptees and adoptive parents are broadly comparable with the general population, but this is not the case in some fundamental respects (Rutter, Silberg, O'Connor, & Simonoff, 1999). Adoptees differ with respect to adoption-specific aspects. However, in our study adoption-specific aspects (e.g., country of origin, age on arrival, health condition on arrival, mixed vs. all-adoptive families) were not associated with adjustment in adolescence. In addition, an increasingly number of adoptions involve older children, particularly those with special needs of one kind or another (Rutter et al., 1999). However, the adopted children in the present study were adopted at a very early age (before the age of six months) and were not selected on the basis of special needs. Moreover, adoptive parents differ from other parents in being better educated and more socially advantaged (as was the case in our sample; Stams et al., 2002; Rutter et al., 1999). To the extent that the adoptive families provide an under-representation of high-risk environments, the effect will be to underestimate the strength of environmental effects. In fact, investigators studying more economically advanced families have not consistently documented significant associations between early parent-child relationships and later development (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Fagot & Kavanagh, 1990; Goldberg, Perrotta, Minde, & Corter, 1986). However, the present study found indirect influences of early parent-child relationships on social development in adolescence. Finally, it should be noted that we included only one dimension of parenting, namely maternal sensitive responsiveness. Social development may be influenced by other aspects of parenting, for example discipline or cognitive stimulation, or other environmental factors.

In conclusion, the results of the present study support coherence in individual development (Sroufe, 1979; Sroufe, Carlson, Shulman, 1993) from infancy through middle childhood to adolescence. Concurrent environmental experiences and child characteristics are essential influences on middle childhood and adolescent social development. Early parent-child relationships are associated with social development in adolescence through the influence on social development in middle childhood, even in the absence of genetic similarities between children and parents. Early parent-child relationships do not determine in final form social development in adolescence, but they provide the basis for healthy social development through the influence on earlier social development. Bowlby's thesis (1973, 1980) that adaptation is always a product of both developmental history *and* current circumstances is supported.

References

Achenbach, T. M. (1991a). *Manual for the Child Behavior Checklist/ 4-18 and 1991 profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M. (1991b). *Manual for the Teacher's Report Form and 1991 profiles*. Burlington, VT: University of Vermont, Department of Psychiatry.

Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1974). Infant-mother attachment and social developments: Socialization as a product of reciprocal responsiveness to signals. In M. P. M. Richards (Ed.), *The integration of a child into a social world*. London: Cambridge University Press.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.

Bates, J. E. (1980). The concept of difficult temperament. *Merrill-Palmer Quarterly*, *26*, 299-319.

Bates, J. E. (1987). Temperament in infancy. In J. D. Osofsky (Ed.), *Handbook of infant development* (pp. 1101-1149). New York: Wiley.

Bates, J. E., Bayles, K., Bennett, D. S., Ridge, B., & Brown, M. M. (1991). Origins of externalizing behavior problems at eight years of age. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 93-120). Hillsdale, NJ: Erlbaum.

Bates, J. E., Freeland, C. A. B., & Lounsbury, M. L. (1979). Measurement of infant difficultness. *Child Development*, *50*, 794-803.

Belsky, J. (1981). Early human experience: A family perspective. *Developmental Psychology*, *17*, 3-23.

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*, 83-96.

Belsky, J., Lerner, R. M., Spanier, G. B. (1984). The child in the family. Reading, MA,US: Addison-Wesley/Addison Wesley Longman.

Bentler, P. M. (1995). *EQS structural equations program manual*. Encino, CA: Multivariate Software, Inc.

Bentler, P. M. (1988). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*, 238-246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, *88*, 588-606.

Berlin, L. J., Cassidy, J., & Belsky, J. (1995). Loneliness in young children and infant-mother attachment: A longitudinal study. *Merrill-Palmer Quarterly*, *41*, 91-103.

Bernstein, B., & Brandis, W. (1970). Social class differences in communication and control. In W. Brandis & D. Henderson (Eds.), *Social class, language, and communication* (pp. 93-124). London: Routledge.

Biringen, Z., & Robinson, J. (1991). Emotional availability in mother-child interactions: A reconceptualization for research. *American Journal of Orthopsychiatry*, *61*, 258-271.

Biringen, Z., Robinson, J. L., & Emde, R. N. (1993). *Manual for scoring of the Emotional Availability Scales Middle Childhood Version*. Boulder: University of Colorado.

Bleichrodt, N., Resing, W. C. M., & Zaal, J. N. (1993). *Beoordeling van schoolgedrag: SCHOBL-R* [Evaluation of school behavior: SCHOAL]. Lisse, The Netherlands: Swets & Zeitlinger.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota symposium on child psychology* (pp. 39-101). Hillsdale, NJ: Lawrence Erlbaum.

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. New York: John Wiley & Sons.

Borkowski, J. G., Ramey, S. L., & Bristol-Power, M. (2002). Parenting and the child's world: Influences on academic, intellectual, and social-emotional development. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Bowlby, J. (1973). *Separation*. New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3.* Loss. New York: Basic.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen and J. S. Long (Eds.), *Testing Structural Models. Newbury Park*: Sage Publications.

Carlson, E. A., Sroufe, L. A., & Egeland, B. (2004). The construction of experience: A longitudinal study of representation and behavior. *Child Development*, *75*, 66-83.

Cillessen, A. H. N., & Ten Brink, P. W. M. (1991). Vaststelling van relaties met leeftijdgenoten [Assessment of children's peer relationships]. *Pedagogische Studiën*, *68*, 1-14.

DeHart, G. B., Sroufe, L. A., & Cooper, R. G. (2004). *Child development. Its nature and course*. New York: McGraw-Hill.

De Wolff, M. S. & Van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68,* 571-591.

Egeland, B., Erickson, M. F., Clemenhagen-Moon, J., Hiester, M. K., & Korfmacher, J. (1990). *24 months tools coding manual*. Project STEEP-revised 1990 from mother-child project scales.

Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent-child relationships. In R. D. Parke & G. W. Ladd (Eds.), *Family-peer relationships: Modes of linkage* (pp. 77-106). Hillsdale, NJ: Erlbaum.

Erickson, M. F., Sroufe, L. A., Egeland, B. (1985). The relationship between quality of attachment and behavior problems in preschool in a high-risk sample. In I. Bretherton & E. Waters (Eds.), Growing points at attachment: Theory and research. *Monographs of the Society for research in Child Development*, *50*, 147-166. Chicago, IL: University of Chicago Press.

Erikson, E. H. (1963). *Childhood and society* (2nd ed.). New York: Norton.

Fagot, B. I. (1997). Attachment, parenting, and peer interactions of toddler children. *Developmental Psychology*, *33*, 489-499.

Fagot, B. I., & Kavanagh, K. (1990). The prediction of antisocial behavior from avoidant attachment classifications. *Child Development*, *61*, 864-873.

Fergusson, D. M., Lynskey, M., & Horwood, L. J. (1995). The adolescent outcomes of adoption: A 16-year longitudinal study. *Journal of Child Psychology and Psychiatry*, *36*, 597-615.

Goldberg, S., Perrotta, M., Minde, K., & Corter, C. (1986). Maternal behavior and attachment in low birthweight twins and singletons. *Child Development*, *57*, 34-46.

Grossmann, K. (1997). *Infant-father attachment relationship: Sensitive challenges during play with toddler is the pivotal feature*. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Washington, DC.

Grossmann, K., Grossmann, K. E., Fremmer-Bombik, E., Kindler, H., Scheuerer-English, H., & Zimmermann, P. (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. *Social Development*, *11*, 307-331.

Hamilton, C. E. (2000). Continuity and discontinuity of attachment from infancy through adolescence. *Child Development*, *71*, 690-694.

Hodges, J., & Tizard, B. (1989a). IQ and behavioural adjustment of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *30*, 53-75.

Hodges, J., & Tizard, B. (1989b). Social and family relationships of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *30*, 77-97.

Hoopes, J. L. (1982). *Prediction in child development: A longitudinal study of adoptive and nonadoptive families. The Delaware family study*. New York, N.Y.: Child Welfare League of America.

Juffer, F. (1993). *Verbonden door adoptie. Een experimenteel onderzoek naar hechting en competentie in gezinnen met een adoptiebaby.* [Attached through adoption. An experimental study on attachment and competence in families with an adopted baby.] Amersfoort, The Netherlands: Academic Press.

Juffer, F., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2005). The importance of parenting in the development of disorganized attachment: Evidence from a preventive intervention study in adoptive families. *Journal of Child Psychology and Psychiatry, 46,* 263-274.

Juffer, F., Hoksbergen, R. A. C., Riksen-Walraven, J. M. A., & Kohnstamm, G. A. (1997). Early intervention in adoptive families-supporting maternal sensitive responsiveness, infant-mother attachment, and infant competence. *Journal of Child Psychology and Psychiatry*, *38*, 1039-1050.

Kagan, J. (1984). *The nature of the child*. New York: Basic Books.

Kerns, K. A. (1994). A developmental model of the relations between mother-child attachment and friendship. In R. Erber & R. Gilmour (Eds.), *Theoretical frameworks for personal relationships* (pp. 129-156). New York: Erlbaum.

Kochanska, G., & Murray, K. T. (2000). Mother-child mutually responsive orientation and conscience development: From toddler to early school age. *Child Development*, *71*, 417-431.

Kohnstamm, G. A. (1984, April 4-7). *Bates' Infant Characteristics Questionnaire (ICQ) in the Netherlands*. Paper presented at the fourth biennial International Conference on Infant Studies, New York, NY.

Lamb, M. (1984). Fathers, mothers and childcare in the 1980s: Family influences on child development. In K. Borman, D. Quarm, & S. Gideouse (Eds.), *Women in the workplace* (pp. 61-88). Norwood, NJ: Ablex.

Lewis, M. (1997). *Altering fate*. New York: Guilford.

Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? In M. Greenberg, D. Cicchetti, & E. Cummings (Eds.), Attachment in the preschool years (pp. 161-182). Chicago: University of Chicago Press.

Main, M., & Hesse, E. (2003, July). *Attachment behavior and attachment representation from infancy to adulthood: Cross generational and life course coherence in the Berkeley social development project*. Paper presented at the international conference Attachment from Infancy and Childhood to Adulthood, Regensburg, Germany.

Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood and adulthood: A move to the level of representation. In I. Bretherton & E. Waters (Eds), Growing Points of Attachment Theory and Research. *Monographs of the Society for Research in Child Development*, *50* (1-2, Serial No. 209), 66-104.

Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 121-160). Chicago: University of Chicago Press.

O'Connor, T. G., Jenkins, J. M., Hewitt, J., DeFries, J. C., & Plomin, R. (2001). Longitudinal connections between parenting and peer relationships in adoptive and biological families. *Marriage and Family Review*, *33*, 251-271.

Pederson, D. R. (1990). Maternal sensitivity and the security of infantmother attachment: A Q-sort study. *Child development*, *61*, 1974-1983.

Plomin, R., Fulker, D. W., Corley, R., & DeFries, J. C. (1997). Nature, nurture, and cognitive development from 1 to 16 years: A parent-offspring adoption study. *Psychological Science*, *8*, 442-447.

Rothbart, M. K., Ahadi, S. A., & Hershey, K. L. (1994). Temperament and social behavior in childhood. *Merrill-Palmer Quarterly*, *40*, 21-39.

Rowe, D. C. (1993a). *The limits of family influence. Genes, experience, and behavior*. New York: Guilford Press.

Rowe, D. C. (1993b). Genetic perspectives on personality. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 179-195). Washington, DC: American Psychological Association.

Rutter, M., Silberg, J., O'Connor, T., & Simonoff, E. (1999). Genetics and child psychiatry: I Advances in quantitative and molecular genetics. *Journal of Child Psychology and Psychiatry*, *40*, 3-18.

Schneider, B. H., Attili, G., Nadel, J., & Weissberg, R. P. (1989). Social competence in developmental perspective. New York, NY: Kluwer Academic/Plenum Publishers.

Schuengel, C., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*, 54-63.

Shulman, S., Elicker, J., & Sroufe, L. A. (1994). Stages of friendship growth in preadolescence as related to attachment history. *Journal of Social and Personal Relationships*, *11*, 341-361.

Simon, R. J. (1996). Transracial adoptions: Experiences of a twenty-year study. *American Sociologist*, *27*, 79-89.

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist*, *34*, 834-841.

Sroufe, L. A. (2000). Early relationships and the development of children. *Infant Mental Health Journal*, *21*, 67-74.

Sroufe, L. A., Carlson, E., Levy, A., & Egeland, B. (1999). Implications of attachment theory for developmental psychopathology. *Development and Psychopathology*, *11*, 1-13.

Sroufe, L. A., Carlson, E., Shulman, S. (1993). Individuals in relationships: Development from infancy through adolescence. In D. C. Funder, R. Parke, C. Tomlinson-Keesey, & K. Widaman (Eds.), *Studying lives through time: Approaches to personality and development* (pp. 315-342). Washington, DC: American Psychological Association.

Sroufe, L. A., Egeland, B., & Carlson, E. A. (1999). One social world: The integrated development of parent-child and peer relationships. In B. Laursen & W. A. Collins (Eds.), *Relationships as developmental contexts. Minnesota Symposia on Child Psychology*, *30* (pp.241-261). Mahwah, NJ: Lawrence Erlbaum Associates.

Sroufe, L. A., Egeland, B., & Kreutzer, T. (1990). The fate of early experience following developmental change: Longitudinal approaches to individual adaptation in childhood. *Child Development*, *61*, 1363-1373.

Stams, G. J. J. M., Juffer, F., Van IJzendoorn, M. H., & Hoksbergen, R. A. C. (2001). Attachment-based intervention in adoptive families in infancy and children's development at age 7: Two follow-up studies. *British Journal of Developmental Psychology*, *19*, 159-180.

Stams, G. J. J. M., Juffer, F., & van IJzendoorn, M. H. (2002). Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: The case of adopted children and their biologically unrelated parents. *Developmental Psychology*, *38*, 806-821.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Boston: Allyn & Bacon.

Thompson, R. A. (1999). Early attachment and later development. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 265-286). New York: The Guilford Press.

Van Lier, P. A., Haselager, G. J. T., Hoeben, S. M., & Van Lieshout, C. F. M. (1992). *Manual for the NCKS. Dutch translation*. Nijmegen, The Netherlands: University of Nijmegen.

Van Lieshout, C. F. M., Riksen-Walraven, J. M. A., Ten Brink, P. W. M., Siebenheller, F. A., Mey, J. T. H., Koot, J. M., Janssen, A. W. H., & Cillessen, A. H. N. (1986). *Zelfstandigheidsontwikkeling in het basisonderwijs*. (Competence development in elementary school). Nijmegen, The Netherlands: University of Nijmegen.

Van IJzendoorn, M. H., & Kroonenberg, P. M. (1988). Cross-cultural patterns of attachment: A meta-analysis of the Strange Situation. *Child Development*, *59*, 147-156.

Van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Some data from Holland and Israel. In R. C. Pianta (Ed.), *New directions in child development: Relationships between children and non-parental adults* (pp. 5-24). San Francisco: Jossey-Bass.

Van Londen, Juffer, F., & Van IJzendoorn, M. H. (in prep.). *The relative contribution of (dis)organized attachment to mental development in internationally adopted infants.* Utrecht, the Netherlands: Utrecht University.

Verhulst, F. C., Koot, H. M., & Van der Ende, J. (1994). Differential predictive value of parents' and teachers' reports of children's problem behaviors: A longitudinal study. *Journal of Abnormal Child Psychology*, *22*, 531-546.

Verhulst, F. C., Van der Ende, J., & Koot, H. M. (1996). *Handleiding voor de CBCL/4-18*. (Manual for the Child Behavior Checklist/4-18, Dutch version.) Rotterdam, The Netherlands: Erasmus University Rotterdam.

Verhulst, F. C., Van der Ende, J., & Koot, H. M. (1997). *Handleiding voor de Teacher's Report Form-TRF*. (Manual for the Teacher's Report Form-TRF, Dutch version.) Rotterdam, The Netherlands: Erasmus University Rotterdam.

Verhulst, F. C., & Versluis–den Bieman, H. J. M. (1995). Developmental course of problem behaviors in adolescent adoptees. *Journal of the American Academy of Child and Adolescent Psychiatry*, *34*, 151-159.

Volling, B. L., & Belsky, J. (1992). The contribution of mother-child and father-child relationships to the quality of sibling interaction: A longitudinal study. *Child Development*, *63*, 1209-1222.

Waters, E., Hamilton, C. E., & Weinfield, N. S. (2000). The stability of attachment security from infancy to adolescence and early adulthood: General introduction. *Child Development*, *71*, 678-683.

Waters, E., Merrick, S. K., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security from infancy to early adulthood: A 20-year longitudinal study. *Child Development*, *71*, 684-689.

Youngblade, L. M., & Belsky, J. (1992). Parent-child antecedents of 5-year-olds' close friendships: A longitudinal analysis. *Developmental Psychology*, *28*, 700-713.

Zimmermann, P., Maier, M. A., Winter, M., & Grossmann, K. E. (2001). Attachment and adolescents' emotion regulation during a joint problem-solving task with a friend. *International Journal of Behavioral Development*, *25*, 331-34.

5
Summary and Discussion

The general aim of this thesis was to examine the problem behavior and socio-emotional competence of internationally adopted adolescents, and to investigate the influence of early, middle childhood and concurrent factors. Research on adopted children and adoptive families is carried out to obtain specific knowledge on the adjustment of adopted children and to improve the assistance and resources for the families involved. Moreover, research on adopted children and adoptive families is carried out to investigate influences of child-rearing or social-interactive factors on the development of all children, independent of shared genetic factors between children and parents. In families with biologically related parents and children, the associations between parent-child variables and parent variables on the one hand and child variables on the other hand, may always be affected by the genetic link between child and parent, instead of parenting influences. Studies with adopted children make it possible to examine the unique contributions of parenting variables to children's development excluding of the influence of genetic similarities.

The first study (Chapter 2) examined the prevalence of problem behaviors in samples of adolescents who were adopted from a foreign country as infants or young children and explored the domains in which any problems were manifested (Bimmel, Juffer, Van IJzendoorn, & Bakermans-Kranenburg, 2003). A meta-analysis of ten studies (N = 2.317 internationally adopted adolescents) showed that internationally adopted adolescents did exhibit more behavior problems than did non-adopted adolescents (d = 0.08, p < .05), with the difference revealed in externalizing (d = 0.11, p < .001) but not in internalizing (d = 0.05, p = 0.12) behavior problems. However, according to conventional criteria, the effect sizes were very small. In the sample of internationally adopted adolescents of the longitudinal study described in the current thesis (N = 177 internationally adopted adolescents; Chapters 3 and 4), we also found more behavior problems in the adopted adolescents (d = 0.44, p < .001), with the difference revealed in both externalizing (d = 0.50, p < .001) and internalizing (d = 0.25, p < 0.001) behavior problems. The effect sizes were small to medium and were larger than the effect sizes found in the meta-analysis. In a meta-analysis of 47 studies (N = 15.790 internationally adopted children), Juffer and Van IJzendoorn (2005) also found more total behavior problems (d = 0.11, p < .001), more externalizing behavior problems (d = 0.10, p < .001), and more internalizing behavior problems (d = 0.07, p < .001) in internationally adopted children in younger and older age cohorts. However, all effect sizes were very small. It should be noted that the effect sizes found in our sample of internationally adopted adolescents were significantly larger than the effect sizes found in both

meta-analyses. An explanation of this may be found in the composition of the sample. The sample of adopted adolescents of the longitudinal study included also children who were referred to mental health services or were placed out of home because of problems, whereas many studies do not include these children (e.g., Sharma, McGue, & Benson, 1998). Also, although these children were adopted at a young age (i.e., before six months), unknown risks in their pre-adoption histories, such as pre- or peri-natal risks, may be partly responsible for the over-representation of behavior problems.

Moreover, the meta-analysis presented in the current thesis (Chapter 2) showed that the percentage of internationally adopted adolescents with behavior problems of clinical significance was larger than the percentage of 'clinical cases' in non-adopted adolescents (*d*'s: 0.08 - 0.15, *p*-values < .05; Bimmel et al., 2003). In the sample of internationally adopted adolescents of the longitudinal study described in the current thesis (Chapters 3 and 4), we also found a higher percentage of internationally adopted adolescents who scored in the clinical range compared with non-adopted adolescents (*d*'s: 0.12 - 0.37, *p*-values < .05). In addition, in this sample we found that more adopted adolescents were placed out of home because of serious difficulties (2.11% compared with 0.25% in non-adopted children, $p < .001$). In their meta-analysis, Juffer and Van IJzendoorn (2005) found that international adoptees were overrepresented in mental health referrals ($d = 0.37$, $p < .001$). Again, the effect sizes found in our sample of internationally adopted adolescents were larger than the effect sizes found in both meta-analyses. The same reasons mentioned before may account for this difference. In all three studies (the two meta-analyses and our study) the effect sizes of the number of clinical cases were larger than the effect sizes of the general behavior problem scores, that is, the differences between adopted and non-adopted children were larger when we considered the percentage of clinical cases. A curvilinear association may be the cause of this, with cumulation of behavior problems on the extreme right side of the distribution (e.g., Juffer & Van IJzendoorn, 2005).

In sum, internationally adopted children and adolescents show somewhat more total, internalizing, and externalizing behavior problems compared with non-adopted children and adolescents, but effect sizes are weak. A higher percentage of internationally adopted children and adolescents have behavior problems of clinical significance and they are overrepresented in mental health referrals. The larger number of severely disturbed ('clinical') children may be responsible for the elevated rate of behavior problems in the entire group of internationally adopted children. The majority of the internationally adopted children are well adjusted, although a relatively large minority of adopted children have behavior problems of clinical significance or are referred to mental health services compared with non-adopted children.

However, another reason for the relatively high percentage of referrals among adopted children may be that the threshold to seek professional help might be lower for adoptive parents than for birth parents (Miller, Fan, Grotevant et al., 2000; Warren, 1992). Due to their expectations of the adopted

child (Geerars, Hoksbergen, & Rooda, 1995), adoptive parents may notice or identify problems sooner. In addition, adoptive parents are familiar with social service agencies, which may lower the threshold to seek professional help. Warren (1992), for example, found that adopted adolescents were more likely than non-adopted adolescents to receive psychiatric treatment, even when the level of behavior problems was controlled for (see also Miller, Fan, Grotevant et al., 2000).

Moreover, it should be stressed that adoption itself is not a risk factor in the adjustment of children (Haugaard, 1998; Stams, Juffer, Rispens, & Hoksbergen, 2000). Compared with children who were born illegitimately but remained with their biological mothers (Maughan & Pickles, 1990; Seglow, Pringle, & Wedge, 1972), children who were placed in institutions (Bohman & Sigvardsson, 1990; Colombo, De la Parra, & López, 1992; Tizard & Hodges, 1978; Van IJzendoorn, Juffer, & Klein Poelhuis, 2005), and children who were relinquished for adoption but later restored to their birth parents (Colombo, De la Parra, & López, 1992; Tizard & Hodges, 1978; Hodges & Tizard, 1989a; Hodges & Tizard, 1989b; Van IJzendoorn et al., 2005), adopted children were better adjusted. Since alternative living arrangements for children who were relinquished for adoption would be living in an institution or staying with or being restored to overburdened birth parents, adoption may even be considered as a protective factor (Van IJzendoorn et al., 2005). Furthermore, children who experienced severe deprivation in an institutional setting showed substantial developmental recovery after adoptive placement (Morison, Ames, & Chisholm, 1995; Rutter et al., 1998). Another alternative for children who were given up for adoption is being adopted within the country. However, in their meta-analysis, Juffer and Van IJzendoorn (2005) found that internationally adopted children showed better behavioral and mental health outcomes than locally adopted children. Because of a lack of empirical studies on local adoptions in the developing countries, outcomes of these adoptions are yet unidentified.

In sum, although more adopted than non-adopted children and adolescents are referred to mental health services, adoption may often be the best solution for a child who would otherwise be raised in an institution or in similar adverse environments. Nevertheless, parents, social workers, and other professionals should be aware of the adversity that many adopted children have experienced, and of the influence that such disadvantages may exert on the adopted children's behavior (Grotevant & McRoy, 1990).

The second study (Chapter 3) examined resting heart rate and its reactivity to a stressful situation in adopted adolescents with aggressive, delinquent, or internalizing behavior problems and adopted adolescents without behavior problems (N = 151). This study was the first to assess the association between heart rate and behavior problems in adopted children, who are raised by their biologically unrelated adoptive parents. In non-adoptive families, the parents may transmit a genetic predisposition for, for example, antisocial behavior and/or lower heart rate to their children, *and* also provide a rearing

environment that provokes or reinforces antisocial behaviors. Therefore, the rearing environment of these children may cause or intensify a possible relation between lower heart rate and antisocial behavior. In adoptive families, genetic influences that predispose children for developing behavior problems are less likely to be intensified by a problematic rearing environment compared to non-adoptive families (Golombok, MacCallum, & Goodman, 2001; Golombok, MacCallum, Goodman, & Rutter, 2002).

Results showed that although there were no significant differences between the groups in resting heart rate, heart rate reactivity to a stressful situation showed rather strong differences. Early-onset delinquents showed heart rate *hypo*reactivity to a stress-eliciting task compared with late-onset delinquent adolescents and adolescents without behavior problems. Heart rate *variability* suggested that these differences were in part mediated by differential responses of the *para*sympathetic nervous system. In their meta-analysis on heart rate and antisocial behavior in children and adolescents, Ortiz and Raine (2004) found a comparable effect size (d = 0.76) for heart rate reactivity during a stressor. Early-onset delinquents appeared to be less aroused by stress. We found no indications for environmental risk factors such as early-childhood parental sensitivity, parental socioeconomic status, or children's health status in the first year of life in the childhood-onset delinquent adolescents, pointing to possible neurobiological or genetic biases towards hyporeactivity in these individuals (Bock & Goode, 1996; Carey, 1994). The differences in heart rate reactivity between the late-onset delinquents and adolescents without behavior problems were not significant. Adolescence-onset delinquents may develop in the same way as their non-antisocial peers (Fox, Schmidt, & Henderson, 2000), except for a period in which they are more affected by the typical exploratory and limit-testing behavior of puberty, for example delinquent or antisocial behavior (Caspi & Moffitt, 1995; Moffitt, 1993; Moffitt & Caspi, 2001). Early-onset delinquent behavior may point to a neurobiological or genetic risk for antisocial behavior in children, whereas late-onset delinquent behavior may be more strongly related to environmental risk factors.

The different forms of aggression (early-onset and late-onset aggression) did not show any significant differences in heart rate reactivity. The aggression and delinquency syndromes of the Child Behavior Checklist (CBCL; Achenbach, 1991) thus appear to refer to divergent patterns of problem behavior. Our findings show that delinquency and aggression may follow different developmental trajectories, and that early-onset delinquency –but not aggression– is characterized by stress hyporeactivity. The differentiation between delinquency and aggression, and between childhood-onset and adolescence-onset delinquency (Moffitt, 1993) is crucial for our understanding of the development of externalizing problem behaviors.

In the third study (Chapter 4), internationally adopted children placed before the age of 6 months were followed from infancy to age 14 to assess the continuity of their social development and to examine the relative influence of

early, middle childhood, and concurrent factors on social development in adolescence (N = 120). The emphasis was on maternal sensitivity and infant attachment security, attachment disorganization, and temperament as predictors in early childhood, and maternal sensitivity, child temperament and social development as predictors in middle childhood. The study controlled for concurrent contextual (parenting) and constitutional (gender, temperament) factors in examining the influence of early experiences on later social development. This study was the first to assess these associations in adopted children, who are raised by their biologically unrelated adoptive parents, and the study thus allowed for more conclusive evidence of the relative influence of early, middle childhood, and concurrent factors on adolescent's social development, independent of shared genetic factors between children and parents.

Regression analysis showed that social development was rather stable from 7 to 14 years of age, even after controlling for significant background variables and child temperament. Early attachment security and attachment disorganization were not associated with social development in adolescence. Early maternal sensitivity and early temperament were associated with social development at 14 years, but they did not predict social development at 14 years after controlling for their contribution at 7 years. Girls were found to be better adjusted than boys, and stressful life events between 7-14 years predicted lower levels of social development. Structural equation modeling demonstrated continuity in temperament and social development from infancy through middle childhood to adolescence. Maternal sensitivity and temperament showed concurrent, but not predictive, influences on middle childhood and adolescent social development. Early parent-child relationships were indirectly associated with social development in adolescence, through the influence on social development in middle childhood.

Early parent-child relationships were not *directly* associated with social development in adolescence. In their structural equation model, Carlson, Sroufe, and Egeland (2004) found a comparable non-significant standardized coefficient of .02 for the *direct* path from early experience (a latent variable with the observed variables attachment quality and toddler experience) to adolescent social functioning. It may be difficult to find *direct* significant influences of infant attachment and early maternal sensitive responsiveness on developmental domains over such a long period. It is also possible that it is difficult to find significant *direct* results of early relational predictors, such as infant attachment and maternal sensitive responsiveness, in a period when children are trying to become more autonomous and independent of parents, as in adolescence. A further explanation for the absence of a *direct* influence of early parent-child relationships on adolescent social development can be found in the strong influences of later and concurrent experiences and behavior. These later and concurrent influences eclipsed the predictive value of the *direct* associations between early parent-child relationships and adolescent social development. Finally, significant *direct* associations between early parent-child relationships

and later adjustment may be indicative of coherence in individual development (Sroufe, 1979; Sroufe, Carlson, Shulman, 1993) or of the confounding of parenting effects and genetic similarities between children and parents (Rowe, 1993a, 1993b). In adoptive families there are no genetic similarities between children and parents, which may be the cause of the low and non-significant standardized coefficient between early parent-child relationships and later adjustment.

We found *indirect* influences of early parent-child relationships on adolescent social development. The different steps of the indirect path found in our study from early maternal sensitivity, through infant attachment security and disorganization, through social development in middle childhood, to social development in adolescence are supported by attachment theory (Bowlby, 1973, 1980) and previous empirical studies (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Belsky, 1981, 1984; De Wolff & Van IJzendoorn, 1997; Elicker, Englund, & Sroufe, 1992; Main & Hesse, 1990; Schuengel, Bakermans-Kranenburg, & Van IJzendoorn, 1999; Stams, Juffer, & van IJzendoorn, 2002). Together, these paths may constitute *indirect* influences of early parent-child relationships on adolescent social development. Carlson et al. (2004) also found an *indirect* association between early experience and adolescent social functioning. In their study early experience had an influence on relationship representation and social behavior in early childhood, which in turn influenced later relationship representation and social behavior which finally influenced adolescent social functioning.

In sum, the results of the third study (Chapter 4) support coherence in individual development (Sroufe, 1979; Sroufe et al., 1993) from infancy through middle childhood to adolescence. Concurrent environmental experiences and child characteristics are essential influences on middle childhood and adolescent social development. Early parent-child relationships are associated with social development in adolescence through the influence on social development in middle childhood, even in the absence of genetic similarities between children and parents. Bowlby's (1973, 1980) thesis that adaptation is always a product of both developmental history *and* current circumstances is supported.

Limitations and directions for further reseach

Some limitations of the studies of the present thesis should be mentioned. A limitation of the meta-analysis (first study, Chapter 2) is that considerable heterogeneity exists within the population of individuals who are adopted (Haugaard, 1998) and between the samples of the different studies included in the meta-analysis. Differences are seen not only in the personal characteristics of the adopted children, but also in the circumstances before their adoption. For example, in most of the studies included in our meta-analysis, the children were adopted from various different countries and cultures, the adoption procedures differed (e.g., some children stayed in institutions before placement, while others lived with their birth family or in a foster home), and the ages on arrival were divergent. Within the population of adopted children,

there may be subgroups of youngsters who are at risk for the development of adjustment problems. Therefore, until additional research on adoption and adjustment in various subgroups is completed, clinicians and policy makers must be careful to avoid generalizing this risk to the entire population of adopted individuals (Haugaard, 1998). Nevertheless, effect sizes were homogeneous across the studies, so the computation of combined effect sizes is meaningful.

A second limitation is that the meta-analytic evidence is comparative, and the causal nature of the association between international adoption and problem behaviors has not been established. We cannot eliminate the possibility that for some internationally adopted children, problem behaviors (or a genetic disposition for such behaviors) may have been the reason why the children were given up for adoption. In this case, problem behaviors are a cause rather than a consequence of the adoption. A third limitation of the meta-analysis is that some of the differences between adopted and nonadopted adolescents may be explained by different perceptions of parents of adopted children and parents of birth children, for example a lower threshold to seek professional help for adoptive parents than for birth parents (Warren, 1992), as discussed before.

The second (Chapter 3) and third (Chapter 4) study share some related limitations. First, we only assessed mother-child-interactions. Future studies should include father-child-interactions (Grossmann, 1997; Grossmann et al., 2002) and, because of the growing influence of peers in adolescence, peer-interactions as well. Sroufe, Egeland, and Carlson (1999) showed that peer relationships at any given age predicted later social competence and that such predictive peer competencies were themselves predicted by qualities of parent-child relationships that preceded them. In their study, peer and parent-child relationships together predicted later social functioning better than either domain alone (Sroufe et al., 1999). A second limitation is the rather high percentage of securely attached children (76%, which is higher than the normative percentage in nonclinical samples; Van IJzendoorn & Kroonenberg, 1988), and the low percentage of resistant children (3%, which is lower than the normative percentage in nonclinical samples; Van IJzendoorn & Kroonenberg, 1988). The lack of resistant children precluded analyses by attachment classification. Third, we included only one dimension of parenting, namely maternal sensitive responsiveness. Behavior problems and social development may be influenced by other aspects of parenting, for example discipline or cognitive stimulation, or other environmental factors.

Finally, it is often claimed that adoptees and adoptive parents are broadly comparable with the general population, but in some fundamental respects this is not the case (Rutter, Silberg, O'Connor, & Simonoff, 1999). Adoptees differ with respect to adoption-specific aspects. However, in the second and third study (Chapters 3 and 4) adoption-specific aspects (e.g., country of origin, age on arrival, health condition on arrival, mixed vs. all-adoptive families) were not associated with adjustment in adolescence. In addition, an increasingly number of adoptions involve older children,

particularly those with special needs of one kind or another (Rutter et al., 1999). The adopted children in the present study were adopted at a very early age (before the age of six months) and were not selected on the basis of special needs. Moreover, adoptive parents differ from other parents in being better educated and more socially advantaged, as was the case in our sample (Stams et al., 2002; see also Rutter et al., 1999), and having a better mental health (Van Londen, 2002). To the extent that the adoptive families provide an under-representation of high-risk environments, the effect will be to underestimate the strength of environmental effects. For example, investigators studying more economically advanced families have not consistently documented significant associations between early parent-child relationships and later behavior problems (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Fagot & Kavanagh, 1990; Goldberg, Perrotta, Minde, & Corter, 1986). Nevertheless, the third study (Chapter 4) found indirect influences of early parent-child relationships on social development in adolescence.

In sum, the fist study of this thesis (Chapter 2) showed that the majority of the internationally adopted children are well adjusted, although a relatively large minority of adopted children had behavior problems of clinical significance or were referred to mental health services compared with non-adopted children. Nevertheless, adoption may often be the best solution for a child who would otherwise be raised in an institution or in other adverse environments (see also Juffer, 2002; Van IJzendoorn et al., 2005). The second and third study (Chapters 3 and 4) showed several longitudinal and concurrent influences on the behavioral and social development of adopted adolescents. The second study (Chapter 3) showed that early-onset delinquency was associated with stress hyporeactivity. The differentiation between delinquency and aggression, and between childhood-onset and adolescence-onset delinquency (Moffitt, 1993) appeared to be important for our understanding of the development of externalizing problem behaviors. The third study (Chapter 4) showed that individual development from infancy through middle childhood to adolescence was rather stable and that concurrent environmental experiences and child characteristics were essential influences on middle childhood and adolescent social development. Early parent-child relationships did not determine in final form social development in adolescence, but they provided the basis for healthy social development through the influence on earlier social development, even in the absence of genetic similarities between children and parents. Bowlby's (1973, 1980) thesis that adaptation is always a product of both developmental history *and* current circumstances was supported.

References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/ 4-18 and 1991 profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.

Bates, J. E., Bayles, K., Bennett, D. S., Ridge, B., & Brown, M. M. (1991). Origins of externalizing behavior problems at eight years of age. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 93-120). Hillsdale, NJ: Erlbaum.

Bimmel, N., Juffer, F., Van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2003). Problem behavior of internationally adopted adolescents: A review and meta-analysis. *Harvard Review of Psychiatry*, *11*, 64-77.

Belsky, J. (1981). Early human experience: A family perspective. *Developmental Psychology*, *17*, 3-23.

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*, 83-96.

Bock, G. R., & Goode, J. A. (Eds.). (1996). *Genetics of criminal and antisocial behavior*. Chichester, England: Wiley.

Bohman, M., & Sigvardsson, S. (1990). Outcome in adoption: lessons from longitudinal studies. In D. M. Brodzinsky & M. D. Schechter (Eds.), The psychology of adoption. New York: Oxford University Press, 1990:93–106.

Bowlby, J. (1973). *Separation*. New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3.* Loss. New York: Basic.

Carey, G. (1994). Genetics and violence. In A. J. Reiss, Jr., K. A. Miezek, & J. A. Roth (Eds.), *Understanding and preventing violence* (pp. 21-58). Washington, DC: National Academy Press.

Carlson, E. A., Sroufe, L. A., & Egeland, B. (2004). The construction of experience: A longitudinal study of representation and behavior. *Child Development*, *75*, 66-83.

Caspi, A., & Moffitt, T. E. (1995). The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior. In D. Cicchetti & D. Cohen (Eds.), *Manual of developmental psychopathology* (pp. 472-511). New York: Wiley.

Colombo, M., De la Parra, A., & López, I. (1992). Intellectual and physical outcome of children undernourished in early life is influenced by later environmental conditions. *Developmental Medicine and Child Neurology*, *34*, 611–622.

De Wolff, M. S., & Van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68,* 571-591.

Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent-child relationships. In

R. D. Parke & G. W. Ladd (Eds.), *Family-peer relationships: Modes of linkage* (pp. 77-106). Hillsdale, NJ: Erlbaum.

Fagot, B. I., & Kavanagh, K. (1990). The prediction of antisocial behavior from avoidant attachment classifications. *Child Development*, *61*, 864-873.

Fox, N. A., Schmidt, L. A., & Henderson, H. A. (2000). Developmental psychophysiology: Conceptual and methodological perspectives. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 665-686). Cambridge: Cambridge University Press.

Geerars, H., Hoksbergen, R. A. C., & Rooda, J. (1995). *Geadopteerden op weg naar volwassenheid: De integratie van 68 Thaise jongeren in de Nederlandse samenleving*. Utrecht, The Netherlands: Utrecht University.

Goldberg, S., Perrotta, M., Minde, K., & Corter, C. (1986). Maternal behavior and attachment in low birthweight twins and singletons. *Child Development*, *57*, 34-46.

Golombok, S., MacCallum, F., & Goodman, E. (2001). The "Test-Tube" Generation: Parent-Child Relationships and the Psychological Well-Being of In Vitro Fertilization Children at Adolescence. *Child Development*, *72*, 599-608.

Golombok, S., MacCallum, F., Goodman, E., & Rutter, M. (2002). Families with children conceived by donor insemination: A follow-up at age twelve. *Child Development*, *73*, 952-968.

Grossmann, K. (1997). *Infant-father attachment relationship: Sensitive challenges during play with toddler is the pivotal feature*. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Washington, DC.

Grossmann, K., Grossmann, K. E., Fremmer-Bombik, E., Kindler, H., Scheuerer-English, H., & Zimmermann, P (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. *Social Development*, *11*, 307-331.

Grotevant, H. D., & McRoy, R. G. (1990). Adopted adolescents in residential treatment: The role of the family. In D. M. Brodzinsky & M. D. Schechter (Eds.), *The psychology of adoption* (pp. 167- 186). Oxford: Oxford University Press.

Haugaard, J. J. (1998). Is adoption a risk factor for the development of adjustment problems? *Clinical Psychology Review*, *18*, 47–69.

Hodges, J., & Tizard, B. (1989a). IQ and behavioural adjustment of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry*, *30*, 53–75.

Hodges, J., & Tizard, B. (1989b). Social and family relationships of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry*, *30*, 77–97.

Juffer, F. (2002, February). Adoptie: een optie voor kind en gezin? [Adoption: an option for child and family?]. Inaugural speech presented at Leiden University, Leiden, The Netherlands.

Juffer, F., & Van IJzendoorn, M. H. (2005). Behavior problems and mental health referrals of international adoptees: A meta-analytic approach. *JAMA: The Journal of the American Medical Association. 293,* 2501-2515 (May 25).

Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? In M. Greenberg, D. Cicchetti, & E. Cummings (Eds.), *Attachment in the preschool years* (pp. 161-182). Chicago: University of Chicago Press.

Maughan, B., & Pickles, A. (1990). Adopted and illegitimate children growing up. In: L. N. Robins & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 36–61). Cambridge, England: Cambridge University Press.

Miller, B. C., Fan, X., Grotevant, H. D., Christensen, M., Coyl, D., Van Dulmen, M. (2000). Adopted adolescents' overrepresentation in mental health counseling: Adoptees' problems or parents' lower threshold for referral? *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 1504-1511.

Moffitt, T. E. (1993). Adolescence-limited and life-course persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674-701.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescent-limited pathways among males and females. *Development and Psychopathology*, *13*, 355-375.

Morison, S. J., Ames, E. W., & Chisholm, K. (1995). The development of children adopted from Romanian orphanages. *Merrill-Palmer Quarterly*, *41*, 411–430.

Ortiz, J., & Raine, A. (2004). Heart rate level and antisocial behavior in children and adolescents: A meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 154-162.

Rowe, D. C. (1993a). *The limits of family influence. Genes, experience, and behavior*. New York: Guilford Press.

Rowe, D. C. (1993b). Genetic perspectives on personality. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 179-195). Washington, DC: American Psychological Association.

Rutter, M., Andersen-Wood, L., Beckett, C., Bredenkamp, D., Castle, J., Dunn, J., et al. (1998). Developmental catch-up, and deficit, following adoption after severe global early privation. *Journal of Child Psychology and Psychiatry*, *39*, 465–76.

Rutter, M., Silberg, J., O'Connor, T., & Simonoff, E. (1999). Genetics and child psychiatry: I Advances in quantitative and molecular genetics. *Journal of Child Psychology and Psychiatry*, *40*, 3-18.

Seglow, J., Pringle, M. L. K., & Wedge, P. (1972). *Growing up adopted: a long-term national study of adopted children and their families*. Slough, England: National Foundation for Education Research in England and Wales.

Schuengel, C., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*, 54-63.

Sharma, A. R., McGue, M. K., & Benson, P. L. (1998). The psychological adjustment of United States adopted adolescents and their nonadopted siblings. *Child Development*, *69*, 791–802.

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist*, *34*, 834-841.

Sroufe, L. A., Carlson, E., & Shulman, S. (1993). Individuals in relationships: Development from infancy through adolescence. In D. C. Funder, R. Parke, C. Tomlinson-Keesey, & K. Widaman (Eds.), *Studying lives through time: Approaches to personality and development* (pp. 315-342). Washington, DC: American Psychological Association.

Sroufe, L. A., Egeland, B., & Carlson, E. A. (1999). One social world: The integrated development of parent-child and peer relationships. In B. Laursen & W. A. Collins (Eds.), *Relationships as developmental contexts. Minnesota Symposia on Child Psychology*, *30* (pp.241-261). Mahwah, NJ: Lawrence Erlbaum Associates.

Stams, G. J. J. M., Juffer, F., Rispens, J., & Hoksbergen, R. A. C. (2000). The development and adjustment of 7-year-old children adopted in infancy. *Journal of Child Psychology and Psychiatry*, *41*, 1025–1037.

Stams, G. J. J. M., Juffer, F., & van IJzendoorn, M. H. (2002). Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: The case of adopted children and their biologically unrelated parents. *Developmental Psychology*, *38*, 806-821.

Tizard, B., & Hodges, J. (1978). The effect of early institutional rearing on the development of eight-year-old children. *Journal of Child Psychology and Psychiatry*, *19*, 99–118.

Van IJzendoorn, M. H., Juffer, F., & Klein Poelhuis, C. W. (2005). Adoption and cognitive development: A meta-analytic comparison of adopted and nonadopted children's IQ and school performance. *Psychological Bulletin*, *131*, 301-316.

Van IJzendoorn, M. H., & Kroonenberg, P. M. (1988). Cross-cultural patterns of attachment: A meta-analysis of the Strange Situation. *Child Development*, *59*, 147-156.

Van Londen, M. (2002). Gehechtheid in adoptiegezinnen. Intergenerationele overdracht en gedesorganiseerde gehechtheid. [Attachment in adoptive families. Intergenerational transmission and disorganized attachment.]. Unpublished doctoral dissertation, Utrecht University, Utrecht, The Netherlands.

Warren, S. B. (1992). Lower threshold for referral for psychiatric treatment for adopted adolescents. *Journal of the American Academy for Child and Adolescent Psychiatry*, *31*, 512-517.

Samenvatting (Summary in Dutch)

Het belangrijkste doel van het onderzoek beschreven in dit proefschrift was om het probleemgedrag en de sociaal-emotionele competentie van internationaal geadopteerde adolescenten te onderzoeken. Daarnaast zijn ook vroegere en huidige invloeden op het probleemgedrag en de sociaal-emotionele competentie onderzocht. Onderzoek naar geadopteerde kinderen en adoptiegezinnen wordt uitgevoerd om specifieke kennis te verkrijgen over de aanpassing van geadopteerde kinderen en om de hulpverlening en voorzieningen voor de betrokken gezinnen te verbeteren. Adoptieonderzoek wordt ook verricht om te onderzoeken of de opvoeding invloed heeft op de ontwikkeling van kinderen, onafhankelijk van gedeelde genetische invloeden tussen kinderen en hun ouders. In gezinnen met biologisch verwante ouders en kinderen kunnen de relaties tussen oudervariabelen en kindvariabelen altijd beïnvloed zijn door de genetische link tussen kind en ouder, in plaats van door de opvoeding. Onderzoek naar geadopteerde kinderen maakt het echter mogelijk om de invloed van de opvoeding op de ontwikkeling van kinderen te onderzoeken zonder de invloed van genetische overeenkomsten tussen ouder en kind.

In de eerste deelstudie (Hoofdstuk 2) onderzochten we het voorkomen van gedragsproblemen bij adolescenten die als baby of jong kind geadopteerd waren uit het buitenland en onderzochten we op welke gebieden eventuele problemen naar voren kwamen (Bimmel, Juffer, Van IJzendoorn, & Bakermans-Kranenburg, 2003). Een meta-analyse van tien onderzoeken (N = 2.317 internationaal geadopteerde adolescenten) liet zien dat internationaal geadopteerde adolescenten meer gedragsproblemen hebben dan niet-geadopteerde adolescenten (d = 0.08, p < .05), met een verschil in externaliserend (d = 0.11, p < .001) maar niet in internaliserend (d = 0.05, p = 0.12) probleemgedrag. De effectgroottes waren echter klein. In de groep van internationaal geadopteerde adolescenten van het Leidse longitudinale onderzoek, dat beschreven wordt in dit proefschrift (N = 177 internationaal geadopteerde adolescenten; Hoofdstukken 3 en 4), vonden we ook meer totaal probleemgedrag bij de geadopteerde adolescenten (d = 0.44, p < .001). Dit betrof zowel externaliserend (d = 0.50, p < .001) als internaliserend (d = 0.25, p < 0.001) probleemgedrag. De effectgroottes waren klein tot gemiddeld en waren groter dan de effectgroottes die gevonden werden in de meta-analyse. In een meta-analyse van 47 onderzoeken (N = 15.790 internationaal geadopteerde kinderen) vonden Juffer en Van IJzendoorn (2005) ook meer totaal (d = 0.11, p < .001), externaliserend (d = 0.10, p < .001), en internaliserend (d = 0.07, p < .001) probleemgedrag bij internationaal geadopteerde kinderen van verschillende leeftijden. De effectgroottes waren echter heel klein. De effectgroottes die gevonden werden bij de internationaal geadopteerde adolescenten van het huidige onderzoek waren significant groter dan de effectgroottes die gevonden

werden in beide meta-analyses. Een verklaring hiervoor kan gevonden worden in de samenstelling van de onderzoeksgroep. In de groep geadopteerde adolescenten van het Leidse longitudinale onderzoek bevonden zich ook jongeren die naar de klinische hulpverlening verwezen waren en jongeren die uit huis geplaatst waren vanwege problemen. De meeste andere onderzoeken hebben deze geadopteerden niet in de onderzoeksgroep betrokken (zoals Sharma, McGue, & Benson, 1998). Daarnaast kunnen, hoewel deze kinderen op jonge leeftijd geadopteerd werden (voor de leeftijd van zes maanden), onbekende risicofactoren uit de tijd voor de adoptie, zoals pre- of perinatale risico's, gedeeltelijk verantwoordelijk zijn voor het vaker voorkomen van gedragsproblemen in ons onderzoek.

De meta-analyse in het huidige proefschrift (Hoofdstuk 2) liet verder zien dat het percentage internationaal geadopteerde adolescenten met probleemgedrag in het klinische gebied hoger was dan het percentage 'klinische gevallen' bij niet-geadopteerde adolescenten (*d*'s: 0.08 - 0.15, *p*-waarden < .05; Bimmel et al., 2003). Bij de groep internationaal geadopteerde adolescenten van het Leidse longitudinale onderzoek dat beschreven wordt in het huidige proefschrift (Hoofdstukken 3 en 4) vonden we ook een hoger percentage adolescenten die in het klinische gebied scoorden vergeleken met niet-geadopteerde adolescenten (*d*'s: 0.12 - 0.37, *p*-waarden < .05). Daarnaast vonden we in deze groep dat meer geadopteerde adolescenten uit huis geplaatst waren vanwege ernstige problemen (2.11% vergeleken met 0.25% bij niet-geadopteerde kinderen, $p < .001$). Juffer en Van IJzendoorn (2005) vonden in hun meta-analyse dat international geadopteerden oververtegenwoordigd waren in de geestelijke gezondheidszorg ($d = 0.37$, $p < .001$). De effectgroottes die gevonden werden in onze groep van internationaal geadopteerde adolescenten waren opnieuw groter dan de effectgroottes van beide meta-analyses. Dezelfde redenen die eerder genoemd zijn, kunnen dit verschil verklaren. In alle onderzoeken (de twee meta-analyses en ons longitudinale onderzoek) waren de effectgroottes van het aantal klinische gevallen groter dan de effectgroottes van de algemene probleemgedragscores. Dit betekent dat de verschillen tussen geadopteerde en niet-geadopteerde kinderen groter waren wanneer het percentage klinische gevallen bekeken werd. Een curvelineair verband kan de oorzaak hiervan zijn, met een cumulatie van probleemgedrag aan de extreem rechterkant van de verdeling (zie ook Juffer & Van IJzendoorn, 2005).

Samenvattend kan gezegd worden dat internationaal geadopteerde kinderen en adolescenten iets meer totaal, internaliserend, en externaliserend probleemgedrag laten zien dan niet-geadopteerde kinderen en adolescenten, maar dat de effectgroottes klein zijn. Een groter percentage internationaal geadopteerde kinderen en adolescenten heeft probleemgedrag dat klinisch van aard is en ze zijn oververtegenwoordigd in de geestelijke gezondheidszorg. Het is mogelijk dat het grotere aantal ('klinische') kinderen met ernstige gedragsproblemen verantwoordelijk is voor het hogere niveau van probleemgedrag in de gehele groep van internationaal geadopteerde kinderen. De meeste internationaal geadopteerde kinderen zijn goed aangepast, maar een

relatief grote minderheid van geadopteerde kinderen heeft probleemgedrag dat klinisch van aard is of is verwezen naar de hulpverlening vergeleken met niet-geadopteerde kinderen.

Een andere mogelijke reden voor het relatief hoge percentage van verwijzingen naar de hulpverlening bij geadopteerde kinderen is dat de drempel om professionele hulp te zoeken voor adoptieouders lager is dan voor ouders met biologisch eigen kinderen (Miller, Fan, Grotevant et al., 2000; Warren, 1992). Door hun verwachtingen van het geadopteerde kind (Geerars, Hoksbergen, & Rooda, 1995), kunnen adoptieouders problemen eerder opmerken of vaststellen. Daarnaast zijn adoptieouders bekend met sociale instellingen, wat de drempel om professionele hulp te vragen kan verlagen. Warren (1992) bijvoorbeeld vond dat geadopteerde adolescenten sneller een psychiatrische behandeling krijgen, zelfs als er voor de mate van probleemgedrag gecontroleerd was (zie ook Miller et al., 2000).

Als laatste moet benadrukt worden dat adoptie zelf geen risicofactor is voor de aanpassing van kinderen (Haugaard, 1998; Stams, Juffer, Rispens, & Hoksbergen, 2000). Vergeleken met kinderen die buitenechtelijk geboren werden maar bij hun biologische moeder bleven (Maughan & Pickles, 1990; Seglow, Pringle, & Wedge, 1972), kinderen die in kindertehuizen geplaatst werden, (Bohman & Sigvardsson, 1990; Colombo, De la Parra, & López, 1992; Tizard & Hodges, 1978; Van IJzendoorn, Juffer, & Klein Poelhuis, 2005), en kinderen die ter adoptie afgestaan werden maar later teruggingen naar hun geboorteouders (Colombo, De la Parra, & López, 1992; Tizard & Hodges, 1978; Hodges & Tizard, 1989a; Hodges & Tizard, 1989b; Van IJzendoorn et al., 2005), bleken de geadopteerde kinderen beter aangepast. Adoptie kan zelfs gezien worden als een protectieve factor (Van IJzendoorn et al., 2005). Alternatieve leefomstandigheden voor kinderen die afgestaan werden voor adoptie zijn bijvoorbeeld het leven in een kindertehuis of het blijven bij of terug gaan naar overbelaste geboorteouders. Daarnaast lieten kinderen die ernstige deprivatie in instituten of kindertehuizen hadden ervaren aanzienlijk herstel zien na de adoptieplaatsing (Morison, Ames, & Chisholm, 1995; Rutter et al., 1998). Een ander alternatief voor kinderen die afgestaan worden voor adoptie is adoptie binnen het land van herkomst. Juffer en Van IJzendoorn (2005) vonden echter in hun meta-analyse dat internationaal geadopteerde kinderen een betere aanpassing lieten zien dan kinderen die geadopteerd waren in hun geboorteland. De gevolgen van binnenlandse adopties in de buitenlandse landen van herkomst zijn niet bekend vanwege het ontbreken van empirisch onderzoek naar deze adopties.

Samengevat laat het eerste onderzoek (Hoofdstuk 2) zien dat er meer geadopteerde dan niet-geadopteerde kinderen en adolescenten verwezen worden naar de klinische hulpverlening. Toch is adoptie vaak de beste oplossing voor een kind dat anders op zou groeien in een instelling of kindertehuis of in een vergelijkbare ongunstige omgeving. Desalniettemin zouden ouders en hulpverleners zich bewust moeten zijn van de ongunstige omstandigheden die veel geadopteerde kinderen ervaren hebben en van de invloed die zulke

omstandigheden kunnen hebben op het gedrag en het welzijn van het geadopteerde kind (Grotevant & McRoy, 1990).

In de tweede deelstudie (Hoofdstuk 3) bestudeerden we rusthartslag en hartslagreactiviteit op een stressvolle situatie bij geadopteerde adolescenten met agressieve, delinquente, of internaliserende gedragsproblemen en geadopteerde adolescenten zonder gedragsproblemen (N = 151). In dit onderzoek werd voor het eerst de relatie tussen hartslag en gedragsproblemen onderzocht bij geadopteerde kinderen die opgevoed worden door hun biologisch niet-verwante adoptieouders. In biologische gezinnen kunnen de ouders een genetische aanleg voor bijvoorbeeld antisociaal gedrag en/of lagere hartslag overdragen aan hun kinderen, *en* daarnaast ook een opvoedingsomgeving bieden die antisociaal gedrag uitlokt of versterkt. De opvoedingsomgeving van deze kinderen kan in dat geval een mogelijke relatie tussen lagere hartslag en antisociaal gedrag veroorzaken of versterken. Bij adoptiegezinnen is de kans kleiner dat genetische invloeden, die kinderen vatbaar maken voor het ontwikkelen van gedragsproblemen, versterkt worden door een problematische opvoedingsomgeving (Golombok, MacCallum, & Goodman, 2001; Golombok, MacCallum, Goodman, & Rutter, 2002).

Hoewel er geen significante verschillen tussen de groepen waren in rusthartslag, liet de hartslagreactiviteit op een stressvolle situatie relatief grote verschillen zien. Persistente delinquenten (jongeren die delinquent gedrag vertoonden in zowel de kindertijd als in de adolescentie) lieten hartslag *hypo*reactiviteit op een stress-oproepende taak zien vergeleken met adolescenten die alleen in de puberteit delinquent gedrag vertoonden en adolescenten zonder gedragsproblemen. De hartslag*variabiliteit* liet zien dat deze verschillen voor een deel veroorzaakt werden door verschillende reacties van het *para*sympathische zenuwstelsel. Ortiz and Raine (2004) vonden in hun meta-analyse naar hartslag en antisociaal gedrag bij kinderen en adolescenten een vergelijkbare effectgrootte voor hartslagreactiviteit tijdens een stressvolle situatie (d = 0.76). Persistente delinquenten bleken minder opgewonden te worden door stress. We vonden voor de persistente delinquenten geen aanwijzingen voor risicofactoren uit de omgeving, zoals de sensitiviteit van de ouders in de vroege kinderjaren, de sociaal-economische status van de ouders, of de gezondheidstoestand van de kinderen in het eerste levensjaar. Neurobiologische of genetische factoren zouden de hyporeactiviteit in deze individuen kunnen veroorzaken (Bock & Goode, 1996; Carey, 1994). De verschillen in hartslagreactiviteit tussen de adolescenten met uitsluitend delinquent gedrag in de puberteit en de adolescenten zonder gedragsproblemen waren niet significant. Adolescenten die alleen in de puberteit delinquent gedrag vertonen lijken zich op dezelfde manier te ontwikkelen als hun niet-antisociale leeftijdgenoten (Fox, Schmidt, & Henderson, 2000), behalve gedurende een periode waarin ze mogelijk meer beïnvloed worden door het exploratieve en provocatieve gedrag dat kenmerkend is voor de puberteit, zoals delinquent of antisociaal gedrag (Caspi & Moffitt, 1995; Moffitt, 1993; Moffitt & Caspi, 2001). Persistent delinquent

gedrag kan wijzen op een neurobiologisch of genetisch risico voor antisociaal gedrag bij kinderen, terwijl delinquent gedrag dat beperkt blijft tot de puberteit sterker gerelateerd kan zijn aan risicofactoren in de omgeving.

We vonden geen significante verschillen tussen de verschillende vormen van agressie (persistente agressie en agressie die alleen in de puberteit voorkomt) in hartslagreactiviteit. De Agressie en Delinquentie syndromen van de Child Behavior Checklist (CBCL; Achenbach, 1991) lijken te verwijzen naar verschillende patronen van gedragsproblemen. Onze resultaten laten zien dat persistente delinquentie –maar niet persistente agressie- gekenmerkt wordt door stress hyporeactiviteit. Onderscheid maken tussen delinquentie en agressie, en tussen persistente delinquentie en delinquent gedrag dat beperkt blijft tot de puberteit (Moffitt, 1993) is cruciaal voor een beter begrip van de ontwikkeling van externaliserende gedragsproblemen.

In de derde deelstudie van dit proefschrift (Hoofdstuk 4) werden internationaal geadopteerde kinderen die geadopteerd waren voor de leeftijd van zes maanden gevolgd vanaf de vroege kindertijd tot en met de leeftijd van 14 jaar (N = 120). De stabiliteit van de sociale ontwikkeling en de relatieve invloed van vroege en huidige factoren op de sociale ontwikkeling in de adolescentie werd onderzocht. In het onderzoek werd gecontroleerd voor huidige contextuele (opvoeding) en vaststaande (geslacht, temperament) factoren. In dit onderzoek werden voor het eerst deze verbanden vastgesteld bij kinderen die opgevoed worden door hun biologisch niet-verwante adoptieouders. Het onderzoek kan daarom een indruk geven van de relatieve invloed van vroege en latere factoren op de sociale ontwikkeling van adolescenten, onafhankelijk van gedeelde genetische factoren tussen kinderen en ouders.

Een regressie-analyse liet zien dat sociale ontwikkeling relatief stabiel was in de periode van 7 tot 14 jaar, zelfs na het controleren voor significante achtergrondvariabelen en het temperament van het kind. De vroege gehechtheidsrelatie was niet gerelateerd aan de sociale ontwikkeling in de adolescentie. De sensitiviteit van de moeder en het temperament van het kind in de vroege kinderjaren waren wel gerelateerd aan de sociale ontwikkeling op 14 jaar, maar ze voorspelden de sociale ontwikkeling op 14 jaar niet meer wanneer er gecontroleerd werd voor hun bijdrage op 7 jaar. Meisjes waren beter aangepast dan jongens. Stressvolle levenservaringen tussen 7 en 14 jaar voorspelden lagere niveaus van de sociale ontwikkeling op 14 jaar. Structurele vergelijkingsmodellen lieten stabiliteit zien in het temperament en in de sociale ontwikkeling vanaf de vroege kindertijd tot in de basisschoolleeftijd en de adolescentie. We vonden huidige, maar geen predictieve invloeden van de sensitiviteit van de moeder en het temperament van het kind op de sociale ontwikkeling van de kinderen op 7 en 14 jaar. Vroege ouder-kind relaties waren *indirect* gerelateerd aan de sociale ontwikkeling tijdens de adolescentie, door de invloed op de sociale ontwikkeling tijdens de basisschoolleeftijd.

De verschillende stappen van het indirecte pad dat gevonden werd in ons onderzoek, namelijk van vroege sensitiviteit van de moeder, via de vroege gehechtheidsrelatie en gedesorganiseerde gehechtheid, via de sociale ontwikkeling tijdens de basisschoolleeftijd, naar de sociale ontwikkeling tijdens de adolescentie, komen overeen met de aannames van de gehechtheidstheorie (Bowlby, 1973, 1980) en eerder empirisch onderzoek (b.v., Ainsworth, Blehar, Waters, & Wall, 1978; Belsky, 1981, 1984; De Wolff & Van IJzendoorn, 1997; Elicker, Englund, & Sroufe, 1992; Main & Hesse, 1990; Schuengel, Bakermans-Kranenburg, & Van IJzendoorn, 1999; Stams, Juffer, & Van IJzendoorn, 2002). Carlson et al. (2004) vonden ook een *indirecte* relatie tussen vroege ervaringen en het sociale functioneren in de adolescentie. In hun onderzoek hadden vroege ervaringen invloed op de representatie van relaties en op het sociale gedrag tijdens de vroege kinderjaren, die op hun beurt weer de latere representatie van relaties en het sociale gedrag beïnvloedden. Deze latere representatie van relaties en het sociale gedrag beïnvloedden uiteindelijk het sociale functioneren in de adolescentie.

Samengevat laten de resultaten van het derde onderzoek (Hoofdstuk 4) continuïteit in individuele ontwikkeling zien (Sroufe, 1979; Sroufe et al., 1993) van de vroege kindertijd tot in de basisschoolleeftijd en de adolescentie. Huidige ervaringen en kindkenmerken zijn belangrijke invloeden voor de sociale ontwikkeling tijdens de basisschoolleeftijd en de adolescentie. Zelfs als er geen genetische overeenkomsten zijn tussen kinderen en hun ouders voorspellen vroege ouder-kind relaties de sociale ontwikkeling in de adolescentie, door de invloed op de sociale ontwikkeling tijdens de basisschoolleeftijd. Bowlby's (1973, 1980) stelling dat aanpassing altijd een product is van zowel de ontwikkelingsgeschiedenis als van de huidige omstandigheden wordt bevestigd.

Beperkingen en suggesties voor vervolgonderzoek

Enkele beperkingen van de deelstudies uit dit proefschrift moeten genoemd worden. Een beperking van de meta-analyse (Hoofdstuk 2) is dat er aanzienlijke heterogeniteit bestaat binnen de populatie van geadopteerden (Haugaard, 1998) en tussen de onderzoeksgroepen in de meta-analyse. Er waren niet alleen verschillen wat betreft de geadopteerde kinderen, maar ook verschillen in de omstandigheden voor de adoptie. De kinderen waren bijvoorbeeld geadopteerd uit verschillende landen en culturen, de adoptieprocedures verschilden (sommige kinderen verbleven bijvoorbeeld voor de adoptie in een kindertehuis, terwijl anderen bij het geboortegezin of in een pleeggezin verbleven), en de aankomstleeftijden van de kinderen liepen uiteen. Binnen de populatie van adoptiekinderen kunnen er subgroepen van kinderen zijn die het risico lopen op het ontwikkelen van aanpassingsproblemen. Voordat verder onderzoek naar adoptie en de aanpassing in verschillende subgroepen afgerond is, zouden clinici en beleidsmakers voorzichtig moeten zijn met het generaliseren van het verhoogde risico op problemen naar de gehele groep van geadopteerden (Haugaard, 1998). Desalniettemin waren de effectgroottes over

de verschillende onderzoeken in onze meta-analyse homogeen, wat de berekening van de totale effectgrootte betekenisvol maakt.

Een tweede beperking is dat het meta-analytisch bewijs vergelijkend is, en dat de oorzaak-gevolg relatie tussen internationale adoptie en gedragsproblemen niet vastgesteld kan worden. We kunnen de mogelijkheid niet uitsluiten dat voor sommige internationaal geadopteerde kinderen gedragsproblemen (of een genetische predispositie voor dergelijk gedrag) de oorzaak zijn geweest voor het ter adoptie stellen van het kind. In dit geval zouden gedragsproblemen de oorzaak zijn in plaats van het gevolg van de adoptie. Een derde beperking van de meta-analyse is dat sommige verschillen tussen geadopteerde en niet-geadopteerde adolescenten verklaard kunnen worden door verschillende percepties van ouders van geadopteerde kinderen vergeleken met ouders van biologisch eigen kinderen. Door hun verwachtingen van het geadopteerde kind (Geerars, Hoksbergen, & Rooda, 1995) zouden adoptieouders bijvoorbeeld eerder problemen kunnen opmerken of vaststellen.

De deelstudies naar de vroegere en huidige invloeden op het probleemgedrag en de sociale ontwikkeling (Hoofdstukken 3 en 4) hebben vergelijkbare beperkingen. Ten eerste hebben we alleen moeder-kind interacties onderzocht. Toekomstig onderzoek zou ook vader-kind interacties moeten onderzoeken (Grossmann, 1997; Grossmann et al., 2002). Vanwege de groeiende invloed van leeftijdgenoten tijdens de adolescentie zouden interacties met leeftijdgenoten ook onderzocht moeten worden. Sroufe, Egeland, en Carlson (1999) lieten zien dat relaties met leeftijdgenoten op elke leeftijd de latere sociale competentie voorspelden en dat dergelijke interacties met leeftijdgenoten zelf voorspeld werden door de kwaliteit van de ouder-kind relatie die hieraan vooraf ging. In hun onderzoek voorspelden relaties met leeftijdgenoten en ouders samen het latere sociale functioneren beter dan elke relatie apart (Sroufe et al., 1999). Een tweede beperking is het relatief hoge percentage van veilig gehechte kinderen (76%, hoger dan het normatieve percentage in niet-klinische groepen; Van IJzendoorn & Kroonenberg, 1988), en het lage percentage van afwerende kinderen (3%, wat lager is dan het normatieve percentage in niet-klinische groepen; Van IJzendoorn & Kroonenberg, 1988). Het gebrek aan afwerende kinderen sloot analyses naar deze gehechtheidsclassificatie uit. Een derde beperking is dat we één dimensie van opvoeding onderzocht hebben, namelijk de sensitieve responsiviteit van de moeder. Gedragsproblemen en sociale ontwikkeling kunnen beïnvloed worden door andere aspecten van de opvoeding, zoals disciplineren of cognitieve stimulatie, of andere factoren uit de omgeving.

Ten slotte wordt vaak beweerd dat geadopteerden en adoptieouders vergelijkbaar zijn met de algemene bevolking, maar op bepaalde belangrijke gebieden is dit niet het geval (Rutter, Silberg, O'Connor, & Simonoff, 1999). Geadopteerden verschillen met betrekking tot adoptiespecifieke aspecten. In de tweede en derde deelstudie (Hoofdstukken 3 and 4) waren adoptiespecifieke aspecten (zoals het land van herkomst, de aankomstleeftijd, en de gezondheidstoestand bij aankomst) echter niet gerelateerd aan de aanpassing in

de adolescentie. Daarnaast gaat het steeds vaker om adopties van oudere kinderen, vooral kinderen met 'special needs' (behoefte aan speciale zorg), zoals een handicap (Rutter et al., 1999). De kinderen uit het huidige onderzoek waren echter op jonge leeftijd geadopteerd (voor de leeftijd van 6 maanden) en waren niet geselecteerd op basis van bepaalde 'special needs'. Verder verschillen adoptieouders van andere ouders doordat zij een hogere sociaal-economische status hebben, wat in onze groep ook het geval was (Stams et al., 2002; zie ook Rutter et al., 1999), en doordat zij een betere psychische gezondheid hebben (Van Londen, 2002). Afhankelijk van de mate waarin adoptiegezinnen een onderrepresentatie van risicovolle omgevingen vormen, zal de invloed van de omgeving onderschat worden. Onderzoekers die bijvoorbeeld gezinnen met een hogere economische status bestudeerden hebben niet consistent significante relaties gevonden tussen vroege ouder-kind relaties en latere problemen (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Fagot & Kavanagh, 1990; Goldberg, Perrotta, Minde, & Corter, 1986). Desondanks vonden we in de derde deelstudie (Hoofdstuk 4) indirecte invloeden van de vroege ouder-kind relaties op de sociale ontwikkeling in de adolescentie.

Samengevat liet de eerste deelstudie uit dit proefschrift (Hoofdstuk 2) zien dat de meerderheid van de internationaal geadopteerde kinderen zich goed ontwikkelt. Vergeleken met niet-geadopteerde kinderen heeft echter een relatief grote minderheid van de geadopteerden gedragsproblemen in de klinische range en werd er relatief vaak verwezen naar hulpverleningsinstellingen. Desalniettemin is adoptie vaak de beste oplossing voor een kind dat anders op zou groeien in een kindertehuis of in andere ongunstige omgevingen (zie ook Juffer, 2002; Van IJzendoorn et al., 2005). In de tweede en derde deelstudie (Hoofdstukken 3 en 4) werden verschillende vroege en huidige invloeden op de gedragsmatige en sociale ontwikkeling van geadopteerde adolescenten aangetoond. In de tweede deelstudie (Hoofdstuk 3) vonden we dat persistente delinquentie gerelateerd is aan stress hyporeactiviteit. Het verschil tussen delinquentie en agressie, en tussen persistente delinquentie en delinquent gedrag dat tot de puberteit beperkt blijft (Moffitt, 1993) bleek belangrijk te zijn voor de ontwikkeling van externaliserende gedragsproblemen. In de derde deelstudie (Hoofdstuk 4) vonden we dat individuele ontwikkeling vanaf de vroege kindertijd via de basisschoolleeftijd tot in de adolescentie relatief stabiel is en dat huidige ervaringen en kindkenmerken een essentiële invloed hebben op de sociale ontwikkeling in de basisschoolleeftijd en de adolescentie. Vroege ouder-kind relaties bepalen niet de uiteindelijke sociale ontwikkeling in de adolescentie, maar ze vormen wel de basis voor een gezonde sociale ontwikkeling door de invloed op de eerdere sociale ontwikkeling, zelfs in de afwezigheid van genetische overeenkomsten tussen ouders en kinderen. Bowlby's (1973, 1980) stelling dat ontwikkeling altijd een product is van zowel de ontwikkelingsgeschiedenis als van de huidige omstandigheden werd door dit onderzoek bevestigd.

Literatuur

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/ 4-18 and 1991 profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.

Bates, J. E., Bayles, K., Bennett, D. S., Ridge, B., & Brown, M. M. (1991). Origins of externalizing behavior problems at eight years of age. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 93-120). Hillsdale, NJ: Erlbaum.

Bimmel, N., Juffer, F., Van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2003). Problem behavior of internationally adopted adolescents: A review and meta-analysis. *Harvard Review of Psychiatry*, *11*, 64-77.

Belsky, J. (1981). Early human experience: A family perspective. *Developmental Psychology*, *17*, 3-23.

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*, 83-96.

Bock, G. R., & Goode, J. A. (Eds.). (1996). *Genetics of criminal and antisocial behavior*. Chichester, England: Wiley.

Bohman, M., & Sigvardsson, S. (1990). Outcome in adoption: Lessons from longitudinal studies. In D. M. Brodzinsky & M. D. Schechter (Eds.), *The psychology of adoption* (pp. 93-106). New York: Oxford University Press.

Bowlby, J. (1973). *Separation*. New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3. Loss*. New York: Basic.

Carey, G. (1994). Genetics and violence. In A. J. Reiss, Jr., K. A. Miezek, & J. A. Roth (Eds.), *Understanding and preventing violence* (pp. 21-58). Washington, DC: National Academy Press.

Carlson, E. A., Sroufe, L. A., & Egeland, B. (2004). The construction of experience: A longitudinal study of representation and behavior. *Child Development*, *75*, 66-83.

Caspi, A., & Moffitt, T. E. (1995). The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior. In D. Cicchetti & D. Cohen (Eds.), *Manual of developmental psychopathology* (pp. 472-511). New York: Wiley.

Colombo, M., De la Parra, A., & López, I. (1992). Intellectual and physical outcome of children undernourished in early life is influenced by later environmental conditions. *Developmental Medicine and Child Neurology*, *34*, 611–622.

De Wolff, M. S., & Van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68,* 571-591.

Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent-child relationships. In

R. D. Parke & G. W. Ladd (Eds.), *Family-peer relationships: Modes of linkage* (pp. 77-106). Hillsdale, NJ: Erlbaum.

Fagot, B. I., & Kavanagh, K. (1990). The prediction of antisocial behavior from avoidant attachment classifications. *Child Development*, *61*, 864-873.

Fox, N. A., Schmidt, L. A., & Henderson, H. A. (2000). Developmental psychophysiology: Conceptual and methodological perspectives. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 665-686). Cambridge: Cambridge University Press.

Geerars, H., Hoksbergen, R. A. C., & Rooda, J. (1995). *Geadopteerden op weg naar volwassenheid: De integratie van 68 Thaise jongeren in de Nederlandse samenleving*. Utrecht: Universiteit Utrecht.

Goldberg, S., Perrotta, M., Minde, K., & Corter, C. (1986). Maternal behavior and attachment in low birthweight twins and singletons. *Child Development*, *57*, 34-46.

Golombok, S., MacCallum, F., & Goodman, E. (2001). The "Test-Tube" Generation: Parent-Child Relationships and the Psychological Well-Being of In Vitro Fertilization Children at Adolescence. *Child Development*, *72*, 599-608.

Golombok, S., MacCallum, F., Goodman, E., & Rutter, M. (2002). Families with children conceived by donor insemination: A follow-up at age twelve. *Child Development*, *73*, 952-968.

Grossmann, K. (1997). *Infant-father attachment relationship: Sensitive challenges during play with toddler is the pivotal feature*. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Washington, DC.

Grossmann, K., Grossmann, K. E., Fremmer-Bombik, E., Kindler, H., Scheuerer-English, H., & Zimmermann, P (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. *Social Development*, *11*, 307-331.

Grotevant, H. D., & McRoy, R. G. (1990). Adopted adolescents in residential treatment: The role of the family. In D. M. Brodzinsky & M. D. Schechter (Eds.), *The psychology of adoption* (pp. 167- 186). Oxford: Oxford University Press.

Haugaard, J. J. (1998). Is adoption a risk factor for the development of adjustment problems? *Clinical Psychology Review*, *18*, 47–69.

Hodges, J., & Tizard, B. (1989a). IQ and behavioural adjustment of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry*, *30*, 53–75.

Hodges, J., & Tizard, B. (1989b). Social and family relationships of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry*, *30*, 77–97.

Juffer, F. (2002, Februari). Adoptie: een optie voor kind en gezin? Inaugurele rede gepresenteerd op de Universiteit van Leiden, Leiden.

Juffer, F., & Van IJzendoorn, M. H. (2005). Behavior problems and mental health referrals of international adoptees: A meta-analytic approach. *JAMA: The Journal of the American Medical Association, 293,* 2501-2515 (May 25).

Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? In M. Greenberg, D. Cicchetti, & E. Cummings (Eds.), *Attachment in the preschool years* (pp. 161-182). Chicago: University of Chicago Press.

Maughan, B., & Pickles, A. (1990). Adopted and illegitimate children growing up. In: L. N. Robins & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 36–61). Cambridge, England: Cambridge University Press.

Miller, B. C., Fan, X., Grotevant, H. D., Christensen, M., Coyl, D., Van Dulmen, M. (2000). Adopted adolescents' overrepresentation in mental health counseling: Adoptees' problems or parents' lower threshold for referral? *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 1504-1511.

Moffitt, T. E. (1993). Adolescence-limited and life-course persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674-701.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescent-limited pathways among males and females. *Development and Psychopathology*, *13*, 355-375.

Morison, S. J., Ames, E. W., & Chisholm, K. (1995). The development of children adopted from Romanian orphanages. *Merrill-Palmer Quarterly*, *41*, 411–430.

Ortiz, J., & Raine, A. (2004). Heart rate level and antisocial behavior in children and adolescents: A meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 154-162.

Rowe, D. C. (1993a). *The limits of family influence. Genes, experience, and behavior*. New York: Guilford Press.

Rowe, D. C. (1993b). Genetic perspectives on personality. In R. Plomin & G. E. McClearn (Eds.), *Nature, nurture, and psychology* (pp. 179-195). Washington, DC: American Psychological Association.

Rutter, M., Andersen-Wood, L., Beckett, C., Bredenkamp, D., Castle, J., Dunn, J., et al. (1998). Developmental catch-up, and deficit, following adoption after severe global early privation. *Journal of Child Psychology and Psychiatry*, *39*, 465–76.

Rutter, M., Silberg, J., O'Connor, T., & Simonoff, E. (1999). Genetics and child psychiatry: I Advances in quantitative and molecular genetics. *Journal of Child Psychology and Psychiatry*, *40*, 3-18.

Seglow, J., Pringle, M. L. K., & Wedge, P. (1972). *Growing up adopted: a long-term national study of adopted children and their families*. Slough, England: National Foundation for Education Research in England and Wales.

Schuengel, C., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*, 54-63.

Sharma, A. R., McGue, M. K., & Benson, P. L. (1998). The psychological adjustment of United States adopted adolescents and their nonadopted siblings. *Child Development*, *69*, 791–802.

Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist*, *34*, 834-841.

Sroufe, L. A., Carlson, E., & Shulman, S. (1993). Individuals in relationships: Development from infancy through adolescence. In D. C. Funder, R. Parke, C. Tomlinson-Keesey, & K. Widaman (Eds.), *Studying lives through time: Approaches to personality and development* (pp. 315-342). Washington, DC: American Psychological Association.

Sroufe, L. A., Egeland, B., & Carlson, E. A. (1999). One social world: The integrated development of parent-child and peer relationships. In B. Laursen & W. A. Collins (Eds.), *Relationships as developmental contexts. Minnesota Symposia on Child Psychology*, *30* (pp.241-261). Mahwah, NJ: Lawrence Erlbaum Associates.

Stams, G. J. J. M., Juffer, F., Rispens, J., & Hoksbergen, R. A. C. (2000). The development and adjustment of 7-year-old children adopted in infancy. *Journal of Child Psychology and Psychiatry*, *41*, 1025–1037.

Stams, G. J. J. M., Juffer, F., & van IJzendoorn, M. H. (2002). Maternal sensitivity, infant attachment, and temperament in early childhood predict adjustment in middle childhood: The case of adopted children and their biologically unrelated parents. *Developmental Psychology*, *38*, 806-821.

Tizard, B., & Hodges, J. (1978). The effect of early institutional rearing on the development of eight-year-old children. *Journal of Child Psychology and Psychiatry*, *19*, 99–118.

Van IJzendoorn, M. H., Juffer, F., & Klein Poelhuis, C. W. (2005). Adoption and cognitive development: A meta-analytic comparison of adopted and nonadopted children's IQ and school performance. *Psychological Bulletin*, *131*, 301-316.

Van IJzendoorn, M. H., & Kroonenberg, P. M. (1988). Cross-cultural patterns of attachment: A meta-analysis of the Strange Situation. *Child Development*, *59*, 147-156.

Van Londen, M. (2002). Gehechtheid in adoptiegezinnen. Intergenerationele overdracht en gedesorganiseerde gehechtheid. Ongepubliceerd proefschrift, Universiteit Utrecht, Utrecht.

Warren, S. B. (1992). Lower threshold for referral for psychiatric treatment for adopted adolescents. *Journal of the American Academy for Child and Adolescent Psychiatry*, *31*, 512-517.

Curriculum Vitae

Nicole Jaffari-Bimmel was born on Oktober 4, 1977 in Domburg, the Netherlands. In 1996 she completed her secondary education at the "Christelijke Scholengemeenschap Walcheren" in Middelburg, the Netherlands. During her study Psychology at the Radboud University of Nijmegen she specialized in Developmental Psychology, resulting in a 'cum laude' masters degree in June 2000. After working in some school and university settings in Stellenbosch, South-Afrika for a couple of weeks, she became a PhD student within the Centre for Child & Family Studies and Data Theory at Leiden University in March 2001. In October 2005 she completed the research project 'Attachment and problem behavior of adopted adolescents: Longitudinal and concurrent factors', presented in this dissertation.

Nicole Jaffari-Bimmel werd geboren op 4 oktober 1977 te Domburg. In 1996 behaalde zij haar VWO-diploma aan de "Christelijke Scholengemeenschap Walcheren" te Middelburg. Tijdens de studie Psychologie aan de Radboud Universiteit van Nijmegen specialiseerde ze zich in de Ontwikkelings-psychologie. In juni 2000 studeerde zij cum laude af. Na een aantal weken werkervaring in verschillende onderwijsinstellingen (basisschool, universiteit, 'open' school in achterstandsbuurt) in Stellenbosch, Zuid-Afrika, trad zij in maart 2001 in dienst als Promovendus bij de afdeling Algemene & Gezinspedagogiek en Datatheorie aan de Universiteit Leiden. In oktober 2005 voltooide zij haar promotieonderzoek 'Attachment and problem behavior of adopted adolescents: Longitudinal and concurrent factors', beschreven in dit proefschrift.