The importance of sensitive parenting: A longitudinal adoption study on maternal sensitivity, problem behavior, and cortisol secretion

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General discussion

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Throughout history, orphans or abandoned and relinquished children have been cared for by non-related adults. In the twentieth century the legalization of this adoption process became wide-spread and many children were adopted domestically or internationally worldwide. In the Netherlands adoption was legalized in 1956, and in 1965 the first legal international adoptions were registered. Since then, more than 40,000 foreign children were adopted into the Netherlands (CBS, 2014). Studying the development and well-being of these adopted children and their adoptive families is beneficial in several ways. First, it is of critical importance to generate knowledge that can help support adopted children and their families. Second, studying adoptive families generates fundamental information that contributes to the nature-nurture debate, because associations between parent and child behavior are not intertwined with genetic relatedness.

In the series of studies presented in this thesis, adopted children were followed from infancy until young adulthood. We specifically focused on the importance of early caregiving experiences in the adoptive family for the development of externalizing and internalizing behavior in adolescence, and for physiological stress regulation in young adulthood. In this chapter we discuss the merits of our longitudinal design, the methodological challenges we met, and some implications based on the results.

1. The merits of a longitudinal adoption design

1.1 Longitudinal studies

Several longitudinal studies have examined the effects of early experiences on the development of children over time. Jack and Jeanne Block (2006) initiated a well-known longitudinal study and followed a cohort of children from California over more than 30 years. They started their longitudinal study in 1968 and followed 128 children from 3 years on into young adulthood. The study generated a wealth of information with a special focus on ego-control and ego-resiliency (Block, 1971), two core constructs that share notions with the temperamental trait effortful control that was used in our study in Chapter 2, and behavioral inhibition that was used in our study in Chapter 3. The longitudinal venture of Jack and Jeanne Block encountered many criticisms, such as being sprawling, untidy, and costly (Block & Block, 2006, p. 325), but they argued that despite the more or less founded nature of these criticisms, longitudinal studies contribute accumulatively to developmental science (Block & Block, 2006). Indeed, in the first stages of a longitudinal study it is difficult to focus and hard to refrain from including (too) many measurements in light of promising future possibilities. Self-reflection, peer criticism and ethical awareness may be important beacons in the search for boundaries.

Another well-known longitudinal study is the Minnesota Study of the Developing Person, rolled out by Alan Sroufe and his colleagues (Sroufe, 2005; Sroufe, Egeland, Carlson, & Collins, 2005). In this study, Bowlby's attachment theory was the central point of departure. Important issues that were addressed are the precursors and developmental sequelae of attachment relationships and the dynamic nature of developmental processes. The longitudinal study started in the mid-1970's and concerned a sample of mothers at risk for parenting problems due to poverty. The Minnesota longitudinal study has shown that infant attachment, although not a unique predictor of certain outcomes in later life, is

[…] *critical, both because of its place in initiating pathways of development and because of its connection with so many critical developmental functions - social relatedness, arousal modulation, emotional regulation, and curiosity, to name just a few. Attachment experiences remain, even in this complex view, vital in the formation of the person.* (Sroufe, 2005, p. 365)

Together with other important longitudinal studies such as the Christchurch Health and Development Study (Fergusson, Boden, & Horwood, 2014), the ongoing longitudinal Dunedin study that started in 1975 (Moffit & Caspi, 2001; Silva, 1990), the early childcare study initiated in the early 90s by the National Institute of Child Health and Human Development (NICHD, 2005), and the recently started and ongoing Generation R study (Jaddoe et al., 2006), the fore mentioned studies generated enormous amounts of information. However, not all developmental questions are tackled satisfactorily in such designs. A major problem in all (longitudinal) research on biologically related parent-child dyads is the confounding of genetics and environment: the same underlying genetic constitution may underlie parent behavior as well as child behavior and therefore increase associations between parent and child outcomes.

1.2 The longitudinal study of adoption

Longitudinal adoption studies give insight into human developmental issues, apart from genetic relatedness between parents and children (see for an overview of longitudinal adoption studies, Juffer et al., 2011). Together with twin-studies, which give insight into the other end of the spectrum (i.e., perfect genetic relatedness), adoption studies can inform us on the unique and interactive contributions of environmental and genetic factors on human development. The longitudinal adoption design however does not only enrich our fundamental knowledge, it also enhances knowledge on the trajectory following adoption which will be relevant to policymakers and practitioners supporting adoptive families.

Several research groups studied the longitudinal development of domestically adopted children. In 1968, Tizard started a pioneering longitudinal study in the United Kingdom. They monitored a group of children who had lived in institutional care in early life and were domestically adopted (or returned to their biological parents) later

on (Hodges & Tizard, 1989a, 1989b). In 1979, more than 240 domestically adopted children together with their birth mothers and their adoptive families entered the Colorado Adoption Project of John DeFries and Robert Plomin. They were followed into adulthood (Rhea, Bricker, Corley, DeFries, & Wadsworth, 2013). Grotevant and colleagues (Grotevant, McRoy, Wrobel, & Ayers-Lopez, 2013) followed a sample of domestic adoptees with different contact arrangements to examine the effects of closed or more open adoptions in the United States of America. The Metera Study from Greece investigated domestic adoptees from infancy to adolescence and compared them with a non-adopted comparison group (Vorria, Ntouma, & Rutter, 2014).

Only a few research groups have studied international adoptees longitudinally. In the Rotterdam Longitudinal Study that started in 1986, internationally adopted adolescents were followed into adulthood (Van der Vegt, Van der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009; Verhulst, 2000). Matt McGue and Bill Iacono started their Sibling Interaction and Behavior Study (SIBS) in 1999. They followed adolescent siblings in 400 domestic or international adoptive families and 200 non-adoptive families over 6 years (Matteson, McGue,& Iacono, 2013). Another well-known project, the English and Romanian Adoptee study (ERA), was initiated in 1993 by Michael Rutter and Thomas O'Connor. They focused on the developmental outcomes of children who experienced severe deprivation in institutional care in Romania and were adopted into the United Kingdom in the early 90's (O'Connor & Rutter, 2000). These children were followed together with a group of non-deprived domestically adopted children and the most recent data were gathered in adolescence (Kumsta et al., 2010). A similar Canadian study initiated by Elinor Ames in 1991 (The Romanian Adoption Project) also followed children who experienced severe deprivation in Romanian institutions. These children were adopted into Canada and have been followed to the age of 17 together with a non-adopted, and an early-adopted control group (Ames, 1997; Chisholm, Carter, Ames, & Morison,1995; Le Mare & Audet, 2011).

1.3 The Leiden Longitudinal Adoption Study

The Leiden Longitudinal Adoption Study (LLAS) was initiated in 1985 and is unique when considering the early start, the intensiveness of the (observational) assessments and the long time span covered. The children participating in the LLAS were internationally adopted and originated from two companion studies. The first was a study on adoptive parents without any biological children (Juffer, 1993). The second sample originated from a study on adoptive families including one or more biological or previously adopted children (Rosenboom, 1994). The first assessments took place in infancy when the focus adopted children were 6, 12, 18, and 30 months of age. In middle childhood, at 7 years of age, a second wave of assessments took place, and 30 additional and comparable adoptive families entered the study based on the same inclusion criteria as before (Stams, Juffer, Rispens, & Hoksbergen, 2000). When the

adoptees were respectively 14 and 23 years of age, the third and fourth waves of the study were carried out (e.g., Jaffari-Bimmel, Juffer, Van IJzendoorn, Bakermans-Kranenburg, & Mooijaart, 2006; Schoenmaker et al., 2013). The aim of the LLAS was to examine correlates and sequelae of sensitive parenting and children's attachment security in a sample of parents and children without genetic relatedness (see Chapter 1 for a review of research on sensitivity and attachment; see Figure 1 for an overview of the design and measurements of the LLAS).

All children in the LLAS were adopted before the age of six months. The mean age at adoption of the children in the current series of studies (N = 160) is 10.19 weeks (SD = 5.04), which means that the period of deprivation (if any) is limited for all children. Children with extended experiences of deprivation in an institution usually show more problems in the area of attachment (e.g., O'Connor & Rutter, 2000), in visual memory and attention (Loman et al., 2013; Pollak et al., 2010), and in cortisol production (e.g., Kertes, Gunnar, Medsen, & Long, 2008). When examining the effects of parenting on the development of problem behavior and cortisol secretion in an adopted sample with long-term early deprivation, predictors as well as response variables can be affected by the experiences of deprivation, making associations between parent behavior and child behavior more difficult to interpret. Because all children in the LLAS were adopted at an early age, this study makes it possible to examine associations between parenting and developmental outcomes of children apart from effects of long-term extreme deprivation.

In this thesis we reported results from three empirical studies from the LLAS that assessed the longitudinal associations between parenting experiences in early and later life, child characteristics across the years, problem behavior in middle childhood and adolescence (Chapters 2 and 3), and cortisol secretion in young adulthood (Chapter 4). Multivariate analyses were performed to capture the longitudinal and multivariate nature of these data.

2. Structural equation modeling as a tool for analyzing longitudinal data.

The empirical studies on the data of the LLAS as presented in Chapters 2, 3, and 4 of this thesis were predominantly analyzed with Structural Equation Modeling (SEM). In the last decades , structural equation modeling has become a popular technique to analyze cross sectional as well as longitudinal data (Tomarken & Waller, 2005). The technique has major advantages, but challenges have also become clear. In this section some of these issues are addressed from an applied point of view. This section is not meant as a statistical guideline, but as an overview of practical challenges and potential considerations.

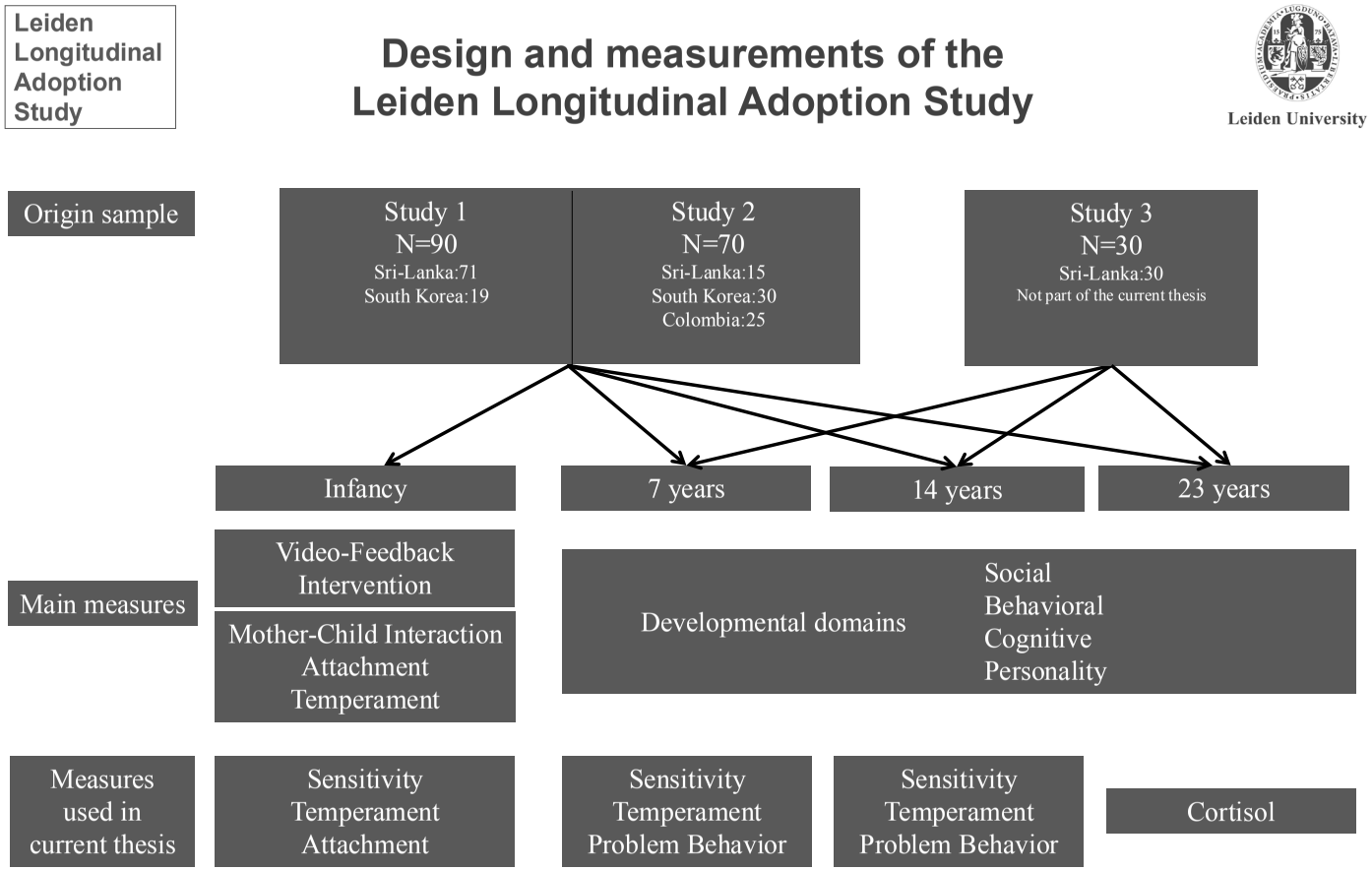

Figure 1. Design and measurements of the Leiden Longitudinal Adoption Study

2.1 Strengths of Structural Equation Modeling

In a Structural Equation Model (SEM) associations between psychological and behavioral constructs can be modeled and estimated. SEM is often presented as a confirmatory method, used to evaluate whether an a priori hypothesized model fits the data (Byrne, 2006). In SEM, theoretical constructs can be defined as latent variables reflected in multiple observed indicator variables (Byrne, 2006; Tomarken & Waller, 2005). For example, in Chapter 2 of this thesis the latent variable *effortful control* was based on three measured variables; items from a questionnaire. A major advantage of this procedure is that measurement error is explicitly modeled and therefore, compared to techniques like multiple regression, estimates of relations between latent constructs are less biased (Byrne, 2006; Tomarken & Waller, 2005). In the last decades, SEM has become a very popular data-analytical approach for psychological research, which is reflected in the large number of publications that use SEM and the large number of books and papers that discuss SEM (Tomarken & Waller, 2005). Apart from the reduction of measurement error, several other strengths of SEM may have contributed to its popularity. First, SEM is a very flexible analytical method. Many hypothesized multivariate models can be tested. Second, SEM enables a confirmative approach to theory testing. Third, several measures are available to assess model fit in order to test model plausibility (Byrne, 2006; Tomarken & Waller, 2005). In practice, however, these advantages bring their own challenges.

2.2 Challenges when using SEM

2.2.1 Flexibility. SEM is a very flexible analytical method. Hypothesized models may exist of more than two waves in time, are not restricted to one specific outcome variable and can specify several transactional processes. On top of that, and in contrast to many other analytic methods, it is possible to model error components in different ways. One may want to allow error components to correlate over time, and it is also possible to constrain error variances to be equal over time. The flexibility of SEM is very useful because it enables researchers to test very detailed theoretical models. At the same time however, this flexibility is one of the major caveats when using SEM, because making choices when you have a lot to choose from is not easy. Like other statistical methods, SEM allows for the specification of models that do not make sense theoretically and cannot test directionality and causality of hypothesized associations. Therefore it is important to carefully evaluate the theoretical and methodological soundness of the hypothesized model and to explicitly report which choices were made and why. As an example, in our study we allowed error variances of the same instruments used at different points in time to correlate. When (slightly) different measures were used, correlations over time were set at zero. Such an approach is quite common in longitudinal studies using SEM, and is theoretically founded.

2.2.2. Confirmative versus exploratory testing. As discussed above, SEM cannot test the theoretical plausibility of models. Without a sound theoretical base, the risk of making Type I errors increases, which is especially a problem when many parameters are estimated. A strictly confirmative approach in which few parameters are to be estimated may seem a solution to this problem, but in practice proves difficult to achieve. In our studies, the models for externalizing and internalizing behavior (Chapters 2 and 3) were tested in several steps. First, full models were estimated with predictive relations between all latent variables and concurrent predictions from sensitivity and temperament to problem behavior. In a second step, non-significant structural paths were removed and the more parsimonious models were compared to the full models. One could argue that this approach is not confirmative, but more data driven and exploratory in nature. It may increase capitalization on chance and enhance the risk for Type I errors. Another option would be to begin with a more parsimonious model in which only very strong theoretically based paths are estimated. Although this approach seems more confirmatory, there are some downsides that need to be considered. First, especially in longitudinal research, theory mostly does not provide specific expectations about relations in specific time-periods. In our models for example, it seemed to be theoretically plausible that maternal sensitivity affected problem behavior at all concurrent and future time points. Second, when researchers do start with a more parsimonious model, they can add more parameters (e.g., using the Lagrange Multiplier Test) in order to improve model fit (Byrne, 2006). In other words, starting with a more parsimonious model may lead to model construction by adding significant paths instead of removing non-significant paths. This approach ultimately has the same problem of chance-capitalization. No straightforward solution to these issues is at hand. Obviously, resampling techniques and cross validation in two subsamples can tackle this problem, but few studies have large enough samples for the latter procedure. In our opinion, researchers should try to keep their models theoretically plausible, validate final findings with results from earlier studies, and report the problems they encountered explicitly.

2.2.3 Fit indices. In SEM several fit-indices are provided that assess overall model fit and that also allow for a comparison between two nested models. Although the availability of fit-indices can be very helpful, it is not easy to choose from all the options available. Often suggested fit indices include the Comparative Fit Index (CFI), the Non Normed Fit Index (NNFI) and the Root Mean Square Error of Approximation (RMSEA). The Chi-square value is also a commonly used fit-index, however, this index is very sensitive to a large sample size (e.g. Iacobucci, 2010) and to many degrees of freedom of the model (Kenny & McCoach, 2003). In our models of externalizing behavior (Chapter 2) all Chi-square values were significant, which would indicate insufficient model fit. However, all the other fit-indices, such as the NNFI and the CFI were satisfactory to good. It has been

proposed not to report the *p*-value of the Chi-square, but to inspect the ratio between the chi-square and degrees of freedom. If this ratio does not exceed 2, the model-fit is adequate (Byrne, 2006; Tabachnick & Fidell, 1996). Nevertheless, this ratio is still sensitive to the number of variables in the model (Kenny & McCoach, 2003) and in very large samples, the Chi-square value may be completely non-informative.

Even if an informed choice of fit-indices has been made, one might wonder whether overall adequate fit always is an essential criterion for the validation of a specified model. In a multiple regression analysis for example, researchers simply focus on the magnitude of associations or on the total amount of variance explained. Also, one should be aware that in SEM fit indices are strongly affected by paths that are not estimated (but should have been due to high correlations). It may be very informative to retain variables in the model that do not relate significantly with other variables (without specifying path estimates) in contrast to deleting these variables completely. A small, non-significant drop in fit-indices may indicate the plausibility of the absence of relations. For that reason we decided to not delete (latent) variables from our models when they did not relate significantly to any other (latent) variable (see for example Chapter 2: delinquency at 7 years of age).

To conclude, good model fit does not necessarily mean that all important variables are included in the model. Fit indices are not always sensitive to omitted variables (Tomarken & Waller, 2005) and one might falsely have the impression that the model reflects reality. It is very important to keep track of the amount of explained variance in main outcome variables.

2.2.4 Defining latent variables. In our study, we made use of the major advantage of SEM and defined the central constructs with multiple indicators. Maternal sensitivity was indicated by three observed variables: supportive presence, clarity of instruction, and sensitivity and timing. The underlying (latent) sensitivity construct loaded highly on all three variables, and measurement error was reduced. This way, the sensitivity construct is defined more precisely compared to using composite scores or single variables. The optimal level of correlations between indicators is under debate (e.g., Hertzog & Nesselroade, 2003; Little, Lindenberger, & Nesselroade, 1999). In our studies, the different sensitivity indicators at the same time-point were highly correlated (between .75 en .86, as expected when coded by the same person). This property is sometimes suggested to be a good thing from a purely statistical point of view, but content wise, one might wonder whether the high correlations among indicators imply that we defined sensitivity too narrowly (Little et al., 1999). When indicators correlate only moderately in SEM, fit-indices of the measurement model may drop dramatically, especially when they also correlate moderately (or highly) with indicators of other latent variables in the model. Making theoretical choices and check their statistical feasibility seems to make the most sense.

2.3 Limitations of SEM

2.3.1 Moderation effects. Although SEM is a very flexible method, it is not easily suited for testing moderation. In our models we were interested in possible interaction effects between temperament and parenting on the development of problem behavior (Chapters 2 and 3). It may be that children with more difficult temperament benefit more from good parenting but also suffer more from bad parenting than children with an easy temperament, in accordance with the theory of differential susceptibility (Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2007). In the SEM context it is difficult to test such moderation effects (Tomarken & Waller, 2005). Several suggestions have been put forward (e.g., Lee, Song, & Poon, 2004), but these suggestions are not straightforward and often are difficult to adapt to the aims of the average user. We decided to use the BoxM test in SPSS 19 (IBM corp., 2010) as an indicator of differential covariance matrices between groups of categorical variables (gender and median split in temperament). Our preliminary results indicated that there were no differences in covariance matrices and that further investigation of moderation was not warranted. However, when the covariance matrices do differ according to the BoxM test, more rigorous analyses are needed in order to find out how the moderation looks like. A way of testing moderation in SEM is making use of multi-group comparison. When interested in categorical variables such as gender, researchers can test the model specifically on different subsamples and evaluate whether constraining parameter estimates to be the same across groups is tenable. However, this method is only appropriate for large sample sizes, not suited to investigate interactions between continuous variables, and often yields results difficult to interpret.

2.3.2 Stability coefficients. Another drawback of a structural model for longitudinal data (such as the models we used when examining problem behavior of adopted adolescents in Chapters 2 and 3), is that in many cases constructs show high stability over time, especially when they are corrected for measurement error. In fact, comparable constructs over time may explain so much variation among each other, that it is difficult to detect possible effects of other variables. On top of that, the stability coefficients do not assess change directly (Hertzog & Nesselroade, 2003). Latent growth modeling (which may be performed with SEM, see Chapter 4), and more specific, latent change modeling may be a solution to these problems, because in this method intercepts and slopes (change scores if two waves are used) are specified as latent variables (Hertzog & Nesselroade, 2003). However, this technique is only applicable in longitudinal studies that use the exact same measurements over time in exactly the same manner. Of course, in our longitudinal developmental models (Chapters 2 and 3) this is not the case and using the exact measurements in this context might not always be preferable. When examining development of children, researchers should be aware of the ongoing developmental process that may only be captured by (slightly) different measurements.

2.3.3 Sample size. SEM in general is most suitable for analyzing relatively large sample sizes. Different suggestions have been made regarding the appropriate sample size. It is proposed that ideally the ratio of sample size to the number of estimated parameters is 20 to 1 (Kline, 2011), but this suggestion does not seem realistic at all. Even the more realistic but ad hoc 10 to 1 rule (see for a discussion Westland, 2010) is difficult to obtain for most studies, including our own. Also, such rules may have led researchers to limit the number of estimated parameters by selecting a smaller number of indicators per latent variable. This approach is not advisable, because it has been suggested that more indicators per latent variables reduces the need for a large sample size (Westland, 2010). Others proposed less stringent rules of thumb, such as a ratio between sample size and free parameters of 5 to 1 (Bentler & Chou, 1987) or a minimum sample size of 200 for any SEM (Weston & Gore, 2006). In the Leiden Longitudinal Study the basic sample consisted of 160 people (Chapters 3 and 4), and the number of young adults that participated in the cortisol study (Chapter 4) measurements was smaller. Thus, we did not meet the criteria proposed above. The stability and power of the models would have been better with a larger sample. However, it is very difficult to obtain large samples in longitudinal adoption studies, especially when intensive observational measures are used such as in the Leiden Longitudinal Adoption Study.

3. Implications of the Leiden Longitudinal Adoption Study

The Leiden Longitudinal Adoption Study (LLAS) has generated a wealth of information regarding the effects of maternal sensitivity and attachment on the development of adopted children. In earlier publications it was reported that adoptive mothers who received a short-term attachment-based intervention were more sensitive than control mothers. Their children were less likely to be classified as having a disorganized attachment in infancy (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005). When the adopted children were seven years of age, long-term positive effects of early maternal sensitivity and the quality of the attachment relationship were found; both variables predicted better social and cognitive development (Stams, Juffer, & Van IJzendoorn, 2002). At this time, adoptive mothers showed less maternal sensitivity than non-adoptive mothers (Stams et al., 2002). When the children were 14 years of age, maternal sensitivity of the mother, current as well as previous, predicted better social development for the adopted adolescent. Also, it seemed to be that maternal sensitivity buffered against a difficult temperament. A more difficult temperament at 7 years of age predicted more maternal sensitivity at 14 years of age which in its turn predicted better concurrent social development (Jaffari-Bimmel et al., 2006).

In the studies of the LLAS discussed in this thesis the above mentioned line of inquiry was continued. First, the protective effects of maternal sensitivity on the development

of problem behavior were investigated from infancy to adolescence. As described in Chapter 2, maternal sensitivity at 14 years of age predicted less delinquent behavior of the adopted adolescent. Second, as described in Chapter 3, maternal sensitivity in infancy and middle childhood predicted less inhibited behavior of the adolescent which in its turn predicted less concurrent withdrawn and anxious behavior. These relations were found in a multivariate model in which temperament of the child was taken into account. It is suggested that maternal sensitivity early as well as later in life, is a protective factor for the development of problem behavior. This said, we also have to conclude that the associations we found were small in magnitude and that other environmental and constitutional factors will play a role. For instance, it may be that psychopathology of the adoptive as well as biological parents (e.g. Goodman et al., 2011) and adolescent peer relations (Deković, 1999) partly determine the absence or presence of problem behavior in adolescence. Also, other dimensions of parenting such as parental monitoring may be important (Dishion & McMahon, 1998; Fosco, Stormshak, Dishion, & Winter, 2011), especially in adolescence. We used a rather narrow measure of maternal sensitivity that primarily focused on the maternal supporting and structuring behavior in a task situation. However, these measures were selected on a strong theoretical base and use of such a dimension may be specifically informative and give better clues for preventive interventions than a broad dimension with more divergent components . Lastly, it may be that the relationship with the father plays an important role in the development of problem behavior (e.g., Bögels & Perotti, 2011; Fosco et al., 2011). Although in the LLAS adoptive fathers were involved in some assessments, no paternal sensitivity rates were available. In future studies we would like to involve the fathers more intensively.

In the third empirical paper of this dissertation (Chapter 4), we investigated the effects of attachment experiences on the HPA-axis functioning in young adulthood, at 23 years of age. Although in earlier studies of the LLAS maternal sensitivity and secure and organized attachment relationships have shown to predict better social development (Jaffari-Bimmel et al., 2006) and less problem behavior in adolescence (this thesis), no long-term associations were found with the HPA-axis functioning: the quality of the attachment relationship and maternal sensitivity in infancy did not predict the height or slope of the cortisol diurnal curve at age 23. The lack of associations may be explained by the long time-span, by overshadowing effects of possible positive as well as negative adoption-specific experiences such as prenatal problems, and by methodological issues. Our results do suggest that on average, the cortisol values of the adopted adults show the expected decline over the day. Although no comparison group was available, it seemed that the non-optimal start in early life did not alter the diurnal rhythm dramatically as has been found in studies of children with longer experiences of deprivation (Gunnar, Morison, Chisholm, & Schuder, 2006). This indication may specifically suggest the positive effects of early adoption, although

we should keep in mind that it does not provide us with any information on individual variation. Finally, the lack of significant associations may be due to the relatively small sample size. It will be interesting to see whether future studies reveal similar results.

In conclusion, (ongoing) effects of parenting practices on the development of adoptees are present, although not large and not equally substantial in all domains. Adoptive parents receive some preparation prior to the adoptive process, but it might be a good idea to offer more ongoing support in order to promote parental sensitive behavior. Social workers, clinicians and policy makers can try to concretize this idea when supporting adoptive parents and their adopted adolescents.

4. Conclusion

The main goal of this thesis was to unravel longitudinal associations between maternal sensitivity, child temperament, and problem behavior from infancy to adolescence, and to assess associations between early quality of attachment and the secretion of cortisol in young adulthood. Results revealed that the constitutionally based temperament of children is an important precursor of behavior problems. Maternal sensitive parenting at different points in time can be important for the beneficial development of children, even when genetic relatedness between mother and child is absent.

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