

**Quality of Parenting and Adolescent Attachment Security:
A Twin Study to Explore the Impact of Genetic Factors**

Katie Glazebrook, PhD.

D.Clin.Psy. Thesis (Volume 1)

2015

University College London

UCL Doctorate in Clinical Psychology

Thesis Declaration Form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature:

Name:

Date:

Overview

The overall focus of the thesis is the role of genetic and environmental influences in the relationship between quality of parenting and adolescent attachment security.

Part one is a literature review exploring interactive antecedents of attachment security beyond infancy. The review includes 16 papers exploring the relationship between the quality of parent-child interactions and attachment security in children and adolescents, with security assessed using a representational measure of attachment, in order to establish which aspects of parenting are most strongly associated with attachment security.

Part two of the thesis reports findings from a twin study designed to explore child-based genetic influences in quality of parenting and adolescent attachment security, using archived data from the *Twins Early Development Study*. Specifically, the study firstly aimed to examine the relative contribution of child genetic factors on quality of parenting, when parenting is assessed using observational methods. Secondly, the study examined whether common genes or common environments can account for the covariance between parenting quality and adolescent attachment security.

Part three is a critical appraisal of the research process, which considers the conceptual issues and dilemmas involved in observational research and reflects on the implications of the study findings for future research and clinical practice.

Table of Contents

| | |
|---|-----------|
| Acknowledgements | 9 |
| Part 1 Literature Review | 10 |
| Abstract | 11 |
| Introduction..... | 12 |
| Interactive Antecedents of Attachment in Infancy | 14 |
| Interactive Antecedents of Attachment beyond Infancy | 15 |
| Study Aim | 17 |
| Method..... | 17 |
| Search Strategy..... | 18 |
| Inclusion and Exclusion Criteria..... | 18 |
| Data Extraction and Study Analysis..... | 20 |
| Results | 22 |
| Study Characteristics | 22 |
| Methodology | 24 |
| Quality of Included Studies | 25 |
| The Relationship between Interactive Antecedents and Children’s Attachment Security.... | 28 |
| Relatedness/ Mutuality | 43 |
| Style of Conversation..... | 53 |
| Discussion | 54 |
| Limitations | 60 |
| Clinical Implications..... | 61 |

| | |
|--|-----------|
| Further Research | 62 |
| Conclusions..... | 63 |
| References..... | 65 |
| Part 2 Empirical paper | 71 |
| Abstract | 72 |
| Introduction..... | 73 |
| Genetic Origins of Attachment Style | 74 |
| Genetic and Environmental Contributions to Attachment in Infancy and Toddlers..... | 76 |
| Genetic and Environmental Contributions to Attachment beyond Infancy | 78 |
| Genes Influence the Rearing Environment Provided By Parents | 79 |
| Evidence for the Influence of Children’s Genes on Parenting (Evocative rGE) | 81 |
| Consequences of the Influence of Children’s Genes on Parenting | 83 |
| Study Aims..... | 85 |
| Research Questions..... | 85 |
| Method..... | 86 |
| Participants..... | 86 |
| Measures | 88 |
| Procedure | 101 |
| Inter-Rater Reliability for Parenting Variables | 103 |
| Ethics | 105 |
| Data Analysis | 105 |
| Results | 108 |

| | |
|--|------------|
| Overview..... | 108 |
| Preliminary Analysis | 108 |
| Genetically Based Child Effects on Parenting: Descriptive Statistics | 114 |
| Genetically Based Child Effects on Parenting: ACE Twin Modelling | 116 |
| Genetic Factors in the Association between Quality of Parenting and Adolescent Attachment Security..... | 120 |
| Discussion..... | 122 |
| Limitations..... | 126 |
| Clinical Implications..... | 127 |
| Future Research..... | 128 |
| Conclusions..... | 128 |
| References..... | 129 |
| Part 3 Critical appraisal | 134 |
| Introduction..... | 135 |
| Conceptualisation and Design of the Research Project | 135 |
| Working as Part of an Established Research Project..... | 136 |
| Observational Research on Parent-Child Interactions | 137 |
| Considerations in Observational Research..... | 138 |
| Task and Setting | 138 |
| Selection of Observational Coding Systems | 140 |
| Reliability and Validity..... | 141 |
| Development of New Scales..... | 143 |

| | |
|---|-----|
| Adaptation of Existing Scales..... | 144 |
| The Family Interaction Coding System | 144 |
| The Coding of Attachment Related Parenting..... | 147 |
| Implications of the Research Findings for Clinical Practice | 148 |
| Implications for Future Research | 150 |
| Conclusions..... | 151 |
| References..... | 152 |
| Appendices | 155 |
| Appendix 1: Search Terms..... | 156 |
| Appendix 2: Study Flow Diagram | 158 |
| Appendix 3: Quality Assessment Tool | 160 |
| Appendix 4: Quality Assessment Scores..... | 163 |
| Appendix 5: Overview of Joint Working..... | 170 |
| Appendix 6: Adapted Warmth Scale | 174 |
| Appendix 7: Adapted Support Scale..... | 176 |
| Appendix 8: Adapted Problem-Solving Scale | 179 |
| Appendix 9: Adapted Sensitive Responding Scale | 182 |
| Appendix 10: Adapted Mutuality Scale | 187 |
| Appendix 11: Openness Scale (developed for study)..... | 192 |
| Appendix 12: Underlying Tension Scale (developed for study) | 195 |
| Appendix 13: Principal Components Analysis SPSS Output | 199 |

Table of Tables

| | |
|---|-----|
| Table 1.1 Magnitudes of Effect Sizes..... | 21 |
| Table 1.2 Aspects of Parenting Measured in Studies..... | 26 |
| Table 1.3 Summary of Included Studies..... | 29 |
| Table 2.1 Use and Adaptation of the Family Interaction Global Coding System in the Current Study..... | 94 |
| Table 2.2 Inter-Rater Reliability for Parenting Scales Indicated by Intra-Class Correlations | 104 |
| Table 2.3 Demographic Information for Sample..... | 110 |
| Table 2.4 Means and Standard Deviations for Scales by Twin Zygosity and Gender..... | 112 |
| Table 2.5 Descriptive Statistics and Covariance Matrix for Overall Quality of Parenting for MZ and DZ Twins | 114 |
| Table 2.6 Descriptive Statistics and Covariance Matrix for Parental Sensitivity for MZ and DZ Twins..... | 115 |
| Table 2.7 Descriptive Statistics and Covariance Matrix for Mutuality for MZ and DZ Twins..... | 116 |
| Table 2.8 ACE model Fitting Statistics for Quality of Parenting | 117 |
| Table 2.9 ACE Model Fitting Statistics for Sensitivity..... | 118 |
| Table 2.10 ACE Model Fitting Statistics for Mutuality..... | 120 |
| Table 2.11 Mean Within-Twin and Cross-Twin Correlations for Overall Quality of Parenting and Attachment Security..... | 120 |
| Table 2.12 Mean Within-Twin and Cross-Twin Correlations for Parental Sensitivity and Attachment Security..... | 121 |
| Table 2.13 Mean Within-Twin and Cross-Twin Correlations for Mutuality and Attachment Security..... | 122 |

Table of Figures

| | |
|---|-----|
| Figure 1 A conceptual model: Do common genes or common environments account for the covariation between parenting quality and attachment security in adolescence? | 84 |
| Figure 2 Univariate Quantitative Genetic Model | 106 |

Acknowledgements

Firstly, thanks must go to my supervisors, Prof. Pasco Fearon and Dr. Yael Shmueli-Goetz for all their guidance and feedback throughout this project. I am grateful to have had the opportunity to work with such knowledgeable and encouraging supervisors.

Thank you to Nadim Ahmad, fellow trainee and researcher. It has been a great experience working together and I have valued your support during this project. In addition, thanks to the TEDS team for allowing us to have access to such a brilliant dataset!

I would also like to thank my family and friends for their support and encouragement. In particular, thank you to Cris and Matt for their proof reading efforts.

Finally, a huge thank you to Dan for the endless love, support and encouragement (and Excel skills) offered throughout the DClinPsy training and in everything I do.

**Interactive Determinants of Attachment beyond Infancy: A
Systematic Literature Review**

Abstract

Aims. This paper reviews empirical research exploring the interactive determinants of attachment security beyond infancy, to establish which interactive antecedents are most strongly associated with attachment security in children and adolescents.

Method. A systematic literature search of three electronic databases (PsychINFO, MEDLINE and Web of Science Core Collection) identified 16 papers which used an observational measure of parent-child interactions and a representational measure of attachment with children aged between 5 and 19 years old.

Results. Style of conversation (e.g. exploration of other's views) and the level of sensitivity, mutuality and positive aspects of parenting were most strongly related to attachment security in children and adolescents. Lower levels of positive engagement and greater levels of chaotic expression of affective information and disorientation and punitive control in parent-child interactions increased the risk of disorganized attachment in children and adolescents. However, other aspects of negative parenting behaviour (e.g. hostility, embarrassment, psychological control or composite measures of negativity) were not related to attachment security and disorganization in childhood and adolescence.

Conclusions. The degree of negative factors in interactions between parents and children has less influence on children's attachment security than positive aspects of parenting such as parental sensitivity, mutuality and the emotional quality of conversations with the child.

Introduction

Since its conception, attachment theory has transformed thinking about the infant-caregiver relationship and the quality of the attachment relationship is now considered to be greatly significant in children's long term development (L. A. Sroufe, 2005). Attachment theory argues that infants are biologically programmed to form an emotional bond with their caregiver, in order to protect the otherwise helpless infant, maximising the chances of survival and eventual reproduction (Bowlby, 1969/1982). When an infant experiences a sense of threat or danger, the attachment system is activated and the infant will respond in a way which promotes increased proximity to, and/or contact with, the attachment figure and elicits their care and attention. In the first few months these attachment behaviours include smiling, vocalising, crying and grasping and as children become older and more mobile, crawling and then walking. Bowlby believed that when an appropriate stimulus is provided by the attachment figure, such as a soothing voice or physical contact, the attachment behaviour is terminated. Over time, experiences with caregivers lead to the development of mental representations (*internal working models*) of the self and the attachment figure which guides their thoughts, affects and behaviour in attachment situations. The nature of the model constructed is considered to influence a person's expectations and behaviour in close relationships throughout their life (Bowlby, 1969/1982, 1973).

Through ethologically-oriented observational studies as well as experimental investigations, Mary Ainsworth proposed that one of the conditions that supports the development of attachment security is the attachment figure's sensitivity in responding to the infant's signals (Ainsworth, Blehar, Waters, & Wall, 1978; Bell & Ainsworth, 1972). Sensitive parents can notice a child's signals, interpret them correctly, and respond to them promptly and adequately. In secure attachment, infants are confident the attachment figure will be available and responsive

in times of distress. The caregiver becomes a base from which the child can explore the environment (Ainsworth, 1963, 1967) and the infant will develop an internal working model of the self as effective, valued and worthy of protection and care. Thus experiences in the caregiving relationship have implications for the child's later socio-emotional development, including self-efficacy, self-esteem, emotional regulation and social relationships (Weinfield, Sroufe, Egeland, & Carlson, 2008). Indeed, research has indicated secure attachment in childhood is associated with a range of developmental advantages, such as greater social competence (L. A. Sroufe, 2005) and better mental health, including a lower risk of internalising problems (Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012) and externalising problems (Fearon, Bakermans-Kranenburg, Van IJzendoorn, Lapsley, & Roisman, 2010; Lyons-Ruth, Alpern, & Repacholi, 1993).

In insecure attachment, infants have experienced unreliable availability or comfort in times of need; attempts at eliciting the caregiver's support and attention may have been responded to with dismissal, mocking, rejection or other insensitive responses. As a result, infants feel concerned about the availability of their caregiver and become either preoccupied with maintaining contact, as in resistant attachment, or disengage with the caregiver, as in avoidant attachment. This compromises exploration behaviour and can lead to models of the self as unworthy and incompetent, impeding socio-emotional development, including behavioural control, self-efficacy and self-reliance.

Disorganized attachment has been related to different parenting behaviours, known as frightened and/or frightening (FR) behaviour (Hesse & Main, 2006; Main & Hesse, 1990) or extremely insensitive behaviour (Lyons-Ruth, Bronfman, & Parsons, 1999). Main and Hesse (1990) propose a conflict arises when the child fears the attachment figure they must approach in times of threat or stress. The infant is unable to adopt a coherent strategy of approach or

retreat and this leads to disorganization or disorientation of behaviour in stressful situations. Rates of disorganized attachment style are higher in families where there is maltreatment or a greater number of socio-economic risk factors (Cyr, Euser, Bakermans-Kranenburg, & van Ijzendoorn, 2010) and disorganization is associated with internalising and externalising problems in childhood (Fearon et al., 2010; Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997).

Interactive Antecedents of Attachment in Infancy

Given the impact of attachment on socio-emotional development, emphasis has been placed on establishing the causal antecedents of attachment security. In line with the hypotheses outlined in attachment theory, much of the research in this domain has explored the links between parental sensitivity and infant attachment. In a meta-analysis of research exploring parental antecedents of infant attachment security, de Wolff and van Ijzendoorn (1997) found a moderately strong association between maternal sensitivity and infant security (combined effect size: $r(837) = .24$). This finding is in line with a meta-analysis by Bakermans-Kranenburg, van Ijzendoorn, and Juffer (2003) of sensitivity and attachment interventions in early childhood, which found that the sensitivity interventions with large effect sizes ($d > .40$) were also most effective in enhancing infant attachment security, whilst less effective sensitivity interventions did not bring about changes in attachment security.

In de Wolff and van Ijzendoorn's (1997) review, however, sensitivity was not an exclusive factor in the development of attachment security, as similar strength relationships were found for other aspects maternal interactive behaviour and attachment: mutuality (combined effect size: $r(166) = .32$) emotional support (combined effect size: $r(1,662) = .16$) and synchrony (combined effect size: $r(256) = .26$). Furthermore, aspects of parenting considered only indirectly related to

the concept of sensitivity appeared to be as strongly related to attachment security: positive attitude (combined effect size: $r(1,090) = .18$) and stimulation (combined effect size: $r(420) = .18$). Sensitivity and disorganized attachment are only weakly associated. In a meta-analysis of 13 studies (van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999), the mean effect size for the relationship between parental insensitivity and disorganized attachment was significant but small ($r(1,951) = .10$). As suggested by Main and Hesse (1990) and Lyons-Ruth and colleagues (1999), anomalous parental behaviour (that is, frightened, threatening, dissociative and disrupted behaviour) is more strongly associated with infant disorganized attachment (combined effect size: $r(644) = .34$; Madigan et al., 2006).

Whilst these findings indicate there are other factors that contribute to the development of attachment security, the association between parent interactive behaviour and infant attachment security is clearly supported by correlational and experimental evidence. However, the significance of interactive markers of attachment security beyond infancy has yet to be reviewed.

Interactive Antecedents of Attachment beyond Infancy

Bowlby postulated that attachment is central to human existence “from the cradle to the grave” (Bowlby, 1979, p. 129) and research into attachment has been guided by the concept that the attachment system is active throughout the lifespan. The development of reliable, valid and age-appropriate measures of attachment in later childhood and adolescence has allowed researchers to investigate the relationship between attachment security and psychological, social and emotional functioning during this period. Research indicates that attachment continues to influence socio-emotional adjustment throughout childhood and adolescence. For example, adolescents classified as having secure attachment relationships demonstrate better

social functioning, lower rates of deviancy and lower rates of internalising and externalising behaviour (Allen, Moore, Kuperminc, & Bell, 1998b; Allen, Porter, McFarland, McElhaney, & Marsh, 2007). Allen et al. (1998b) demonstrated that amongst a group of academically at-risk adolescent high school students (n= 131), attachment security was related to lower levels of self-reported internalising behaviours and lower levels of deviant behaviour (peer- and maternal-report). In addition, attachment security predicted social acceptance (as reported by peers) after accounting for demographic factors, perceived self-worth, quality of the maternal relationship and paternal control (maternal report). Whilst a later study, using a sample of young adolescents (n= 167), found that greater attachment security was associated with better peer relations, including greater requests for emotional support and more autonomy in observed interactions with peers and greater popularity (as rated by peers), as well as lower rates of self-reported depressive symptoms and peer-reported externalising behaviours (Allen et al., 2007).

Considering the impact of attachment security on functioning throughout the lifespan it is important to establish determinants of attachment security beyond the first few years of life. Continuity of attachment security into later childhood, adolescence and adulthood has been shown to be modest (Pinquart, Feußner, & Ahnert, 2013) and it is therefore important to establish how later parenting sensitivity, or other related domains of parenting, might influence later attachment.

Furthermore, it is important to explore the relationship between parenting quality and later attachment because attachment organisation is measured and conceptualised very differently beyond infancy. Measures of attachment used with older children have been constructed on the premise that attachment organization can be revealed through mental representations of relationships rather than on differences in observed attachment behaviours. Individual differences in internal working models of attachment are related to differences in content and

quality of language and style of discourse, as well as non-verbal behaviour, used when talking about relationships (Main, Kaplan, & Cassidy, 1985). For example, secure attachment is characterised by coherent, reflective and balanced discussion of attachment-related experiences.

Understanding the causal influences on attachment throughout childhood and adolescence may assist in determining the optimal functioning of the attachment system during this period and allow for the development of effective intervention and prevention programmes. However, there has yet to be a formal review of literature exploring interactive determinants of attachment representations.

Study Aim

This paper aims to summarise and evaluate the literature exploring the relationship between the quality of parent-child interactions and attachment security in children and adolescents (aged 5-19 years), with security assessed using a representational measure of attachment, to establish which interactive antecedents are most strongly associated with attachment security.

Method

A systematic search was carried out to identify papers which had explored the relationship between quality of parent-child interactions and attachment security beyond infancy.

Search Strategy

To identify studies for inclusion in the review, electronic databases PsychINFO (years 1806 to 2014), MEDLINE (years 1946 to 2014) and Web of Science Core Collection (years 1900 to 2014) were searched, with search terms related to children and adolescents (e.g. “child*, “adolescen*”, “teen*” etc.), attachment (e.g. “/attachment behavi\$r”, “/attachment theory” etc.), parenting (e.g. “parent*”, “maternal” etc.) and assessment (e.g. “observation”, “interaction” etc.) The full list of search terms is reproduced in Appendix 1. In addition, the references of all included papers were hand searched to identify any further relevant papers.

Inclusion and Exclusion Criteria

Each study had to meet specific criteria for inclusion in the review. The first criterion was that the study contained an observational measure of the parent’s behaviour towards the child. Observational measures are considered the ‘gold standard’ for assessing the quality of parenting; self-report measures of parenting can be susceptible to bias (Morsbach & Prinz, 2006) and it has been established that parent report is only weakly correlated with observations of parenting (Sessa, Avenevoli, Steinberg, & Morris, 2001). The observed interactions between parent and child could be derived from structured or unstructured tasks. Furthermore, the quality of the interaction could be assessed based on ratings of the parent’s behaviour alone or on ratings of the behaviour of the dyad, but not based solely on the child or adolescent’s behaviour.

The second criterion for inclusion was that the study used a representational measure of children’s attachment security, where children are asked about attachment-based experiences or scenarios, e.g. attachment interviews and story-stem completion tasks. Attachment in

middle-childhood and adolescence has also been measured through laboratory based separation-reunion tasks (e.g. Main & Cassidy, 1988) which assess behavioural processes, and questionnaires, which rely on a person's abilities to recall and reflect on attachment-related experiences. Whilst these measures have all been developed on the basis of attachment theory, there is evidence that the different kinds of measures do not always converge empirically (Dykas, Woodhouse, Cassidy, & Waters, 2006; Roisman et al., 2007) and thus caution must be executed in generalising across attachment measures (Crowell, Fraley, & Shaver, 2008).

Representational measures of attachment are typically used from middle childhood, as performance primarily relies on verbal expression. Therefore, the third criterion for the literature was that the study sample of children and adolescent had a mean age of between 5 and 19 years old when attachment security was measured. This age range also applied to the child's age when parental behaviour was assessed.

The fourth criterion for inclusion was that the study had analysed the relationship between child attachment and parental behaviour.

Final criteria were that the article was written in English and that it was published in full in a peer reviewed journal.

The search was run on 4th November 2014 and the initial search generated 9910 potential references. After duplicate papers and studies from dissertations had been removed, 7506 papers remained. Titles and abstracts were scrutinised and 71 papers were identified as being potentially relevant to the review; the full transcripts of these papers were then examined to see if they met the inclusion criteria for the review (Appendix 2).

Studies were excluded if they had used self-report measures of attachment (e.g. Easterbrooks, Bureau, & Lyons-Ruth, 2012), parent-report measures of attachment (e.g. John, Morris, & Halliburton, 2012) or behavioural-based measures of attachment (e.g. Lecompte & Moss, 2014). Furthermore, studies that used self-report measures of quality of parenting (e.g. M. R. George, Cummings, & Davies, 2010) or adolescent-report measures (e.g. Bosmans, Braet, Van Leeuwen, & Beyers, 2006) of parenting were excluded. Studies that assessed family functioning rather than dyadic interactions (e.g. Weinfield, Sroufe, & Egeland, 2000) were also excluded. Those studies that measured attachment before the child was age 5 or beyond age 19 (e.g. Allen & Hauser, 1996) were excluded, as were those that assessed quality of parent-child interactions before the age of 5 (e.g. Ontai & Thompson, 2002) or beyond age 19. Studies were excluded if only ratings of child behaviour in parent-child interactions were reported (e.g. Becker-Stoll, Fremmer-Bombik, Wartner, Zimmermann, & Grossmann, 2008), if they measured parent and children's success on a task rather than interaction style (e.g. Cobb, 1996) or if they measured attachment quality and parent-child interactions but did not analyse the relationship between these variables (e.g. Diamond & Doane, 1994). Articles that duplicated findings reported in other papers were excluded (Marsh, McFarland, Allen, McElhaney, & Land, 2003), as were intervention studies.

Data Extraction and Study Analysis

Following the systematic search, relevant data was extracted from the studies (see Table 1.3 for summary). This included population source, sample size, age and gender of participants, study design, method of assessing quality of parent-child interactions, method of assessing attachment and relevant statistics concerning the relationship between quality of parenting and attachment. Reference to a statistically significant finding is based on a probability level of $p=$

.05. Any statistical analysis that had been duplicated in another publication was omitted from the table.

Effect sizes were included if they had been calculated as part of the study analyses, otherwise these were calculated by the author. Effect sizes were classified as small, medium or large based on established criteria (Cohen, 1988; Haddock, Rindskopf, & Shadish, 1998; Miles & Shevlin, 2001) (Table 1.1).

Table 1.1 Magnitudes of Effect Sizes

| Statistic | Value | Interpretation |
|------------------|--------------|-----------------------|
| Cohen's d | .20 | Small |
| | .50 | Medium |
| | .80 | Large |
| Correlation | .10 | Small |
| | .30 | Medium |
| | .50 | Large |
| η^2 | .02 | Small |
| | .13 | Medium |
| | .26 | Large |
| Odds ratio | 1.5 | Small |
| | 3.5 | Medium |
| | 9.0 | Large |

Studies were not excluded on the basis of their quality, however the quality was evaluated using a scale developed based on the Newcastle-Ottawa Quality Assessment Scale for cohort studies (Wells et al., 2000), the Q-Coh (Jarde, Losilla, Vives, & F Rodrigo, 2013) and from information gleaned through a systematic review by Sanderson, Tatt, and Higgins (2007) of tools for assessing quality and susceptibility to bias in observational studies. The appraisal tool is reproduced in Appendix 3.

Results

Study Characteristics

Samples, Participants and Study Design

Based on the above limits 16 papers met the inclusion criteria. Scrutiny of the papers revealed that the same dataset was shared across some studies, but with different aspects of parent-child interactions or associations reported within the papers. This was the case for three of the papers produced by Allen and colleagues (Allen et al., 2002; Allen, McElhaney, Kuperminc, & Jodl, 2004; Allen et al., 2003) and the two papers produced by Dubois-Comtois and colleagues (Dubois-Comtois, Cyr, & Moss, 2011). Therefore, the 16 papers pertained to findings from 13 separate samples.

The literature was published between 1993 and 2014, although the rate of publication had increased in recent years, with only one paper published in the 1990s and eight papers published from 2011 onwards.

Papers described studies conducted in the USA (Allen et al., 2002; Allen et al., 2004; Allen et al., 2003; Allen, Porter, McFarland, Marsh, & McElhaney, 2005; Hershenberg et al., 2011; Kerns, Brumariu, & Seibert, 2011; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Macfie, Swan, Fitzpatrick, Watkins, & Rivas, 2014; Obsuth, Hennighausen, Brumariu, & Lyons-Ruth, 2014; Roisman, Madsen, Hennighausen, Sroufe, & Collins, 2001), as well as the UK (Joseph, O'Connor, Briskman, Maughan, & Scott, 2014; Matias, O'Connor, Futh, & Scott, 2014; Scott, Briskman, Woolgar, Humayun, & O'Connor, 2011), the Netherlands (Beijersbergen, Juffer, Bakermans-

Kranenburg, & van Ijzendoorn, 2012) and Canada (Dubois-Comtois et al., 2011; Dubois-Comtois & Moss, 2008).

Age at observation of parent-child interaction ranged from 5.34 years to 19.9 years. Eight publications used samples that included clinical or 'at risk' children (Allen et al., 2002; Allen et al., 2004; Allen et al., 2003; Kerns et al., 2011; Matias et al., 2014; Obsuth et al., 2014; Roisman et al., 2001; Scott et al., 2011), two publications sampled adopted or fostered children (Beijersbergen et al., 2012; Joseph et al., 2014) and one publication used a sample that included children of mothers with borderline personality disorder (Macfie et al., 2014).

The majority of the studies included in the review (12/16) had samples that included mothers of participants. Two of the publications had samples that included both mothers and fathers (Hershenberg et al., 2011; Joseph et al., 2014) and one publication included foster mother and fathers (Scott et al., 2011); however, these publications assessed quality of parenting based on interactions with the mother only. Finally, one publication stated that parent-child interactions were conducted with 'primary caregivers', but did not specify if any of these caregivers were fathers (Roisman et al., 2001). It is possible, therefore, that all of the parent-child interactions were conducted with mothers.

Seven of the studies employed a longitudinal design (Table 1.3), however, two of these seven studies utilised cross-sectional data to examine the relationship between quality of parent-child interactions and attachment (Allen et al., 2002; Beijersbergen et al., 2012).

Methodology

Task Design

The measures used to assess the quality of parenting are described in detail in Table 1.3. The majority of the studies assessed quality of parenting from observations made during a structured task or multiple structured tasks, designed to prompt interaction between the parent and child. Half of the studies included in the review used a type of conflict-discussion task, whereby the parent and child discussed a topic of disagreement and attempt to resolve their differences (Allen et al., 2002; Allen et al., 2004; Allen et al., 2003; Beijersbergen et al., 2012; Joseph et al., 2014; Kerns et al., 2011; Obsuth et al., 2014; Scott et al., 2011). Other structured tasks involved the dyad solving puzzles, planning an event or recreating a Lego structure together.

Two publications reported using an unstructured task and this was the ‘unstructured snack-time interaction’ task used by Dubois and colleagues (Dubois-Comtois et al., 2011; Dubois-Comtois & Moss, 2008). In this task, the dyad was provided with toys and magazines, but no prompts were given.

The length of the assessed parent-child interaction ranged from 2 minutes to 25 minutes. Four publications reported the observed interaction took place in the home (Beijersbergen et al., 2012; Joseph et al., 2014; Macfie et al., 2014; Matias et al., 2014), nine publications reported interactions in a laboratory setting (Allen et al., 2002; Allen et al., 2004; Allen et al., 2003; Allen et al., 2005; Dubois-Comtois et al., 2011; Dubois-Comtois & Moss, 2008; Hershenberg et al., 2011; Kerns et al., 2011; Kobak et al., 1993) and three publications did not specify a location for the interactions (Obsuth et al., 2014; Roisman et al., 2001; Scott et al., 2011).

Coding of Interactions

A range of parenting qualities was assessed across the 16 publications (for a breakdown of aspects of parenting measured in the studies see Table 1.2). Eight publications reported dyadic ratings of parent-child interactions and eight publications reported ratings based on the parents' behaviour alone (see Table 1.3).

Quality of Included Studies

Studies were assessed based on their study design, participant selection, exposure and outcome measures and statistical analysis. Higher scores were given for longitudinal study designs, larger samples, greater response rates from participants, fewer missing data, blinding of assessors, the use of valid measures, high inter-rater reliability and analysis that adjusted for potentially confounding independent variables and baseline attachment (Appendix 3). Scores awarded to studies ranged from 6 to 13 (out of a maximum possible score of 16). The breakdown of quality scores is reported in Appendix 4.

Table 1.2 Aspects of Parenting Measured in Studies

| Aspect of parenting | Studies |
|-------------------------------------|---|
| Affective content of conversations | Dubois-Comtois et al. (2011) |
| Anger/rejection | Joseph et al. (2014); Kobak et al. (1993); Roisman et al. (2001); Scott et al. (2011) |
| Assertiveness | Joseph et al. (2014); Kobak et al. (1993); Scott et al. (2011) |
| Autonomy | Allen et al. (2002); Macfie et al. (2014) |
| Avoidance of problem solving | Kobak et al. (1993) |
| Coercion | Joseph et al. (2014); Scott et al. (2011) |
| Communication | Dubois-Comtois and Moss (2008); Joseph et al. (2014); Obsuth et al. (2014); Scott et al. (2011) |
| Conflict | Roisman et al. (2001) |
| Conflict resolution | Roisman et al. (2001) |
| Confrontative attacking | Roisman et al. (2001) |
| Co-ordination | Dubois-Comtois and Moss (2008) |
| Criticism | Matias et al. (2014) |
| Directive parenting | Matias et al. (2014) |
| Disoriented/ distractible behaviour | Obsuth et al. (2014) |
| Embarrassment | Hershenberg et al. (2011) |
| Emotional dysregulation | Hershenberg et al. (2011) |
| Emotional engagement | Roisman et al. (2001) |
| Emotional expression/ affect | Dubois-Comtois and Moss (2008); Roisman et al. (2001) |
| Enjoyment | Dubois-Comtois and Moss (2008) |
| Hostility | Hershenberg et al. (2011); Macfie et al. (2014); Roisman et al. (2001) |
| Interest in child | Kerns et al. (2011) |
| Involvement | Joseph et al. (2014); Scott et al. (2011) |
| Mood | Dubois-Comtois and Moss (2008) |
| Odd (out of context behaviour) | Obsuth et al. (2014) |
| Mutuality | Matias et al. (2014) |
| Partner roles | Dubois-Comtois and Moss (2008) |
| Positive attending | Matias et al. (2014) |

| Aspect of parenting | Studies |
|----------------------------------|--|
| Positivity | Allen et al. (2005); Hershenberg et al. (2011) |
| Psychological control | Kerns et al. (2011) |
| Punitive behaviour | Obsuth et al. (2014) |
| Relatedness | Allen et al. (2004); Allen et al. (2003); Beijersbergen et al. (2012) |
| Role confusion | Obsuth et al. (2014) |
| Tension | Dubois-Comtois and Moss (2008) |
| Sensitivity | Dubois-Comtois and Moss (2008); Joseph et al. (2014); Macfie et al. (2014); Matias et al. (2014) |
| Support/ validation | Kobak et al. (1993) |
| Validation of adolescent's voice | Obsuth et al. (2014) |
| Warmth | Hershenberg et al. (2011); Joseph et al. (2014); Kerns et al. (2011); Scott et al. (2011) |

The Relationship between Interactive Antecedents and Children's Attachment Security

Studies have been grouped according to the aspect of parenting measured. Half of the studies included in the review reported using composite ratings of parenting or excluded aspects of parenting from statistical analysis as a result of correlations between parenting variables (Dubois-Comtois & Moss, 2008; Joseph et al., 2014; Kerns et al., 2011; Kobak et al., 1993; Macfie et al., 2014; Obsuth et al., 2014; Roisman et al., 2001; Scott et al., 2011). Composite ratings will therefore be referred to throughout the remainder of the review. Relevant statistical material has been extracted and included below. A number of studies explored multiple aspects of parenting and thus findings from these studies are discussed in more than one domain.

Table 1.3 Summary of Included Studies

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|-------------------------------------|---|--|---|--|---|---|
| | Source | Gender (%female) M age(SD) | | | | |
| Allen et al. (2002)* USA | 125 adolescents in ninth and tenth grade (identified as meeting at least one of four academic risk factors) and their mothers | 49.6% T1= 15.9 yrs (.81) T2= 18.1 yrs (1.00) | Longitudinal study assessing the contribution of attachment and autonomy to social skills and delinquency in adolescence. Attachment and autonomy in family interactions assessed at baseline and at 2 years follow-up, however only cross-sectional data from baseline was reported. | Task: Revealed differences task. Dyad discussed a family issue about which they disagreed, e.g. money, grades, household rules etc. Interactions took place in a laboratory and were videotaped and later transcribed and coded. Coding system: Autonomy and Relatedness Coding System (Allen et al., 1998a). Aspect of interaction: Mother and adolescent's speech coded on the Stating Reasons and Exhibiting Confidence subscales, which were combined to form the <i>Displaying Autonomy</i> scale. This scale assesses the individual's use and presentation of a reasoned argument and their level of confidence. | Adult Attachment Interview (AAI) and Q set (C. George, Kaplan, & Main, 1985; Kobak et al., 1993), designed to generate continuous measures of attachment organisation. The Q sorts were then compared with a dimensional prototype sort for secure vs. anxious (insecure) interview strategies and preoccupied vs. dismissing strategies (Kobak et al., 1993). The correlation of an individual's Q-sort with the prototype sort for each dimension was used as the individual's scale score for that dimension (ranging from -1.00 to 1.00). | As the overall adolescent attachment security scale was highly correlated with the insecure-dismissing scale, the dismissing scale was not used in analyses. - Maternal displays of autonomy were not significantly associated with adolescent attachment security ($r = -.02^+$, $p = ns$) nor adolescent attachment preoccupation ($r = .03^+$, $p = ns$). |
| Allen et al. (2004)* USA | 101 adolescents in ninth and tenth grade (identified as meeting at least one of four academic risk factors) | 51.5% T1= 15.9 yrs (.8) T2= 18.1 yrs (1.00) | Longitudinal study assessing stability and change in attachment security across adolescence. Relatedness in parent-adolescent interactions reported from baseline only. | Task: Revealed differences task (Allen et al., 2002). Coding: Autonomy and Relatedness Coding System (Allen et al., 1998a) Aspect of interaction: <i>Dyadic Relatedness</i> (i.e. validating statements and displays of engagement and empathy with the other person). Behaviours were initially coded separately for mothers' and adolescents' | AAI and Q set (C. George et al., 1985; Kobak et al., 1993) as described in (Allen et al., 2002), but Q sorts were compared with the dimensional prototype sort for the secure vs. anxious interview strategies dimension only. The | - Dyadic relatedness was significantly associated with adolescent security at 16 years ($r = .46^{++}$, $p < .001$) and 18 years ($r = .40^{++}$, $p < .001$). - Dyadic Relatedness at 16 failed to reach significance in predicting higher level of attachment security at 18, after controlling for baseline security and adolescent characteristics in the interaction ($\beta = .15$, $p < .10$). |

* Papers report studies using data obtained from the same dataset, however papers report different associations or aspects of interactions

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|-------------------------------------|---|-------------------------------|---|--|---|---|
| | Source | Gender (%female) M age(SD) | | | | |
| | and their mothers | | Attachment measured at baseline and 2 year follow-up. | and then combined (after standardising). | correlation between an individual's Q-sort and the prototype sort was used as the individual's security score (ranging from -1.00 to 1.00), with higher scores indicating greater security. | |
| Allen et al. (2003)* USA | 125 adolescents in ninth and tenth grade (identified as meeting at least one of four academic risk factors) and their mothers | 49.3% 15.9 yrs (.8) | Cross-sectional study exploring the association between qualities of the mother-adolescent relationship and adolescent attachment security. | Task: Revealed differences task (Allen et al., 2002) Coding: Autonomy and Relatedness Coding System (Allen et al., 1998a) Aspect of interaction: <i>Dyadic Relatedness</i> . Behaviours were coded separately for mothers' and adolescents' and then combined (after standardising). | AAI and Q set (C. George et al., 1985; Kobak et al., 1993), as described in Allen et al. (2004). | - Degree of dyadic relatedness was related to adolescent attachment security ($r = .20^+$, $p < .05$), after adjusting for gender, income and racial/ethnic minority states. |
| Allen et al. (2005) USA | 185 adolescents in seventh and eighth grades and their mothers and close friends. Participants came from a single public middle school with a catchment area of urban | 53% 13.36 yrs (.66) | A longitudinal study exploring adolescent popularity, social adaptation and deviant behaviour as part of a larger longitudinal study exploring adolescent social development in familial and peer contexts. Mother-adolescent interactions were observed when | Task: A supportive behaviour task where the dyad discussed a problem they were having which they wanted help with. Interactions took place in a laboratory and were videotaped and later transcribed and coded. Coding: Coding schedule developed for study. Aspect of interaction: Adolescents and mothers interactions were coded for positivity (i.e. the degree of positivity expressed by adolescent, positive affect and engagement by mother and adolescent, the mother's success in | AAI and Q set (C. George et al., 1985; Kobak et al., 1993), as described in Allen et al. (2004). | - Positivity with mother was significantly related to adolescent attachment security ($r = .30^{++}$, $p \leq .001$). |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|--|--|---|---|--|--|--|
| | Source | Gender (%female) M age(SD) | | | | |
| | and suburban areas. | | adolescents were 13 years old and attachment security was assessed after adolescents turned 14 years old. | understanding the adolescent's problem and the adolescent's satisfaction with the interaction). | | |
| Beijersbergen et al. (2012) The Netherlands | 125 internationally adopted adolescents (adopted before the age of 6 months) and their mothers | 55.2% 14.4 yrs (.52) | A longitudinal study exploring the continuity of attachment from infancy to adolescence and the role of parental sensitive support; cross-sectional data collected when adolescents were 14 years old is reported here. | Task: Revealed differences task (Allen et al., 2002). The task took place in the participant's home. Coding: Autonomy and Relatedness Coding System (Allen et al., 1998a). Aspect of interaction: <i>Maternal Relatedness</i> (i.e. how the mother validates or positively responds to the adolescent and the degree to which she shows empathy and engagement) was used as an index of maternal sensitive support. | AAI (C. George et al., 1985). Transcripts classified as secure or insecure (if dismissing or preoccupied). | - Greater sensitive support was shown by mothers of secure adolescents (M= 2.18, SD= .49) compared with mothers of insecure adolescents (M= 1.95, SD= .49), $F(1, 121) = 4.82, p = .03, \eta^2 = .04^+$. |
| Dubois-Comtois et al. (2011)** Canada | 83 French-speaking children and their mothers | 42.2% T1= 5.56 yrs (.34) T2= 8.71 yrs (.37) | A longitudinal study exploring attachment behaviour and mother-child conversations as predictors of attachment in middle childhood, as part of an ongoing longitudinal project investigating the | Task: Unstructured snack-time interaction (10 min) (Cyr, Dubois-Comtois, & Moss, 2008). Interactions took place in a laboratory setting and were videotaped and later coded. Coding: Coding of affective information processing styles in the dyad (Cyr et al., 2008) Aspect of interaction: Four styles of mother-child conversations were assessed: <i>integration of affective information</i> | Doll-play narrative procedure developed by Bretherton, Ridgeway, and Cassidy (1990b) and adapted by Solomon, George, and De Jong (1995). Classification of the narratives followed the Attachment Doll Play Classification System (C. George & Solomon, 2000; Solomon et al., 1995), which | - Greater integration of affective information in dyads with confident children, compared with dyads with children with other attachment classifications ($t(79) = 4.04, p < .01$). Greatest difference in ratings was seen between confident (M= 2.61, SD= 1.63) and casual children (M= 1.00, SD= 1.07), $d = 1.17^{+++}$ - More exaggeration of affects was observed in dyads with preoccupied/busy children, $t(79) = 2.67, p < .01$. Greatest difference in ratings seen between busy (M= 2.83, SD= 1.59) and confident children (M= 1.57, SD= 1.17), $d = .90^{+++}$ |

** Studies use data from the same dataset, however studies report different aspects of interactions

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|--|---|--|---|---|---|---|
| | Source | Gender (%female) M age(SD) | | | | |
| | | | influence of parent-child relationships on developmental adaptation. Quality of mother-child interactions was assessed when the child was age 5.5 and children's attachment security was assessed at age 8.5. | (exploration of other's feelings and thoughts), <i>minimisation of affective information</i> (suppressing, avoiding or devaluing affects), <i>exaggeration of affective information</i> (verbal statements that maximise negative emotion, embellish situation etc.) and <i>chaotic expression of affective information</i> (displaying sudden hostile or withdrawn behaviours unrelated to the context, or child verbally controls parent or parent displays helplessness). | classifies participants into four categories: confident, casual, busy (also referred to as "preoccupied" by the authors in this paper) and frightened. | - Greater levels of chaotic mother-child interactions seen in dyads with frightened children than children with other attachment styles, $t(79) = 2.32, p < .05$. Greatest difference in ratings seen between frightened ($M = 1.83, SD = 1.59$) and confident children ($M = .67, SD = 1.23$), $d = .82^{+++}$ - No differences in ratings of minimisation of affect found between the causal attachment group and other attachment groups. |
| Dubois-Comtois and Moss (2008)** Canada | 49 French-speaking children and their mothers | 40.9% T1= 66.20 mos (4.41) T2= 104.06 mos (4.72) | A longitudinal study exploring the relationship between family interactions and attachment in middle childhood, part of an ongoing longitudinal project investigating the influence of parent-child relationships on developmental adaptation. Observations of mother-child interactions when the child was aged 5.5 and children's attachment assessed at age 8.5 are reported here. | Task: Unstructured snack-time interaction with mother (Cyr et al., 2008). Toys and magazines were available but no instructions were given to the dyad. Interactions took place in a laboratory setting and were videotaped and later coded. Coding: Quality of interaction (as in Dubois-Comtois & Moss, 2004) Aspect of interaction: <i>Overall quality</i> rating (from high quality, i.e. responsive, harmonious, to low quality, i.e. indifferent or conflictual) and <i>Coordination, Communication, Partner Roles, Emotional Expression, Responsivity/Sensitivity, Tension, Mood and Enjoyment</i> subscales were used to rate global aspects of parent-child behaviours. | Doll-play narrative procedure and Attachment Doll Play Classification System as described in Dubois-Comtois et al. (2011). Participants classified as confident, casual, busy and frightened. | High inter-scale correlations for the interaction measure; therefore overall quality scale was used in analyses. - Overall quality of interactions did not significantly differ according to attachment style group ($F(2, 45) = 2.51, p = ns$). - Polynomial comparisons, based on a-priori hypotheses, revealed a significant linear contrast (confident vs. frightened attachment) ($t(46) = 2.06, p < .05$) and a non-significant quadratic contrast (casual/busy group vs. confident and frightened groups combined) - Indicates greater quality of mother-child interactions in dyads with confident children ($M = 4.71, SD = 1.24$), compared with frightened children ($M = 3.63, SD = 1.30$), $d = .85^{+++}$. - The level of quality of interaction in the causal/busy group fell in between ($M = 4.08, SD = 1.51$). |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|---|---|---|---|---|---|---|
| | Source | Gender (%female) M age(SD) | | | | |
| Hershenberg et al. (2011) USA | 83 adolescents in the seventh and eighth grade and their parents (80 mothers, 3 fathers) | 100% 13.45 yrs (.68) | Cross -study exploring the relationship between emotional behaviour in adolescent-parent relationships and adolescent attachment security, as part of a larger study of relationships and psychological functioning among early adolescent females. | Task: Positive interaction task. Dyad instructed to "spend 2 minutes telling each other what you like most about each other". Interactions took place in a laboratory and were videotaped and later coded. Coding: Interactions coded using a global coding system developed for the study. Aspect of interaction: <i>Positivity about the relationship, warmth, embarrassment, hostility and emotional dysregulation.</i> Parent and adolescent behaviour rated separately. | Family Attachment Interview (Bartholomew, 1998; Bartholomew & Horowitz, 1991). Participants are scored against four attachment classifications: secure, fearful, preoccupied and dismissing. Coders rated participants for each attachment pattern on a nine-point scale from (1) <i>no evidence of characteristics of the prototype</i> to (9) <i>near perfect fit with the prototype</i> . There was low reliability for the fearful attachment style, therefore this code was dropped. An overall security score was computed by subtracting ratings of the two insecure patterns from the rating of the secure pattern. | - None of the ratings of parenting were related to adolescent attachment security; parental positivity ($r = .20^+$, $p = ns$), warmth ($r = .10^+$, $p = ns$) embarrassment ($r = .05^+$, $p = ns$), hostility ($r = -.04^+$, $p = ns$), emotional dysregulation ($r = .20^+$, $p = ns$). |
| Joseph et al. (2014) UK | 62 adolescents and their birth parents and foster parents, 50 'normal-risk' adolescents and their birth parents comparable in | <i>Foster care group</i> 46.8% 13.86 yrs (1.95) <i>Comparison group</i> 48% 14.19 yrs (1.65) | Cross-sectional study exploring attachment security in adolescents in foster care. | Task: 3 interaction tasks: (1) Adolescent and foster mother planned a family holiday together (5 min) (2) 'hot topics' task; dyad discussed two topics nominated as sources of disagreements (10 min) (3) dyad constructed a challenging magnetic creation from a picture (10 min). Interactions took place in the home and were videotaped and later coded. Coding: Family interaction global coding system (Hetherington, Hagan, & Eisenberg, 1992) | Child Attachment Interview (CAI; Target, Fonagy, & Shmueli-Goetz, 2003). Adolescents in foster care were interviewed first about their relationship with their current foster carers and subsequently their birth parents. Based on their verbal and non-verbal behaviour during the interview, adolescents were | A principal components analysis confirmed a Positivity factor (warmth, assertiveness, communication, involvement) and a Negativity factor (anger/rejection, coercion). - Greater positivity was seen in mothers of securely attached foster adolescents ($M = 3.97$, $SD = .69$) compared with insecurely attached adolescents ($M = 3.47$, $SD = .61$) ($F(1,47) = 7.09$, $p < .05$, $d = .72^{++}$) - Greater maternal sensitivity was observed in interactions with secure foster adolescents ($M = 5.17$, $SD = 1.18$) than insecure foster adolescents ($M = 4.24$, |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings |
|--------------------------------|--|-------------------------------|---|---|--|--|
| | Source | Gender (%female) M age(SD) | | | | |
| | terms of age, gender and ethnicity | | | <p>Aspect of interaction: Parent and adolescent <i>warmth, communication, assertiveness, involvement, anger/rejection, and coercion.</i></p> <p>Coding: Coding of Attachment Related parenting (Matias, Scott, & O'Connor, 2006)</p> <p>Aspect of interaction: <i>maternal sensitivity</i> scale (adapted)</p> | classified as secure, dismissing, preoccupied or disorganized. | <p>⁺ = small effect size ⁺⁺ = medium effect size ⁺⁺⁺ = large effect size</p> <p>SD= 1.05) ($F(1, 46) = 8.23, p < .01, d = .78^{+++}$)</p> <p>- Parental negativity in interactions did not differ according to foster adolescent attachment style (secure M= 1.40, SD= .54 vs. insecure M= 1.48, SD= .46, ($F(1, 46) = .33, p = ns, d = -.16^+$).</p> <p>-Logistic regression analyses revealed observed maternal positivity significantly predicted attachment to foster mother, independent of child's age, sex and verbal IQ and length of current placement ($B = 1.42, OR = 4.15^{++}, 95\%CI = 1.28-13.47$).</p> <p>-Sensitivity also predicted attachment when included as an alternative to positivity ($B = .82, OR = 2.26^+, 95\%CI = 1.08- 4.73, p < .05$)</p> <p>- Maternal positivity also significantly predicted attachment security to mother (foster mother for adolescents in foster families; birth mother for adolescents in comparison families) independent of child's demographics ($B = 1.05, OR = 2.85^+, 95\%CI = 1.30-6.27$), with no significant effect of group or group x positivity interaction. No evidence of group x sensitivity interaction when maternal sensitivity used as the predictor of attachment security.</p> |
| Kerns et al. (2011) USA | 87 children and their mothers (95% of participants recruited from schools and 5% from mental health clinics) | 55.2% 11.32 yrs (.68) | Cross-sectional study exploring the relationship between mother-child attachment, parenting, and child depressive symptoms in middle childhood. | <p>Task: Dyads identified the most important problem in their relationship from a list of topics provided, then discussed this, including why it was a problem, feelings about the problem and possible solutions (8 min). Interactions took place in a laboratory and were videotaped and later coded.</p> <p>Coding: Gini, Oppenheim, and Haimovich (2002) coding system</p> <p>Aspect of interaction: <i>warmth/ positive</i></p> | Story stem task adapted from Granot and Mayselless (2001). Stories were rated as secure, ambivalent, avoidant or disorganized according to criteria adapted from criteria developed by Granot and Mayselless (2001). | <p>Warmth and interest scales were highly correlated therefore averaged to form composite scale of warmth/engagement.</p> <p>- Greater maternal warmth/ engagement was associated with greater attachment security ($r = .28^{++}, p < .01$).</p> <p>- Warmth/engagement was not related to avoidant attachment ($r = .09^+, p = ns$) or ambivalent attachment styles ($r = -.03^+, p = ns$).</p> <p>- Lower levels of observed warmth/engagement was</p> |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|--|--|-------------------------------|---|---|---|--|
| | Source | Gender (%female) M age(SD) | | | | |
| | | | | <p><i>affect</i> (amount and intensity of maternal verbal and non-verbal authentic positive affect expressed towards the child) and <i>interest in child</i> (maternal attention, interest and focus on the child).</p> <p>Coding: Barber (1996) coding system Aspect of interaction: <i>Psychological control</i></p> | | <p>significantly related to disorganization in children ($r = -.33^{++}$, $p < .01$).</p> <p>- Psychological control was not significantly related to attachment security ($r = -.19^+$, $p = ns$), ambivalence ($r = .03^+$, $p = ns$), avoidance ($r = .08^+$, $p = ns$) or disorganization ($r = .10^+$, $p = ns$).</p> |
| Kobak et al. (1993) USA | 48 adolescents and their mothers drawn from a sample originally recruited through a newspaper survey of parents with adolescents | 56% 15.7 yrs | Cross-sectional study exploring attachment and emotion regulation in mother-adolescent problem-solving. | <p>Task: A conflict-discussion task as described by Allen et al. (2002), however after the dyad rated areas of disagreement in their relationships to identify main area of disagreement, they were separately interviewed about their point of view and a statement of their position recorded. Dyad reunited and each statement replayed to facilitate discussion. The dyad was then instructed to try and resolve the problem (10mins). Interactions took place in a laboratory and were videotaped through a one-way mirror and later coded.</p> <p>Coding: Based on previous observational coding systems, the authors developed four scales to assess mother-teen problem solving (Markman & Notarius, 1987)</p> <p>Aspect of interaction: <i>Support/validation</i> (expressing an interest in other's position, awareness of other's feelings, non-verbal communication e.g. eye contact and nodding etc.), <i>Dysfunctional anger</i> (overt attacking behaviours e.g. raised voice and criticism, non-verbal behaviour e.g. sighing,</p> | AAI and Q set (C. George et al., 1985; Kobak et al., 1993). Q-set developed and validated by the authors, see description in Allen et al. (2002). | <p>Mother and adolescent ratings were correlated on avoidance of problem-solving, dysfunctional anger and support/validation scales so scores were composited to form a single rating for the dyad. A dyadic score was also created to indicate the degree of maternal dominance in the interaction, by subtracting adolescent's communicative assertiveness score from the mother's score.</p> <p>- Less dysfunctional anger was seen in interactions with secure female ($r = -.36^{++}$, $p < .05$) and male adolescents ($r = -.45^{++}$, $p < .05$).</p> <p>- Greater levels of dysfunctional anger was seen in interactions with male adolescents with deactivating attachment ($r = .53^{+++}$, $p < .01$).</p> <p>-Dysfunctional anger was not significantly associated with deactivating attachment in females ($r = .12^+$, $p = ns$).</p> <p>- Less avoidance of problem solving was seen in dyads with secure males ($r = .50^{+++}$, $p < .01$).</p> <p>-Avoidance of problem solving was not significantly associated with secure attachment in females ($r = -.29^+$, $p = ns$), nor deactivating attachment in males ($r = .23^+$, $p = ns$) or females ($r = .13^+$, $p = ns$).</p> |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|---|---|-------------------------------|--|--|--|---|
| | Source | Gender (%female) M age(SD) | | | | |
| | | | | etc.), <i>Communicative assertiveness</i> (communicating goals and points of view) and <i>Avoidance of problem-solving</i> (interest in the problem and focus on the topic in hand). | | - Higher levels of maternal dominance seen in dyads where females had greater deactivating attachment ($r = .39^{++}$, $p < .05$). -Maternal dominance was not significantly associated with secure attachment in males ($r = .03^+$, $p = ns$) or females ($r = -.27^+$, $p = ns$), nor deactivating attachment in males ($r = -.08^+$, $p = ns$). -Support-validation was not significantly associated with secure attachment in males ($r = -.04^+$, $p = ns$) or females ($r = .28^+$, $p = ns$), nor deactivating attachment in males ($r = .33^{++}$, $p = ns$) or females ($r = .18^+$, $p = ns$). |
| Macfie et al. (2014) USA | 62 children and their mothers; 31 of whose mothers had Borderline Personality Disorder and 31 normative comparisons | 53.3% 5.34 yrs (5.18) | Cross-sectional study exploring parental and child attachment and mother-child interactions in mothers with BPD and normative comparisons. | Task: Puzzle solving session. Puzzles presented one at a time with increasing difficulty. Mothers were instructed: “the puzzle is for your child to complete, but feel free to give any help you think your child might need” (10 min). Interactions took place in the home (or a location specified by the parent) and were videotaped and later coded. Coding: Maternal and child behaviours coded from videotapes using the Qualitative Ratings of Parent/Child Interaction at 58 months (Cox, 1997). Aspect of interaction: <i>maternal sensitivity</i> (provision of emotional support and the mother’s responsiveness to the child’s needs and cues), <i>maternal autonomy support</i> (degree to which mother acts in a way that recognises child’s individuality, motives and perspectives) and <i>maternal hostility</i> (frequency and intensity of negative affect). | Children completed 10-story stems (Bretherton, Oppenheim, Buchsbaum, Emde, & the MacArthur Narrative Group, 1990a; Bretherton et al., 1990b). The Narrative Coding Manual (Bickham & Fiese, 1999) was used to code mother-child <i>relationship expectations</i> ; a 5-point scale where 1= dissatisfying, dangerous, and/or unpredictable etc. and 5= safe, reliable, rewarding fulfilling etc. | Maternal sensitivity was significantly correlated with maternal autonomy support and maternal hostility, and maternal hostility was significantly correlated with maternal autonomy support so a <i>maternal parenting composite</i> was created (maternal sensitivity and autonomy support scores were summed and then hostility scores subtracted from this score). - Maternal parenting was significantly associated with children’s narrative representations of relationship expectations ($r = .44^{++}$, $p < .001$). |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings |
|---|--|-------------------------------|--|---|--|---|
| | Source | Gender (%female) M age(SD) | | | | |
| Matias et al. (2014) UK | 113 children and their mothers (n= 51 'higher risk', n= 62 'lower risk') | 51% 5 yrs 4 mos (4.3 mos) | A cross-sectional study assessing the impact of attachment theory and observational learning theory-based measures of parenting in predicting child adjustment. Data for the study was the first (pre-treatment) wave of data from the Primary Age Learning Skills (PALS) study. | <p>Tasks: 3 standard observational tasks (O'Connor, Matias, Futh, Tantam, & Scott, 2013): (1) Free play with designated set of toys (10 mins) (2) Structured play task; dyad worked collaboratively to recreate a pictured Lego structure (10 mins) (3) Tidy-up task (3 mins). Interactions took place in the home and were videotaped and later coded.</p> <p>Coding: The Coding of Attachment Related Parenting manual (CARP; Bisceglia et al., 2012; O'Connor et al., 2013)</p> <p>Aspect of interaction: <i>Sensitive responding</i> (degree to which parent shows awareness and sensitivity of child's needs, promotes autonomy etc.) and <i>mutuality</i> (degree to which parent and child seek the other's involvement in the task, maintain attention and conversation and reciprocate positive affect etc.)</p> <p>Coding: The Parenting Behavior Coding Scheme (Aspland & Gardner, 2003; O'Connor et al., 2013)</p> <p>Aspect of interaction: <i>Positive Attending</i> (identified by five scales: attending, positive attending, praise, seeking cooperation, facilitating), <i>Directive Parenting</i> (vague commands, clear commands and prohibitions) and <i>Criticism</i>.</p> | Manchester Child Attachment Story Task (Green, Stanley, Smith, & Goldwyn, 2000) a narrative story stem task. A continuous scale of attachment security was used and a disorganized scale was coded separately. | <p>⁺ = small effect size ⁺⁺ = medium effect size ⁺⁺⁺ = large effect size</p> <p>- Attachment-based measures of parenting were significantly correlated with child's attachment security; Maternal sensitive responding ($r = .20^+$, $p < .05$) and mutuality ($r = .32^{++}$, $p < .001$).</p> <p>- The social learning theory measures of parenting were not significantly associated with child's attachment security (Positive Attending, $r = .17^+$; $p = ns$; Directive Parenting $r = -.11^+$, $p = ns$; Criticism $r = .01^+$, $p = ns$).</p> <p>- Neither the attachment theory (Sensitive responding $r = -.10^+$, $p = ns$; Mutuality $r = -.15^+$, $p = ns$) nor the social learning-theory based measures of parenting (Positive Attending, $r = .00$; $p = ns$; Directive Parenting $r = .13^+$, $p = ns$; Criticism $r = .06^+$, $p = ns$) were significantly associated with disorganization in the attachment narrative.</p> |
| Obsuth et al. (2014) USA | 120 adolescents and their | 42.5% 19.9 yrs (1.57) | A cross-sectional study exploring the relationship between | Task: A conflict-discussion task as described in Kobak et al. (1993) but with an unstructured reunion (5 min) prior to | AAI (C. George et al., 1985). Unresolved with respect to Loss or Trauma was the | Confirmatory Factor Analysis indicated a four-factor model provided a best fit for the data (Collaboration, Punitive control, Disorientation and Role-confusion). |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|----------------------------------|---|-------------------------------|---|--|--|---|
| | Source | Gender (%female) M age(SD) | | | | |
| | mothers (largely low income families) | | disorganization behaviour in adolescent-parent interactions and attachment state of mind, partner abuse and psychopathology. 56 of the participants were part of a cohort studied longitudinally from infancy; the remaining 64 families were recruited in adolescence. | discussion of the problem (10 min). Interactions were videotaped and later coded. Coding: Goal-Corrected Partnership in Adolescence Coding System (Lyons-Ruth, Hennighausen, & Holmes, 2005a). Aspect of interaction: 10 scales including <i>Collaborative communication</i> (dyadic; the extent to which the interaction is cooperative, reciprocal, and balanced), <i>parental validation of adolescent's voice</i> , <i>parental odd (out of context) behaviour</i> , <i>parental disoriented-distractible behaviour</i> , <i>parental punitive behaviour</i> and <i>parental role-confusion</i> . The other four scales rated the behaviour of the adolescent. | primary classification of interest and adolescents were categorised as Unresolved or not Unresolved. The AAI was also coded for Hostile-Hopeless (HH) representations of attachment relationships (Lyons-Ruth, Yellin, Melnick, & Atwood, 2005b) | Socio-demographic risk was included as a covariate in all analyses. - Higher scores on collaborative interactions lowered the risk of disorganized attachment in adolescence; for every 1-point increase in the level of collaboration, risk of being classified as Unresolved was reduced by 159% ($\chi^2 = 6.20$, $p = .01$, $OR = 1.59^+$) and risk of being classified as HH was reduced by 164% ($\chi^2 = 8.82$, $p = .003$, $OR = 1.64^+$). - Both disorientation and punitive control increased the risk of disorganized attachment in adolescence. Every 1 point increase in disorientation increased risk of being classified as Unresolved by 164% ($\chi^2 = 4.72$, $p = .03$, $OR = 1.64^+$) and every 1 point increase in punitive control increased the chance of being classified as HH 138% ($\chi^2 = 4.17$, $p = .041$, $OR = 1.38^+$). -No significant relationship between Punitive Control and Unresolved attachment. - No significant relationship between Disorientation and HH attachment. -No significant relationship between Caregiving/ Role-confused interactions and Unresolved attachment or HH attachment. |
| Roisman et al. (2001) USA | 73 young adults (born into low-income families and therefore considered 'development ally at-risk') | 50.7% Age 20-21 yrs | A longitudinal study investigating dyadic behaviour in parent-child and romantic relationships using data collected as part on the ongoing Minnesota Longitudinal Study of | Tasks: (1) Dyad (adolescent and primary caregiver) created anti-smoking campaign (2) Dyad completed puzzle with caregiver blindfolded (3) Dyad discussed results of imaginary events (4) Dyad collaborated on a Q-sort of the ideal person. Coding: 11 dyadic rating scales of behaviour and affect (J. W. Sroufe, 1991) Aspect of interaction: <i>Anger</i> , <i>Conflict</i> , | AAI (C. George et al., 1985). Participants were classified as secure-autonomous, insecure-dismissing, insecure-preoccupied or unresolved with respect to loss. The categories were then grouped into secure and insecure (unresolved | Principal components analysis revealed two factors: parent-child process (Balance I, Balance III, Emotional Engagement and Positive Affect) and parent-child negative affect (Anger, Conflict, Confrontive-Attacking and Hostility). - Higher ratings of parent-child process associated with adolescent attachment security (secure M= 5.20, SD= .61; insecure M= 4.77, SD= .83; $t(1, 59) =$ |

| Study Country | Population | | Design | Measure of parent-child interaction | Representational measure of attachment | Findings + = small effect size ++ = medium effect size +++ = large effect size |
|---|---|--|--|--|---|--|
| | Source | Gender (%female) M age(SD) | | | | |
| | and their partners | | Parents and Children. Data from the assessment of parent-child interactions at age 13 years and assessment of attachment at 19 years is reported here (n= 61). | <i>Conflict resolution, Confrontive-attacking, Emotional engagement, Hostility, Negative Affect, Positive Affect</i> and 3 balance scales: <i>Balance I</i> (degree to which relationship entailed acceptance/ expression/ responsiveness to individual feelings and ideas), <i>Balance II</i> (degree to which relationship scaffolded personal development) and <i>Balance III</i> (degree to which relationship helped individual meet task demands). | participants were classified as insecure, regardless of their secondary classification). Two continuous variables were also used in coding the transcripts as a proxy for security; coherence of transcript and coherence of mind. | 2.10, $p = .04$, $d = .59^{++}$ - Parent-child process was significantly correlated with AAI coherence of transcript ($r = .27^+$, $p < .05$) and coherence of mind ($r = .30^{++}$, $p < .05$). - Ratings of parent-child negative affect did not significantly differ between attachment groups (secure $M = 2.09$, $SD = 1.02$; insecure $M = 2.03$, $SD = .66$; $t(1, 29) = .22$, $p = .83$, $d = .07^+$) - Parent-child negative affect was not significantly related AAI coherence of transcript ($r = -.03^+$, $p = ns$) and mind ratings ($r = -.08^+$, $p = ns$). |
| Scott et al. (2011) UK | 248 adolescents and their parent (n= 102 from a high risk clinical sample, n= 96 from a moderate risk community trial, n=50 from a normative risk community sample) | <i>High risk</i> 23.5% 13.2 yrs (1.8) <i>Moderate risk</i> 32.3% 11.0 yrs (.90) <i>Normative risk</i> 48% 14.2 yrs (1.7) | A cross-sectional study exploring the contribution of attachment and parenting to behaviour adjustment, using participants drawn from three samples with different levels of risk. | Task: 'Hot topics' paradigm; dyad discuss a topic chosen by them that is leading to difficulty in the relationship (10 mins). Interactions were videotaped and later coded. Coding: The family interaction global coding system (Hetherington et al., 1992); separate ratings for adolescent and parent. Aspect of interaction: <i>Warmth, communication, assertiveness, involvement, anger and coerciveness.</i> | Child Attachment Interview (Target et al., 2003). Adolescents are classified as secure, insecure-dismissing, insecure-preoccupied and disorganized/disoriented with respect to their mother and father. As 91% received the same insecure/secure classification to both mother and father (chi-square $p < .001$), representations of the mother were used for analysis. | Factor analysis revealed two factors: positive factor (warmth, communication, assertiveness and involvement) and a negative factor (anger and coerciveness). - Greater levels of maternal positivity observed in dyads with securely attached adolescents (secure $M = 3.93$, $SD = .76$ vs. insecure $M = 3.65$, $SD = .69$; $F(1, 209) = 5.74$, $p < .05$, $d = .38^+$). - No significant differences in maternal negativity between securely and insecurely attached adolescents (secure $M = 1.42$, $SD = .74$ vs. insecure $M = 1.59$, $SD = .87$; $F(1, 209) = 1.52$, $p = ns$, $d = -.22^+$). |

Sensitivity

Two recently published studies explored the relationship between parental sensitivity and children and adolescent's attachment security (Joseph et al., 2014; Matias et al., 2014). Parental sensitivity is the degree to which the parent shows awareness of, and responds sensitively to, the child's needs. The study conducted by Joseph et al. (2014) aimed to investigate attachment security in adolescents in foster care. Participants were adolescents (n= 62) and their birth parents and foster parents and 'normal-risk' adolescents (n= 50) and their birth parents, comparable in terms of age, gender and ethnicity. The relationship between observed parental sensitivity and attachment was explored using the sub-sample of adolescents in foster care and their foster mothers. Attachment was measured using the Child Attachment Interview (Target et al., 2003). Results demonstrated that greater maternal sensitivity was observed in interactions with foster mothers and securely attached foster adolescents than insecurely attached foster adolescents and the strength of this association was large ($F(1, 46) = 8.23, p < .01, d = .78$). In addition, logistic regression analyses revealed observed maternal sensitivity significantly predicted adolescent's attachment to their foster mother, independent of the adolescent's age, sex and verbal IQ and length of current placement ($B = .82, OR = 2.26, 95\%CI = 1.08 - 4.73, p < .05$). Adolescents with foster mothers who displayed greater sensitivity were more than two times as likely to be classified as securely attached. The authors concluded that current quality of observed parenting was a reliable and independent predictor of attachment security, even for high-risk adolescents living in shorter-term placements.

Matias et al. (2014) examined the impact of attachment theory-based measures of parenting and social learning theory measures of parenting in children (mean age 5 years, 4 months) on attachment style, measured using the Manchester Child Attachment Story Task (Green et al., 2000). Results indicated that maternal sensitivity (an attachment theory-based aspect of

parenting) was significantly associated with child's attachment security ($r = .20$, $p < .05$), although the strength of the relationship was small. The study also explored the association between sensitive responding and disorganization in the attachment narrative using a separate disorganization scale, however the relationship between sensitivity and disorganization was not significant ($r = -.10$, $p = ns$).

The overall the quality of these studies was good. Both studies utilised the Coding of Attachment Related parenting scale (CARP; Matias et al., 2006) to assess quality of maternal interactions. This measure was designed for use with younger children and the psychometric properties of the scales are sound in this age group (Matias et al., 2014; O'Connor et al., 2013). However, the psychometric properties of the CARP when used to assess parent-adolescent interactions have yet to be established.

Autonomy

Allen et al. (2002) used a large sample of adolescents ($n = 125$) identified as meeting at least one of four academic risk factors, and their mothers, to examine the relationship between maternal displays of autonomy and attachment security. Although autonomy in mother-child interactions and adolescent attachment security were assessed when adolescents were 16 and 18 years old, only cross-sectional data analysis was reported. Findings indicated maternal autonomy was not associated with adolescent attachment security ($r = -.02$, $p = ns$) nor was it associated with adolescent attachment preoccupation ($r = .03$, $p = ns$). The quality of this study was found to be good, based on the sample size, high response rate and use of valid and reliable measures.

Support/ Validation

Kobak et al. (1993) examined the relationship between aspects of mother-adolescent problem-solving and attachment security, as part of a study exploring emotion regulation and attachment in mother-adolescent problem-solving. A small sample ($n= 48$) of adolescents and their mothers were observed during a conflict discussion task and the interactions were coded for the degree of support/validation, conceptualised as expressing an interest in the other's position, awareness of other's feelings and non-verbal communication such as eye contact and nodding. Adolescents were also administered the AAI and transcripts were rated using the Adult attachment Q-sort, developed by the authors. For this method two or more raters sorted 100 descriptors, derived from Main and Goldwyn's (1984) original scoring system, into nine categories from most characteristic to least characteristic of the participant. Each Q-description is then correlated with prototypes for the secure-anxious (insecurity) dimension and the deactivating-hyperactivating dimension, to establish the degree of a participant's secure-anxious and deactivation-hyperactivation tendencies.

Findings showed that dyadic ratings of support/ validation were not associated with secure attachment, for males ($r= -.04$, $p= ns$) or females ($r= .28$, $p= ns$). Furthermore, support/ validation was not associated with deactivating attachment in males ($r= .33$, $p= ns$) or females ($r= .18$, $p= ns$). The quality of this study was found to be good, due to the rigorous blinding of assessors coding interactions and attachment narratives, as well as use of valid and reliable measures. The Q-sort was developed by the authors and thus had not been used in previous research; however validation for this measure was established as part of the paper.

Relatedness/ Mutuality

Allen and colleagues (Allen et al., 2004; Allen et al., 2003) utilised data from the same cohort of adolescents as the study reported by Allen et al. (2002) to investigate the relationship between dyadic relatedness and attachment security. Adolescents and their parents took part in a revealed differences task (Allen et al., 2002) and were rated according to the degree to which they engaged with, and emphasised with, the other person. Adolescent attachment security was established through the Adult Attachment Interview (AAI; C. George et al., 1985) and Q-sort (Kobak et al., 1993).

In a cross-sectional study with a sample of 125 adolescents, Allen et al. (2003) found that degree of dyadic relatedness was related to adolescent attachment security at 16 years old ($r = .20$, $p < .05$), after adjusting for demographic factors (gender, income and racial/ethnic minority status).

Allen et al. (2004) utilised a subsample of these adolescents ($n = 101$) in a longitudinal study aimed to investigate stability and change in attachment security in adolescence. Dyadic relatedness and adolescent attachment security was assessed when adolescents were 16 years old and adolescent attachment security was assessed again two years later. Results from the study revealed dyadic relatedness was significantly associated with adolescent security at 16 years ($r = .46$, $p < .001$) and 18 years ($r = .40$, $p < .001$), and the strength of these relationships was moderate. Regression analyses revealed dyadic relatedness at 16 failed to reach significance in predicting higher level of attachment security at 18, after controlling for baseline security and adolescent characteristics in the interaction ($\beta = .15$, $p < .10$). This study was considered excellent in the quality ratings because it utilised a longitudinal design and adjusted for both confounding independent variables and baseline attachment security in the statistical analyses.

Beijersbergen et al. (2012) used the same relatedness scale as Allen and colleagues as a proxy for maternal sensitive support to examine how maternal sensitive support related to attachment in a group of internationally adopted adolescents ($n= 125$) aged 14. Greater sensitive support was shown by mothers of adolescents classified as securely attached, compared to mothers of insecure adolescents ($F(1, 121)= 4.82, p= .03, \eta^2= .04$ (small effect size)). This study was rated as being of good quality, due to the large sample size, low rate of missing data and use of reliable and valid exposure and outcome measures.

Using a sample of 5 year old children ($n= 113$), Matias and colleagues (2014) found mutuality, defined as the degree to which the parent and child encourage each other's engagement in the task and maintain joint attention, to be related to the children's attachment security. The strength of this association was moderate ($r= .32, p< .001$).

In addition, research by Obsuth et al. (2014) indicates that 'collaboration' in the dyad is negatively related to disorganization in the attachment narrative. The authors investigated the relationship between disorganization behaviour in parent-adolescent interactions and disorganized attachment representations in adolescents, using a sample of adolescents from predominantly low-income families ($n= 120$). Adolescent attachment was assessed using the AAI, with adolescents classified as 'unresolved with respect to loss or trauma' or 'not unresolved' based on the content of their narrative. In addition, AAI transcripts were coded for Hostile-Hopeless representations of attachment relationships (Lyons-Ruth et al., 2005b). Parent behaviour was rated according to five scales (validation of adolescent's voice, odd (out of context) behaviour, disoriented-distractible behaviour, punitive behaviour and role-confusion) and four scales rated adolescent behaviour (odd (out of context) behaviour, disoriented-distractible behaviour, punitive behaviour and caregiving behaviour). In addition, the dyad was rated on collaborative communication; that is, the extent to which the interaction is

cooperative, reciprocal, and balanced. Confirmatory Factor Analysis of the 10 scales indicated that a four-factor model provided a best fit for the data: collaboration, punitive control, disorientation and role-confusion. As socio-demographic risk was significantly related to the collaboration, disorientation and role-confusion factor, it was included as a covariate in all analyses. The findings showed that more collaborative interactions lowered the risk of being classified as having disorganized attachment in adolescence for both the Unresolved classification ($\chi^2 = 6.20$, $p = .01$, OR= 1.59) and the Hostile-Hopeless classification ($\chi^2 = 8.82$, $p = .003$, OR= 1.64) of the Adult Attachment Interview (C. George et al., 1985; Lyons-Ruth et al., 2005b). The quality of the study was found to be good; the study utilised a large sample size, valid and reliable measures and adjustment was made for confounding independent variables in the statistical analyses.

Positivity

Eight studies explored the relationship between parental positivity and attachment security. Two of these studies rated parental 'positivity' (Allen et al., 2005; Hershenberg et al., 2011), whilst six studies used a composite rating comprising positive aspects of parenting (Dubois-Comtois & Moss, 2008; Joseph et al., 2014; Kerns et al., 2011; Macfie et al., 2014; Roisman et al., 2001; Scott et al., 2011). Several of the studies using composite ratings included some factors already discussed, such as sensitivity and support.

Allen et al. (2005) explored the relationship between positivity in mother-child interactions and attachment security in a longitudinal study with a sample of high school students ($n = 185$). Mothers and their children (aged 13) were asked to discuss a problem the child was having and interactions were coded for the level of positivity. Positivity was conceptualised as the degree of positivity expressed by the adolescent, positive affect and engagement from both members of

the dyad, the mother's success in understanding the adolescent's problem and the adolescent's satisfaction with the interaction. Adolescent's attachment was established using the AAI (C. George et al., 1985) but this was administered after adolescents turned 14 years old, to maximise the validity of the instrument with this population. Results demonstrated that the level of positivity in the interaction was related to later adolescent attachment security and the strength of this association was moderate ($r = .30, p \leq .001$). The quality of this study was rated as good due to the reasonable sample size, good response rate and low rate of missing data, amongst other factors.

Hershenberg and colleagues' (2011) cross-sectional study explored the relationship between parenting and attachment security in a sample of adolescents in an American high school ($n = 83$). Parents and adolescents were instructed to spend "2 minutes telling each other what you like most about each other". Interactions were coded for degree of positivity (how positively the parent spoke about their relationship) and level of warmth (how much the parent smiled, returned compliments etc.). Adolescent attachment was established using the Family Attachment Interview (Bartholomew, 1998; Bartholomew & Horowitz, 1991). Findings indicated that neither parental positivity ($r = .20, p = ns$) nor warmth ($r = .10, p = ns$) was related to attachment security. However this study was deemed to be lacking in quality in part because it utilised a small sample size, did not report blinding of assessors and used a non-validated exposure measure.

The relationship between parenting and adolescent attachment was also explored as part of a longitudinal study investigating dyadic behaviour in parent-child and romantic relationships, using data collected as part of the Minnesota Longitudinal Study of Parents and Children (Roisman et al., 2001). Infants who had been born into low income families (and therefore considered developmentally 'at risk') were recruited in infancy and followed throughout

childhood and adolescence. The assessment of parent-child interactions was conducted when participants were 13 years old and attachment security was assessed when participants were 19 years old using the AAI (C. George et al., 1985). Adolescents and their primary caregivers (the authors did not specify whether this included both mothers and fathers) were rated on 11 dyadic rating scales (J. W. Sroufe, 1991) and 3 'balance scales' (assessing responsiveness and collaboration, among other factors). A composite positive factor referred to as the 'parent-child process' comprised ratings of warmth, responsiveness, sensitivity, emotional engagement and positive affect. Results indicated that ratings of parent-child process at 13 were associated with later adolescent attachment security status (secure vs. insecure, $t(1, 59) = 2.10, p = .04, d = .59$). That is, there were greater levels of positive parent-child process seen in dyads where adolescents were subsequently classified as securely attached compared with adolescents later classified as insecurely attached and the size of the difference between the two groups represents a moderate effect size. In addition, greater scores of parent-child process were correlated with higher ratings on the AAI subscales coherence of transcript ($r = .27, p < .05$ (small effect size)) and coherence of mind ($r = .30, p < .05$ (moderate effect size)), which are considered a proxy for attachment security. However, this study was also deemed to be a lower quality study, due to its small sample size, lack of reporting of blinding of assessors and use of a non-validated exposure measure.

More recently, Scott et al. (2011) conducted a cross-sectional study which explored the relationship between parenting and adolescent attachment security, as part of a study investigating the contribution of attachment and parenting to behaviour adjustment. Using a large sample of adolescents ($n = 248$), approximately half of whom were considered to be moderate or high risk adolescents due to antisocial behaviour or conduct problems, Scott and colleagues found that greater levels of maternal positivity (a composite factor comprising warmth, communication, assertiveness and involvement) were observed in dyads with securely

attached adolescents ($M= 3.93$, $SD= .76$) compared with dyads where adolescents were classified as insecurely attached ($M= 3.65$, $SD= .69$) ($F(1, 209)= 5.74$, $p< .05$, $d= .38$ (small effect size)). The 'insecure' classification included those adolescents classified as having dismissing and preoccupied attachment styles as well as disorganized attachment style. The study was rated as being of good quality.

In their study of attachment security in adolescents in foster care, Joseph et al. (2014) established that greater positivity (a composite factor comprised of ratings of parental warmth, assertiveness, communication and involvement) was observed in mothers of securely attached foster adolescents compared with mothers of insecurely attached adolescents ($F(1,47)= 7.09$, $p< .05$, $d= .72$ (moderate effect size)). Observed maternal positivity also predicted adolescent attachment to the foster mother, independent of the adolescent's age, sex and verbal IQ and length of current placement ($B= 1.42$, $OR= 4.15$, $95\%CI= 1.28-13.47$). Furthermore, maternal positivity predicted attachment security to mother (i.e., foster mother for adolescents in the foster families and birth mother for adolescents in the comparison families) independent of adolescent demographics ($\beta= 1.05$, $OR= 2.85$, $95\%CI= 1.30-6.27$). There was found to be no significant effect of 'group' or 'group x positivity' interaction, indicating that the living situation of the adolescents did not predict attachment status and that greater carer positivity was associated with a nearly three times greater chance of secure attachment to the carer regardless of whether adolescents were in foster care or lived with their biological parents.

The remaining studies explored the relationship between parenting quality and attachment security in younger children. Kerns and colleagues (2011) found that greater maternal warmth/engagement (composite factor) was associated with greater attachment security in preadolescents and this was a moderate strength relationship ($r= .28$, $p< .01$). Maternal warmth/engagement was not related to organised insecure attachment styles; that is, avoidant

attachment ($r = .09$, $p = ns$) and ambivalent attachment styles ($r = -.03$, $p = ns$), however, lower levels of observed warmth/engagement were related to disorganization in children ($r = -.33$, $p < .01$ (moderate effect size)). The study fell within the good range on the quality scale; points were lost as the study used an adapted story-stem task and scoring criteria to assess attachment, but no validity was established for this measure.

Macfie and colleagues' (2014) cross-sectional study aimed to explore parental and child attachment and mother-child interactions in mothers with borderline personality disorder (BPD) and normative comparisons. A small sample of 5 year old children ($n = 62$), half of whom had mothers with a diagnosis of BPD, completed a story-stem measure of attachment (Bretherton et al., 1990a; Bretherton et al., 1990b), which was coded for mother-child relationship expectations (Bickham & Fiese, 1999). Children were also observed completing a puzzle-solving task with their mothers. Findings from across the sample as a whole (clinical and control group combined) indicate that maternal parenting, a composite factor created by adding ratings of maternal sensitivity and autonomy support and subtracting scores of maternal hostility, was significantly associated with children's narrative representations of relationship expectations ($r = .44$ (moderate effect size), $p < .001$). Other aspects of child's attachment were coded for, e.g. fear of abandonment and self-fantasy confusion; however this was not included in the analysis. This study was rated as 'moderate' on the quality rating scale, in part due to the small sample size, the absence of participant response rate and the use of non-validated exposure measure.

Lastly, in a longitudinal study of parent-child relationships, Dubois-Comtois and Moss (2008) conducted observations of mother-child interactions when children were 5.5 years old and assessed children's attachment representations when children were aged 8.5 years old. Attachment was measured using a doll-play narrative procedure and, based on the content of the narrative, children were classified as confident (secure behaviours), casual (avoidant

behaviours), busy (ambivalent behaviours) or frightened (disorganized behaviours) (C. George & Solomon, 2000; Solomon et al., 1995). Results indicate that the overall quality of mother-child interactions did not significantly differ according to attachment style group ($F(2, 45) = 2.51, p = ns$). Nevertheless, the authors explored polynomial comparisons based on a-priori hypotheses and these revealed a significant linear contrast (confident vs. frightened attachment, $t(46) = 2.06, p < .05$) and a non-significant quadratic contrast (causal/busy group vs. confident/ frightened group). The authors report that this indicates greater quality of mother-child interactions were seen in dyads with children later classified as confident (secure) ($M = 4.71, SD = 1.24$), compared with frightened (disorganized) children ($M = 3.63, SD = 1.30$), with the level of quality of interaction in the causal/busy group falling in between ($M = 4.08, SD = 1.51$). The size of the difference between the confident and frightened attachment groups represents a large effect size ($d = .85$). This study was found to be of good quality.

Negativity

Eight studies explored the relationship between negative aspects of parenting and attachment security in children and adolescents (Hershenberg et al., 2011; Joseph et al., 2014; Kerns et al., 2011; Kobak et al., 1993; Matias et al., 2014; Obsuth et al., 2014; Roisman et al., 2001; Scott et al., 2011), however these studies also explored the contribution of positive aspects of parenting and thus their methodology has been discussed in greater detail elsewhere in this review.

Kobak and colleagues (1993) were the first to explore the relationship between mother-adolescent interactions and attachment security during a conflict-discussion task. In the study, observed mother and adolescent problem-solving was coded according to the degree of dysfunctional anger; that is, overt attacking behaviours such as raised voices and criticism, as well as non-verbal behaviour such as sighing, and avoidance of problem-solving, e.g. interest in

the problem and focus on the task etc. In addition, a dyadic score was created to reflect the degree of maternal dominance in the relationship, obtained by subtracting the adolescent's communicative assertiveness score from the mother's score. Results indicated that less dysfunctional anger was seen in interactions with secure female ($r = -.36, p < .05$) and male adolescents ($r = -.45, p < .05$), and the strength of this association was moderate. Conversely, greater levels of dysfunctional anger were seen in interactions with male adolescents with deactivating attachment ($r = .53, p < .01$), and the strength of this relationship was large. Less avoidance of problem-solving was seen in dyads with secure males ($r = .50, p < .01$), and the strength of this relationship was also large. Higher levels of maternal dominance was found in dyads where females had greater deactivating attachment ($r = .39, p < .05$) but not in males ($r = -.08, p = ns$), however maternal dominance was not associated with secure attachment in adolescents.

As part of a longitudinal study Roisman et al. (2001) explored the relationship between parent-child negative affect (a composite factor constructed from dyadic ratings of anger, conflict, confrontative-attacking and hostility) and attachment security, with caregiver-adolescent interactions observed at 13 years old and attachment security assessed at 19 years old. Results from the study indicate that ratings of parent-child negative affect in early adolescence did not differ between adolescents later classified as secure and insecurely attached ($t(1, 29) = .22, p = .83, d = .07$). Furthermore, parent-child negative affect was not related to coherence of transcript ($r = -.03, p = ns$) and coherence of mind ratings ($r = -.08, p = ns$) on the AAI.

Scott et al. (2011) also investigated the relationship between maternal negativity (a composite factor comprising anger and coerciveness) and attachment security in a UK-based cross-sectional study of adolescents and their mothers. There was found to be no difference in observed

maternal negativity in interactions with securely and insecurely attached adolescents (secure M= 1.42, SD= .74 vs. insecure M= 1.59, SD= .87; $F(1, 209)= 1.52$, $p= ns$, $d= -.22$).

In an American study published the same year, Hershenberg et al. (2011) found no relationships between negative aspects of parent behaviour and adolescent attachment security (parental embarrassment ($r= .05$, $p= ns$), hostility ($r= -.04$, $p= ns$) and emotional dysregulation ($r= .20$, $p= ns$)).

Meanwhile, Kerns and colleagues (2011) found no relationship between maternal psychological control and attachment security ($r= -.19$, $p= ns$), attachment ambivalence ($r= .03$, $p= ns$), attachment avoidance ($r= .08$, $p= ns$) or disorganization ($r= .10$, $p= ns$) in preadolescents.

Similarly, a study by Joseph et al. (2014) found that the degree of parental negativity (a composite factor comprising anger/rejection and coercion) in interactions between adolescents and their foster parent did not differ according to adolescent attachment style (secure M= 1.40, SD= .54 vs. insecure M= 1.48, SD= .46; $F(1, 46)= .33$, $p= ns$, $d= -.16$).

Obsuth et al. (2014) investigated the relationship between disorganization behaviour in parent-adolescent interactions and disorganized attachment representations in adolescents. Both the disorientation and punitive control factors were found to increase the risk of disorganized attachment in adolescence. Every 1 point increase in disorientation increased risk of being classified as 'Unresolved' on the AAI by 164% ($\chi^2= 4.72$, $p= .03$, OR= 1.64) and every 1 point increase in punitive control increased the chance of being classified as Hostile-Hopeless (HH) on the AAI by 138% ($\chi^2= 4.17$, $p= .041$, OR= 1.38). The authors reported that no significant relationship was found between the punitive control factor and unresolved attachment representations on the AAI, nor any relationship between the disorientation factor and HH

attachment. There was also found to be no relationship between caregiving/ role-confused interactions and the unresolved attachment style or the Hostile-Hopeless attachment representation.

Matias and colleagues (2014) report the only study to investigate the relationship between negative aspects of parenting and attachment security in young children (mean age 5 years old). The study examined the impact of attachment theory-based measures of parenting and social learning theory-based measures of parenting on attachment style. None of the social learning theory-based measures of parenting were significantly associated with child's attachment security, including directive parenting ($r = -.11$, $p = ns$) and criticism ($r = .01$, $p = ns$). Furthermore, neither directive parenting ($r = .13$, $p = ns$) nor criticism ($r = .06$, $p = ns$) were significantly associated with disorganization in the attachment narrative.

Style of Conversation

Dubois-Comtois et al. (2011) utilised the same longitudinal dataset as Dubois-Comtois and Moss (2008), to explore the relationship between parent-child interactions at 5.5 years and attachment security at 8.5 years. However, in their study Dubois-Comtois et al. (2011) rated the observations of mother-child interactions on the basis of the style of conversation, rather than the overall quality of the interaction. Four styles of mother-child conversations were assessed: integration of affective information (explored other's feelings and thoughts), minimisation of affective information (suppressed, avoided or devalued affects), exaggeration of affective information (verbal statements that maximised negative emotion, embellished situation etc.) and chaotic expression of affective information (displayed sudden hostile or withdrawn behaviours unrelated to the context, or child verbally controlled parent or parent displayed helplessness). The findings indicated that there was greater integration of affective information

in dyads with children later classified as confident (secure), compared with dyads with children subsequently classified with other attachment classifications ($t(79)= 4.04$, $p < .01$). The greatest difference in ratings was seen between confident (secure) children ($M= 2.61$, $SD= 1.63$) and casual (avoidant) children ($M= 1.00$, $SD= 1.07$) and this difference represents a large effect size ($d= 1.17$). In addition, greater exaggeration of affects was observed in dyads with busy (preoccupied) children, compared with other attachment styles ($t(79)= 2.67$, $p < .01$). The greatest difference in ratings was observed between busy (preoccupied) children ($M= 2.83$, $SD= 1.59$) and confident (secure) children ($M= 1.57$, $SD= 1.17$). Again this difference represents a large effect size ($d= .90$).

Furthermore, more chaotic mother-child interactions were seen in dyads with children later classified as frightened (disorganized) than in dyads with children subsequently classified as having other attachment styles, ($t(79)= 2.32$, $p < .05$). The greatest difference in parental ratings was seen between frightened (disorganized) ($M= 1.83$, $SD= 1.59$) and confident (secure) children ($M= .67$, $SD= 1.23$; $d= .82$). However, there were found to be no differences in terms of the amount of minimisation of affect observed between the causal (avoidant) attachment group and other attachment groups. The quality of this research was found to be good, due to the longitudinal study design and use of reliable and valid measures. Points were lost because the authors did not adjust for possible confounding independent variables in the statistical analyses, amongst other reasons.

Discussion

The aim of this review was to summarise and evaluate the literature exploring interactive determinants beyond infancy. Studies which examined the relationship between quality of parenting and attachment security in children and adolescents aged 5-19 years, using a

representational measure of children's attachment and an observational measure of parenting were included in the review. Sixteen studies met the inclusion criteria. Within these studies a number of aspects of parenting quality were assessed and findings were summarised and effect sizes calculated to determine which interactive antecedents were most strongly associated with attachment security beyond infancy.

Traditionally research exploring parental antecedents of attachment security in infancy has examined the role of parental sensitivity, in line with Bowlby's attachment theory. The association between parent sensitivity and infant attachment security has been supported by correlational and experimental evidence (Bakermans-Kranenburg et al., 2003; de Wolff & van IJzendoorn, 1997), however the significance of this relationship in later childhood and adolescence has yet to be reviewed. In investigations of the relationship between parental quality and attachment beyond infancy, four of the studies included in this review rated the degree of parental sensitivity in the interaction. However, two of these studies used sensitivity ratings as part of a composite rating of parenting behaviour (Dubois-Comtois & Moss, 2008; Macfie et al., 2014). Research which explored sensitivity as an independent construct demonstrated that sensitivity is strongly associated with adolescent attachment for adolescents in care and that the degree of sensitivity in parent-adolescent interactions is a predictor of attachment to foster mothers, independent of children's demographic factors (Joseph et al., 2014). Maternal sensitivity was found to be more weakly but significantly associated with attachment security in a younger group of children, with greater sensitivity observed in dyads with more securely attached children. However, sensitivity was not found to be related to attachment disorganization in young children (Matias et al., 2014). This is in line with a meta-analysis which showed that parental insensitivity was only weakly associated with disorganized attachment (van IJzendoorn et al., 1999).

The relationship between maternal autonomy, conceptualised as the mother's use and presentation of a reasoned argument and their level of confidence, and adolescent attachment security was explored by Allen et al. (2002). Maternal autonomy was not found to be related to adolescent attachment security in this study.

In addition, parental support/ validation was not found to be related to secure attachment tendencies or deactivating attachment tendencies in a small sample of adolescents (Kobak et al., 1993). This is different to findings from research with infants, where a small, but significant, association between emotional support and infant attachment was established in the meta-analysis by de Wolff and van Ijzendoorn (1997).

de Wolff and van Ijzendoorn's (1997) review also determined the significance of mutuality as an antecedent for attachment security (combined effect size: $r(166) = .32$). In line with this, evidence for the relationship between relatedness/ mutuality and attachment security in childhood and adolescence was provided by five of the papers included in the review. Cross-sectional research indicated that mutuality was associated with attachment security in young children, and the strength of this relationship was moderate (Matias et al., 2014). Relatedness was also associated with adolescent attachment security, independent of possibly confounding demographic variables (Allen et al., 2004). In addition, collaboration was found to be associated with adolescent disorganization in the attachment narrative, although the strength of this relationship was small (Obsuth et al., 2014). Longitudinal research demonstrated that relatedness at 16 was associated with later attachment and the strength of this relationship was moderate (Allen et al., 2004). Although causal effect cannot be determined, this research demonstrates a temporal sequence between exposure and outcome as outlined by attachment theory. However, relatedness was not independently predictive of later attachment after adjusting for demographic factors and baseline attachment security. There was found to be

substantial stability in attachment during this two year period and thus attachment at baseline accounted for much of the variance in attachment security at follow-up.

Eight studies explored the association between parental positivity and attachment security and of these, seven studies found evidence for a relationship. Overall, good quality cross-sectional and longitudinal research with children and adolescents indicated that there is a moderate to high strength relationship between positive aspects of parenting and attachment security (Allen et al., 2005; Dubois-Comtois et al., 2011; Macfie et al., 2014; Roisman et al., 2001; Scott et al., 2011). That is, more positive parenting was associated with greater attachment security, and lower levels of disorganization. Furthermore, research with adolescents living in foster care indicated that the relationship is independent of adolescent demographic factors and stands irrespective of whether adolescents live with carers or are living with their biological parents (Joseph et al., 2014).

The evidence for the relationship between parental warmth and children's attachment security is inconclusive. Interestingly, warmth was not related to attachment when measured as a separate construct (Hershenberg et al., 2011). However, Kerns and colleagues' (2011) study found greater warmth combined with interest was associated with higher levels of secure attachment and lower levels of disorganized attachment. There were no relationships with organised insecure attachment styles. During Ainsworth's early research in Uganda conducting an ethologically-oriented observational study of infant-mother attachment, she observed that "Ganda babies very rarely manifest any behavior pattern even closely resembling European affection, and, indeed their mothers did not try to elicit hugging or kissing in the baby, although they themselves occasionally nuzzled the baby while holding him" (Ainsworth, 1967, p. 344). Despite this, the level of attachment behaviours observed amongst the infants was greater than those seen in American samples. Ainsworth noted her impression was that compared to

mothers from America, more of the Ugandan mothers were “sensitive to infant signals and communications, and fewer of them insensitive, rejecting, inaccessible or interfering” (Ainsworth, 1977, p. 126). In an interview with Mary Ainsworth conducted two decades later, Ainsworth acknowledged that she had been unsuccessful in creating a scale of parental warmth as part of her extensive research on infant attachment. Ainsworth cited two reasons for this: firstly, it is difficult to define behaviours that are crucial in the rating of maternal warmth (e.g. “kissing” could in fact be an unaffectionate peck on the cheek) and secondly, two mothers can be seen to be equally ‘warm’ but have significantly different effects on their children. Ainsworth distinguished between warmth and sensitivity- sensitivity as responding to and supporting the infant’s initiative and warmth as characteristic of the mother- and emphasised that it is parental sensitivity that is crucial to a child’s attachment security (Ainsworth & Marvin, 1995). Research reviewed supports the notion that warmth alone is not significantly associated with attachment. However, it is also noted that this review indicates that sensitivity is not an exclusive factor in the development of attachment security and that similar strength relationships were found for other positive aspects of maternal interactive behaviour, in line with the findings from the meta-analysis of parental antecedents of attachment in infancy (de Wolff & van Ijzendoorn, 1997).

Eight studies explored the relationship between negative aspects of parenting and attachment; however only two studies found evidence for an association between the two factors. Cross-sectional research with adolescents demonstrated that less dysfunctional anger and less avoidance of problem-solving within the parent-child dyad is related to secure attachment, whilst greater levels of dysfunctional anger were associated with deactivating attachment in males, and maternal dominance was found to be related to deactivating attachment in females (Kobak et al., 1993). In addition, there is evidence from cross-sectional research that greater disorientation and punitive control in parent-child interactions increase the risk of disorganized attachment in adolescence (Obsuth et al., 2014). This is in line with evidence from research with

infants, where anomalous parental behaviour has been found to be more strongly associated with disorganized attachment than other aspects of parenting, such as sensitivity (Madigan et al., 2006; van IJzendoorn et al., 1999).

However, no relationships were found between other aspects of negative parenting behaviour (hostility, embarrassment, psychological control, role-confused interactions, negative affect or composite measures of negativity) and attachment security and disorganization in childhood and adolescence (n= 666; Hershenberg et al., 2011; Joseph et al., 2014; Kerns et al., 2011; Matias et al., 2014; Roisman et al., 2001; Scott et al., 2011). This suggests that the degree of negative factors in interactions between parents and children has less influence on children's attachment security than the level of positive aspects of parenting. The meta-analysis of parental antecedents of infant attachment (de Wolff & van IJzendoorn, 1997) explored only positive aspects of parenting (sensitivity, mutuality, physical contact, cooperation, positive attitude, emotional support and synchrony), making it difficult to draw comparisons in this domain.

Lastly, a good quality, longitudinal study exploring the relationship between conversational style and attachment demonstrated that the content and nature of the conversations between children and their parents is significantly related to later attachment style (Dubois-Comtois et al., 2011). Scrutiny of the findings indicated that particular conversational styles were related to specific attachments styles (e.g. integration of affective information was related to secure attachment and chaotic expression of affective information was related to disorganized attachment). This study indicates that is the content of conversation used in the interaction, not just the nature of the parent's behaviour, which is associated with later attachment security and disorganization. However, this appears to be an under-researched area of study.

Limitations

The research reviewed has a number of important methodological limitations. Firstly, there was a great deal of heterogeneity in the samples and methods used in the studies. There was a significant dearth of studies exploring interactive determinants of attachment using father-child dyads. The majority of studies reviewed used samples which only included mothers, whilst those that did include fathers still conducted observations of interactions with mothers only. One study referred to using 'primary caregivers' in observations of interactions but did not specify if this included fathers. It could be that all of the interactions were conducted with mothers. It is possible, therefore, that the findings of the studies reviewed are not generalisable to fathers. In addition, the studies included in the review were conducted in developed countries. Although these studies used samples from low risk and high risk populations, it is possible that parental antecedents of attachment may vary depending on cultural backgrounds.

Furthermore, despite only including studies that used observational measures of parenting, there was significant variety in the duration and context of the parent-child interactions. The observations of interactions ranged from two to twenty-five minutes and it may be that the shorter observations did not provide enough time to capture the true nature of the interactions between the parent and the child. Although the majority of the interactions were based around structured tasks, the variety of the tasks used can also make it difficult to compare studies. The aspects of parenting measured were not exhaustive and it is possible other factors may also be relevant to children's attachment security.

Similarly, despite only including studies that used representational measures of attachment there was a range of attachment measures used across the studies with variations in methods depending on the participant's age. Studies assessing attachment in younger children used

story-stem completion tasks, which may incorporate doll-play as well as conversation in the discussion of attachment-related vignettes, whilst studies with older children used attachment interviews, which ask about children's lived experiences. Measures of attachment also varied in how they classified attachment (e.g. some used categorical classification and some assessed attachment quality along a continuous scale), further compromising the ability to make comparisons between studies.

In addition to this, the quality of studies varied. Some studies, for example, used exposure or outcome measures that had not been validated. In particular, there was a lack of prospective research and very few studies controlled for other possible confounding independent variables. Finally, that the majority of studies (n= 11) used participants in adolescence (i.e. aged 13-19) and the number of studies that used participants in middle childhood and preadolescence was low.

Clinical Implications

The finding that conversation style and positive factors of parenting are more strongly related to attachment security in children and adolescence can be used to inform future interventions aimed to promote attachment security in at risk children and adolescents, including those in foster care. To date, interventions aimed at increasing attachment security have predominantly focused on parental sensitivity (e.g. Kalinauskiene et al., 2009; Kennedy, Landor, & Todd, 2010; Moretti & Obsuth, 2009), however this review indicates that interventions could also focus on enhancing other aspects of parenting, such as mutuality and positivity as well as the content of the conversation style. For example, support in integration of affective information through the exploration of other's feelings and thoughts should enhance attachment security. Mentalization-based treatment (MBT), which is grounded in attachment theory, aims to increase mentalizing; that is, the capacity to understand behaviour of the self and other in relation to mental states

such as thoughts and feelings. This therapy has been shown to be more effective than routine care in reducing repeat self-harm in a clinical sample of adolescents and the mechanism of change was attributable to improved mentalization and reduced attachment avoidance (Rossouw & Fonagy, 2012). This indicates that this therapy may not only be helpful in improving clinical outcomes for adolescent self-harm, but also in enhancing attachment security.

Further Research

It is not known whether the findings of this review are generalisable to fathers and therefore future research should aim to explore the relationship between paternal interactive determinants of attachment security in children and adolescents. In addition, much of the research in this domain has relied on a cross-sectional design in exploring the relationship between parenting and attachment security in children and adolescence and future research should aim to examine the association longitudinally, whilst adjusting for possible confounding factors. This will shed light on the temporal sequence between exposure and outcome and whether this is in line with attachment theory (i.e. if quality of parenting predicts later attachment style).

Only seven out of the 16 studies included in the review measured disorganized attachment (Dubois-Comtois et al., 2011; Dubois-Comtois & Moss, 2008; Joseph et al., 2014; Kerns et al., 2011; Matias et al., 2014; Obsuth et al., 2014; Scott et al., 2011) and of these, two studies grouped disorganization with other insecure attachment styles to examine 'secure vs. insecure' attachment styles. Research with infants has demonstrated that interactive determinants of disorganization are different from the other organised attachment styles (Madigan et al., 2006) and future research should aim to examine the relationship between anomalous parental behaviour and attachment disorganization in children and adolescents. Furthermore, the

considerable variations in both exposure measures and outcomes used make it more difficult to draw comparisons between the studies included in the review. If there were more studies with more consistent measures it would be useful to conduct a meta-analysis of the interactive determinants of attachment beyond infancy.

Finally, the research reported here only allows conclusions to be drawn about associations between parenting and attachment and not causal factors. It is therefore imperative that future research evaluates the impact of interventions aimed at enhancing positive aspects of parenting, including conversational style, on attachment security in children and adolescents. Pilot work should first establish the feasibility of identifying children with greater levels of insecure attachment and randomly allocating them to a parenting intervention. A full-scale, randomised, controlled trial could then evaluate the effectiveness of an attachment-promoting intervention with a large cohort of vulnerable children with insecure attachment. Collecting follow-up data on attachment would enable researchers to establish any causal relationship between quality of parenting and attachment security and to explore the clinical benefits and cost-effectiveness of parenting-based interventions to promote secure attachment beyond infancy.

Conclusions

The aim of this review was to summarise and evaluate the literature exploring interactive determinants beyond infancy. Sixteen studies met the inclusion criteria. Findings indicate that the style of conversation and the level of sensitivity, mutuality and positive aspects of parenting were most strongly related to attachment security in children and adolescents. Warmth when measured as a separate factor was not related to attachment security. Lower levels of positive engagement, poorer quality of parenting, chaotic expression of affective information and greater levels of disorientation and punitive control in parent-child interactions increased the risk of

disorganization in children and adolescents. However, other aspects of negative parenting behaviour (hostility, embarrassment, psychological control, role-confused interactions, negative affect or composite measures of negativity) were not related to attachment security and disorganization in childhood and adolescence. Negative aspects of interactions between parents and children appear to exert less influence on children's attachment security than more positive aspects of parenting such as sensitivity, mutuality and quality of emotional content of conversations with children.

References

- Ainsworth, M. D. S. (1963). The development of infant-mother interaction among the Ganda. In B. M. Foss (Ed.), *Determinants of infant behavior* (Vol. 2, pp. 67-112). London: Methuen.
- Ainsworth, M. D. S. (1967). Patterns of attachment behavior *Infancy in Uganda: Infant care and the growth of love* (pp. 332-350). Baltimore: John Hopkins University Press.
- Ainsworth, M. D. S. (1977). Infant development and mother-infant interaction among Ganda and American families. In P. H. Leiderman, S. R. Tulkin & A. Rosenfeld (Eds.), *Culture and infancy* (pp. 119-149). New York, NY: Academic Press.
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Ainsworth, M. D. S., & Marvin, R. S. (1995). On the shaping of attachment theory and research: An interview with Mary DS Ainsworth (Fall 1994). *Monographs of the Society for Research in Child Development*, 60(2-3), 3-21.
- Allen, J. P., & Hauser, S. T. (1996). Autonomy and relatedness in adolescent-family interactions as predictors of young adults' states of mind regarding attachment. *Development and Psychopathology*, 8(4), 793-809.
- Allen, J. P., Hauser, S. T., Bell, K. L., McElhaney, K. B., Tate, D. C., & Insabella, G. M. (1998a). *The autonomy and relatedness coding system*. Unpublished manuscript, University of Virginia, USA.
- Allen, J. P., Marsh, P., McFarland, C., McElhaney, K. B., Land, D. J., Jodl, K. M., & Peck, S. (2002). Attachment and autonomy as predictors of the development of social skills and delinquency during midadolescence. *Journal of Consulting and Clinical Psychology*, 70(1), 56-66.
- Allen, J. P., McElhaney, K. B., Kuperminc, G. P., & Jodl, K. M. (2004). Stability and change in attachment security across adolescence. *Child Development*, 75(6), 1792-1805.
- Allen, J. P., McElhaney, K. B., Land, D. J., Kuperminc, G. P., Moore, C. W., O'Beirne-Kelly, H., & Kilmer, S. L. (2003). A secure base in adolescence: Markers of attachment security in the mother-adolescent relationship. *Child Development*, 74(1), 292-307.
- Allen, J. P., Moore, C., Kuperminc, G., & Bell, K. (1998b). Attachment and adolescent psychosocial functioning. *Child Development*, 69(5), 1406-1419.
- Allen, J. P., Porter, M., McFarland, C., McElhaney, K. B., & Marsh, P. (2007). The relation of attachment security to adolescents' paternal and peer relationships, depression, and externalizing behavior. *Child Development*, 78(4), 1222-1239.
- Allen, J. P., Porter, M. R., McFarland, F. C., Marsh, P., & McElhaney, K. B. (2005). The two faces of adolescents' success with peers: Adolescent popularity, social adaptation, and deviant behavior. *Child Development*, 76(3), 747-760.
- Aspland, H., & Gardner, F. (2003). Observational measures of parent-child interaction: An introductory review. *Child and Adolescent Mental Health*, 8(3), 136-143.
- Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., & Juffer, F. (2003). Less is more: meta-analyses of sensitivity and attachment interventions in early childhood. *Psychological Bulletin*, 129(2), 195.
- Barber, B. K. (1996). Parental psychological control: Revisiting a neglected construct. *Child Development*, 67(6), 3296-3319.
- Bartholomew, K. (1998). *The family and peer attachment interview*. Unpublished manuscript, Simon Fraser University.
- Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: a test of a four-category model. *Journal of Personality and Social Psychology*, 61(2), 226-244.

- Becker-Stoll, F., Fremmer-Bombik, E., Wartner, U., Zimmermann, P., & Grossmann, K. E. (2008). Is attachment at ages 1, 6 and 16 related to autonomy and relatedness behavior of adolescents in interaction towards their mothers? *International Journal of Behavioral Development*, 32(5), 372-380.
- Beijersbergen, M. D., Juffer, F., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2012). Remaining or becoming secure: Parental sensitive support predicts attachment continuity from infancy to adolescence in a longitudinal adoption study. *Developmental Psychology*, 48(5), 1277-1282.
- Bell, S. M., & Ainsworth, M. D. S. (1972). Infant crying and maternal responsiveness. *Child Development*, 43(6), 1171-1190.
- Bickham, N., & Fiese, B. (1999). *Child narrative coding system*. Unpublished manuscript. Syracuse University, Syracuse, NY.
- Bisceglia, R., Jenkins, J., Wigg, K., O'Connor, T., Moran, G., & Barr, C. (2012). Arginine vasopressin 1a receptor gene and maternal behavior: evidence of association and moderation. *Genes, Brain and Behavior*, 11(3), 262-268.
- Bosmans, G., Braet, C., Van Leeuwen, K., & Beyers, W. (2006). Do parenting behaviors predict externalizing behavior in adolescence, or is attachment the neglected 3rd factor? *Journal of Youth and Adolescence*, 35(3), 373-383.
- Bowlby, J. (1969/1982). *Attachment and loss: Vol.1. Attachment* (2nd ed.). New York: Basic Books (Original work published 1969).
- Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation: Anxiety and anger*. New York: Basic Books.
- Bowlby, J. (1979). *The making and breaking of affectional bonds*. London: Tavistock.
- Bretherton, I., Oppenheim, D., Buchsbaum, H. K., Emde, R. N., & the MacArthur Narrative Group. (1990a). *MacArthur Story Stem Battery (MSSB)*. Unpublished manuscript.
- Bretherton, I., Ridgeway, D., & Cassidy, J. (1990b). Assessing internal working models of the attachment relationship. In M. T. Greenberg, D. Cicchetti & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 273-308). Chicago: University of Chicago Press.
- Cobb, C. L. H. (1996). Adolescent-parent attachments and family problem-solving styles. *Family Process*, 35(1), 57-82.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Cox, M. (1997). *Qualitative ratings of parent/child interaction*. Unpublished manual, University of North Carolina at Chapel Hill.
- Crowell, J. A., Fraley, R. C., & Shaver, P. R. (2008). Measurement of individual differences in adolescent and adult attachment. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 599-634). New York, NY: Guilford Press.
- Cyr, C., Dubois-Comtois, K., & Moss, E. (2008). Mother-child conversations and the attachment of children in the pre-school period. *Canadian Journal of Behavioural Science*, 40(3), 140-152.
- Cyr, C., Euser, E. M., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2010). Attachment security and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology*, 22(01), 87-108.
- de Wolff, M. S., & van Ijzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68(4), 571-591.
- Diamond, D., & Doane, J. A. (1994). Disturbed attachment and negative affective style. An intergenerational spiral. *British Journal of Psychiatry*, 164(6), 770-781.

- Dubois-Comtois, K., Cyr, C., & Moss, E. (2011). Attachment behavior and mother-child conversations as predictors of attachment representations in middle childhood: A longitudinal study. *Attachment & Human Development, 13*(4), 335-357.
- Dubois-Comtois, K., & Moss, E. (2004). Relation between attachment and mother-child interaction in school-age children in natural and experimental settings. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 36*(4), 267-279.
- Dubois-Comtois, K., & Moss, E. (2008). Beyond the dyad: Do family interactions influence children's attachment representations in middle childhood? *Attachment & Human Development, 10*(4), 415-431.
- Dykas, M. J., Woodhouse, S. S., Cassidy, J., & Waters, H. S. (2006). Narrative assessment of attachment representations: Links between secure base scripts and adolescent attachment. *Attachment & Human Development, 8*(3), 221-240.
- Easterbrooks, M. A., Bureau, J. F., & Lyons-Ruth, K. (2012). Developmental correlates and predictors of emotional availability in mother-child interaction: A longitudinal study from infancy to middle childhood. *Development and Psychopathology, 24*(1), 65-78.
- Fearon, R. P., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: A meta-analytic study. *Child Development, 81*(2), 435-456.
- George, C., Kaplan, N., & Main, M. (1985). *Adult Attachment Interview*. Unpublished manuscript, University of California, Berkeley.
- George, C., & Solomon, J. (2000). *Six-year attachment doll play classification system*. Unpublished classification manual, Mills College Oakland, CA.
- George, M. R., Cummings, E. M., & Davies, P. T. (2010). Positive aspects of fathering and mothering, and children's attachment in kindergarten. *Early Child Development and Care, 180*(1-2), 107-119.
- Gini, M., Oppenheim, D., & Haimovich, T. (2002). *The Joint Story Telling (JST) task scales*. Unpublished manuscript, University of Haifa, Israel.
- Granot, D., & Mayseless, O. (2001). Attachment security and adjustment to school in middle childhood. *International Journal of Behavioral Development, 25*(6), 530-541.
- Green, J., Stanley, C., Smith, V., & Goldwyn, R. (2000). A new method of evaluating attachment representations in young school-age children: The Manchester Child Attachment Story Task. *Attachment & Human Development, 2*(1), 48-70.
- Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. P. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development, 83*(2), 591-610.
- Haddock, C. K., Rindskopf, D., & Shadish, W. R. (1998). Using odds ratios as effect sizes for meta-analysis of dichotomous data: A primer on methods and issues. *Psychological Methods, 3*(3), 339.
- Hershenberg, R., Davila, J., Yoneda, A., Starr, L. R., Miller, M. R., Stroud, C. B., & Feinstein, B. A. (2011). What I like about you: The association between adolescent attachment security and emotional behavior in a relationship promoting context. *Journal of Adolescence, 34*(5), 1017-1024.
- Hesse, E., & Main, M. (2006). Frightened, threatening, and dissociative parental behavior in low-risk samples: Description, discussion, and interpretations. *Development and Psychopathology, 18*(2), 309-343.
- Hetherington, E. M., Hagan, M. S., & Eisenberg, M. M. (1992). *Family interaction global coding system*. Unpublished manual, Department of Psychology, University of Virginia, USA.

- Jarde, A., Losilla, J.-M., Vives, J., & F Rodrigo, M. (2013). Q-Coh: A tool to screen the methodological quality of cohort studies in systematic reviews and meta-analyses. *International Journal of Clinical and Health Psychology, 13*(2), 138-146.
- John, A., Morris, A. S., & Halliburton, A. L. (2012). Looking beyond maternal sensitivity: Mother-child correlates of attachment security among children with intellectual disabilities in urban India. *Journal of Autism and Developmental Disorders, 42*(11), 2335-2345.
- Joseph, M. A., O'Connor, T. G., Briskman, J. A., Maughan, B., & Scott, S. (2014). The formation of secure new attachments by children who were maltreated: An observational study of adolescents in foster care. *Development and Psychopathology, 26*(1), 67-80.
- Kalinauskiene, L., Cekuoliene, D., van Ijzendoorn, M., Bakermans-Kranenburg, M. J., Juffer, F., & Kusakovskaja, I. (2009). Supporting insensitive mothers: The Vilnius randomized control trial of video-feedback intervention to promote maternal sensitivity and infant attachment security. *Child: Care, Health and Development, 35*(5), 613-623.
- Kennedy, H., Landor, M., & Todd, L. (2010). Video Interaction Guidance as a method to promote secure attachment. *Educational and Child Psychology, 27*(3), 59-72.
- Kerns, K. A., Brumariu, L. E., & Seibert, A. (2011). Multi-method assessment of mother-child attachment: Links to parenting and child depressive symptoms in middle childhood. *Attachment & Human Development, 13*(4), 315-333.
- Kobak, R. R., Cole, H. E., Ferenz-Gillies, R., Fleming, W. S., & Gamble, W. (1993). Attachment and emotion regulation during mother-teen problem solving: a control theory analysis. *Child Development, 64*(1), 231-245.
- Lecompte, V., & Moss, E. (2014). Disorganized and controlling patterns of attachment, role reversal, and caregiving helplessness: Links to adolescents' externalizing problems. *American Journal of Orthopsychiatry, 84*(5), 581-589.
- Lyons-Ruth, K., Alpern, L., & Repacholi, B. (1993). Disorganized infant attachment classification and maternal psychosocial problems as predictors of hostile-aggressive behavior in the preschool classroom. *Child Development, 64*(2), 572-585.
- Lyons-Ruth, K., Bronfman, E., & Parsons, E. (1999). Maternal frightened, frightening, or atypical behavior and disorganized infant attachment patterns. *Monographs of the Society for Research in Child Development, 64*(3), 67-96.
- Lyons-Ruth, K., Hennighausen, K., & Holmes, B. (2005a). *Goal-Corrected Partnership in Adolescence Coding System (GPACS): Coding manual (Version 2)*. Unpublished document, Department of Psychiatry, Harvard Medical School, Cambridge, MA.
- Lyons-Ruth, K., Yellin, C., Melnick, S., & Atwood, G. (2005b). Expanding the concept of unresolved mental states: Hostile/helpless states of mind on the Adult Attachment Interview are associated with disrupted mother-infant communication and infant disorganization. *Development and Psychopathology, 17*(01), 1-23.
- Macfie, J., Swan, S. A., Fitzpatrick, K. L., Watkins, C. D., & Rivas, E. M. (2014). Mothers with borderline personality and their young children: Adult Attachment Interviews, mother-child interactions, and children's narrative representations. *Development and Psychopathology, 26*(2), 539-551.
- Madigan, S., Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., Moran, G., Pederson, D. R., & Benoit, D. (2006). Unresolved states of mind, anomalous parental behavior, and disorganized attachment: A review and meta-analysis of a transmission gap. *Attachment & Human Development, 8*(2), 89-111.
- Main, M., & Cassidy, J. (1988). Categories of response to reunion with the parent at age 6: predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology, 24*(3), 415.
- Main, M., & Goldwyn, R. (1984). *Adult attachment scoring and classification system*. Unpublished scoring manual, University of California, Berkeley.

- 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. T. Greenberg, D. Cicchetti & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 161-182). Chicago, IL: University of Chicago Press.
- Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood, and adulthood: A move to the level of representation. *Monographs of the Society for Research in Child Development, 50*(1-2), 66-104.
- Markman, H. J., & Notarius, C. I. (1987). Coding marital and family interaction: Current status. In T. Jacob (Ed.), *Family interaction and psychopathology: Theories, methods and findings* (pp. 329-390). New York: Plenum.
- Marsh, P., McFarland, F., Allen, J. P., McElhaney, K. B., & Land, D. (2003). Attachment, autonomy, and multifinality in adolescent internalizing and risky behavioral symptoms. *Development and Psychopathology, 15*(2), 451-467.
- Matias, C., O'Connor, T. G., Futh, A., & Scott, S. (2014). Observational attachment theory-based parenting measures predict children's attachment narratives independently from social learning theory-based measures. *Attachment & Human Development, 16*(1), 77-92.
- Matias, C., Scott, S., & O'Connor, T. G. (2006). *Coding of Attachment-Related Parenting (CARP)*. Unpublished manuscript, Institute of Psychiatry, King's College London, UK.
- Miles, J., & Shevlin, M. (2001). *Applying regression and correlation: A guide for students and researchers*. London, UK: Sage Publications.
- Moretti, M. M., & Obsuth, I. (2009). Effectiveness of an attachment-focused manualized intervention for parents of teens at risk for aggressive behaviour: The Connect Program. *Journal of Adolescence, 32*(6), 1347-1357.
- Morsbach, S. K., & Prinz, R. J. (2006). Understanding and improving the validity of self-report of parenting. *Clinical Child and Family Psychology Review, 9*(1), 1-21.
- O'Connor, T. G., Matias, C., Futh, A., Tantam, G., & Scott, S. (2013). Social learning theory parenting intervention promotes attachment-based caregiving in young children: Randomized clinical trial. *Journal of Clinical Child and Adolescent Psychology, 42*(3), 358-370. doi: 10.1080/15374416.2012.723262
- Obsuth, I., Hennighausen, K., Brumariu, L. E., & Lyons-Ruth, K. (2014). Disorganized behavior in adolescent-parent interaction: Relations to attachment state of mind, partner abuse, and psychopathology. *Child Development, 85*(1), 370-387.
- Ontai, L. L., & Thompson, R. A. (2002). Patterns of attachment and maternal discourse effects on children's emotion understanding from 3 to 5 years of age. *Social Development, 11*(4), 433-450.
- Pinquart, M., Feußner, C., & Ahnert, L. (2013). Meta-analytic evidence for stability in attachments from infancy to early adulthood. *Attachment & Human Development, 15*(2), 189-218.
- Roisman, G. I., Holland, A., Fortuna, K., Fraley, R. C., Clausell, E., & Clarke, A. (2007). The Adult Attachment Interview and self-reports of attachment style: an empirical rapprochement. *Journal of Personality and Social Psychology, 92*(4), 678.
- Roisman, G. I., Madsen, S. D., Hennighausen, K. H., Sroufe, L., & Collins, W. (2001). The coherence of dyadic behavior across parent-child and romantic relationships as mediated by the internalized representation of experience. *Attachment & Human Development, 3*(2), 156-172.
- Rossouw, T. I., & Fonagy, P. (2012). Mentalization-based treatment for self-harm in adolescents: a randomized controlled trial. *Journal of the American Academy of Child & Adolescent Psychiatry, 51*(12), 1304-1313.

- Sanderson, S., Tatt, I. D., & Higgins, J. P. (2007). Tools for assessing quality and susceptibility to bias in observational studies in epidemiology: a systematic review and annotated bibliography. *International Journal of Epidemiology*, *36*(3), 666-676.
- Scott, S., Briskman, J., Woolgar, M., Humayun, S., & O'Connor, T. G. (2011). Attachment in adolescence: Overlap with parenting and unique prediction of behavioural adjustment. *Journal of Child Psychology and Psychiatry*, *52*(10), 1052-1062.
- Sessa, F. M., Avenevoli, S., Steinberg, L., & Morris, A. S. (2001). Correspondence among informants on parenting: Preschool children, mothers, and observers. *Journal of Family Psychology*, *15*(1), 53.
- Shaw, D. S., Keenan, K., Vondra, J. I., Delliquadri, E., & Giovannelli, J. (1997). Antecedents of preschool children's internalizing problems: A longitudinal study of low-income families. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(12), 1760-1767.
- Solomon, J., George, C., & De Jong, A. (1995). Children classified as controlling at age six: Evidence of disorganized representational strategies and aggression at home and at school. *Development and Psychopathology*, *7*(03), 447-463.
- Sroufe, J. W. (1991). Assessment of parent-adolescent relationships: Implications for adolescent development. *Journal of Family Psychology*, *5*(1), 21.
- Sroufe, L. A. (2005). Attachment and development: A prospective, longitudinal study from birth to adulthood. *Attachment & human development*, *7*(4), 349-367.
- Target, M., Fonagy, P., & Shmueli-Goetz, Y. (2003). Attachment representations in school-age children: the development of the Child Attachment Interview (CAI). *Journal of Child Psychotherapy*, *29*(2), 171-186.
- van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, *11*(02), 225-250.
- Weinfield, N. S., Sroufe, L. A., & Egeland, B. (2000). Attachment from infancy to early adulthood in a high-risk sample: Continuity, discontinuity, and their correlates. *Child Development*, *71*(3), 695-702.
- Weinfield, N. S., Sroufe, L. A., Egeland, B., & Carlson, E. (2008). Individual differences in infant-caregiver attachment: Conceptual and empirical aspects of security. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2 ed., pp. 78-101). New York, NY: Guilford Press.
- Wells, G. A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2000). The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp. Accessed 6th January, 2015.

Part 2 Empirical paper

**Quality of Parenting and Adolescent Attachment security: A Twin
Study to Explore the Impact of Genetic Factors**

Abstract

Aims. The study aimed to firstly test the relative role of genetic influences on the quality of parenting and secondly examine whether common genes might account for the covariation between parenting quality and adolescent attachment security in twins.

Method. The sample consisted of 100 twin-pairs (50 monozygotic and 50 dizygotic twin-pairs), aged 14-15 years. Adolescent attachment security was assessed by the Child Attachment Interview. Adolescents and their parents also completed a conflict resolution task. Parenting quality, including attachment-related aspects of parenting (sensitivity and mutuality), was rated by observers.

Results. Correlational results indicate genetic factors are involved in variations in the quality of parenting twins receive, however, the univariate genetic model was not powered to reliably distinguish between the effects of genes and shared environment. Cross-twin correlations were greater for MZ than DZ twins for all parenting variables, suggesting common genetic factors may underlie the association between parenting quality and attachment security.

Conclusions. Findings from this preliminary study suggest that adolescents' genetic characteristics might influence the quality of parenting they receive, including attachment-related aspects of parenting (sensitivity and mutuality). However, the ability to distinguish reliably between the effects of genes and shared environment was limited by the small sample size. In addition, results indicate that the genetic propensities of adolescents that evoke poor parenting quality may also lead to attachment insecurity and this warrants further investigation using formal multivariate genetic analysis.

Introduction

Over the past four decades, behavioural genetic research has had a significant impact on our understanding of the aetiology of observable traits and disorders. Quantitative genetic theory proposes that observed individual differences can be explained by both genetic variability and variability in experience, as determined by the environments encountered. Family, twin and adoption studies have identified widespread genetic influences on socio-emotional development and psychopathology (Plomin, DeFries, Knopik, & Neiderhiser, 2013) but there seems to be little genetic influence on early attachment security, suggesting that this is environmentally driven (Bokhorst et al., 2003). Yet the child's inherited characteristics do seem to have a substantial influence on their representations of attachment in adolescence (Fearon, Shmueli-Goetz, Viding, Fonagy, & Plomin, 2014). The reasons for this development are unclear; however it is possible that bidirectional mechanisms play a role, whereby the child's genetically endowed characteristics become more salient in later childhood and potentially evoke greater sensitivity or insensitivity, in the parent, which then impacts on representations of attachment security in the adolescent. Research has shown that parenting in adolescence, predominantly assessed using parent-report and/or adolescent-report measures, is influenced by the child's genetic characteristics (Avinun & Knafo, 2014; Klahr & Burt, 2014). In addition, common genetic factors (child effects) have been found to mediate the association between parenting and adolescent adjustment (Pike, McGuire, Hetherington, Reiss, & Plomin, 1996). As yet, however, no study has explored whether shared genetic factors play a role in the association between quality of parenting and adolescent attachment security. The present study therefore used a twin study design to explore the relative contribution of child genetic factors on quality of parenting using observational methods. In addition, this study examined whether common genes or common environments can account for the covariance between parenting quality and adolescent attachment security.

Genetic Origins of Attachment Style

In Bowlby's attachment theory, emphasis is placed on the role of the caregiver in the formation of secure or insecure attachment; specifically the caregiver's sensitivity and responsiveness to attachment cues are hypothesised to be crucial in the development of individual differences in attachment (Bowlby, 1969/1982). There has been a wealth of research that has generated data on interactive precursors of attachment security (e.g. de Wolff & van IJzendoorn, 1997; Madigan et al., 2006; van den Dries, Juffer, van IJzendoorn, & Bakermans-Kranenburg, 2009; van IJzendoorn, Goldberg, Kroonenberg, & Frenkel, 1992; van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999) and on the basis of hypotheses outlined in attachment theory, many studies have examined the relationship between parental sensitivity and attachment. A moderately strong association between maternal sensitivity and infant security (combined effect size: $r(837) = .24$) was established in a meta-analysis of research exploring parental antecedents of infant attachment security (de Wolff & van IJzendoorn, 1997). Similar strength relationships were found for other aspects of maternal interactive behaviours and attachment, with mutuality being most strongly associated with attachment security (combined effect size: $r(166) = .32$). Meanwhile, a literature review of research conducted with children in middle childhood and adolescence has also highlighted the significance of parenting antecedents in attachment security (Glazebrook, 2015). The review by Glazebrook (2015) indicated that positive aspects of parenting such as parental sensitivity, mutuality and the emotional quality of conversations with the child have greater influence on children's attachment security than the degree of negative factors in interactions between parents and children. However, the correlational data included in these reviews cannot provide information on the direction of effect in the relationship between parenting and attachment. Nor does it reveal whether parenting itself might be influenced by the child's genetic characteristics, and how this relates to attachment security. It

has only been in more recent years that researchers have considered the potential contribution of genetic factors to variation in attachment security.

Quantitative genetics uses numerous population designs (but particularly twin and adoption studies) to establish the relative strength of genetic and environmental influences.

Environmental influences come in two forms: those shared by siblings reared in the same family (known as the shared environment) and those not shared by siblings in a family (the non-shared environment). The concept of non-shared environment challenges the idea that parents behave in the same way towards all their children (Dunn & Plomin, 1990); a concept considered to be the one of the most important contributions of behavioural genetics (Plomin, 2011). Crucially the term “environment” in behavioural genetics is a broad term covering those sources of variation which cannot be explained by heritable genetic effects (e.g. psycho-social experiences, perinatal events, accidents etc.) (Pike & Plomin, 1996).

In twin studies the three variance components (genetic, shared environment and non-shared environment) can be estimated from observed differences in variance and covariance between monozygotic (MZ) and dizygotic (DZ) twins. Genetic influences are broadly indicated when there is greater similarity (covariance) between MZ twin pairs (who share 100% of their genes) than between DZ twin pairs (who share on average 50% of their genes). Shared-environment effects are indicated where the associations between MZ twins and between DZ twins are of a similar magnitude, that is, there is family resemblance not explained by genetics. Whilst non-shared environment effects (within-family effects) are indicated when there is variation within pairs of MZ twins reared together. However, differences in experience can also be due to error of measurement. Standard univariate twin modelling uses structural equation modelling techniques to estimate the proportion of variance in a trait (e.g. attachment security) that is

attributable to genes, shared environment and non-shared environment (which also includes measurement error) (Neale & Cardon, 1992; Rijdsdijk & Sham, 2002).

Genetic and Environmental Contributions to Attachment in Infancy and Toddlers

To date studies investigating the contribution of genetic and environmental influences to individual differences in attachment in infancy and toddlers have consistently found evidence for environmental rather than genetic determinants of attachment, as predicted by attachment theory. For example, Bokhorst and colleagues (2003) combined participants from two sites- London (UK, 62 twin pairs) and Leiden (the Netherlands, 76 twin pairs)- and measured child-mother attachment at 12 months using the Strange Situation Procedure (Ainsworth & Wittig, 1969). Genetic analysis showed that for secure vs. non-secure attachment 52% of the variance in security was explained by shared environment and 48% of the variance was explained by non-shared environment. The role of genetic factors was found to be negligible. Similar results were shown in the Leiden part of this sample for infant-father attachment (Bakermans-Kranenburg, van Ijzendoorn, Bokhorst, & Schuengel, 2004). Attachment security was assessed using the attachment Q-Sort and univariate genetic analysis indicated 59% of the variance in security was attributable to shared environment and 41% to non-shared environment.

O'Connor and Croft (2001) measured child-caregiver attachment at 43 months in a sample of 110 MZ and DZ twins using the Strange Situation Procedure. The findings indicated little genetic influence in attachment security (genes accounted for 14% of the variance) and considerable influences of shared (32%) and non-shared (53%) environment. Similarly, Roisman and Fraley (2008) administered a version of the Attachment Q-sort specifically designed for toddlers to a subsample 485 twin pairs from the Early Childhood Longitudinal Study—Birth Cohort (ECLS-B) and results suggested minimal genetic influence; shared and non-shared environment

respectively accounted for 53% and 30% of the variance in attachment security (when zygosity was established based on ratings by ECLS–B researchers and parent ratings).

In addition to this, candidate gene studies investigating associations between specified genes of interest and attachment security in infancy or gene-by-environment interactions (i.e. genetic susceptibility to environments, whereby individuals with different genotypes respond differently to the same environment) in relation to attachment in infancy have provided inconsistent findings. Luijk et al. (2011) combined data from two birth cohort studies and tested main and interaction effects of candidate genes involved in the dopamine, serotonin, and oxytocin systems on attachment security and disorganisation. They found no reliable evidence of single gene associations or gene-by-environment interactions. These findings, coupled with results from twin studies, have provided strong empirical support for environmental antecedents of attachment security in infancy.

However, continuity of attachment security into later childhood, adolescence and adulthood has shown to be modest (Grossmann, Grossmann, & Waters, 2005), thus we cannot assume that behavioural-genetic findings from infancy generalise across the lifespan. It is possible that genes become influential in later ages because the child's genes increasingly influence parental caregiving behaviour. It has also been theorised that genes play a more significant role in later attachment because attachment organisation is assessed and conceptualised very differently beyond infancy (Fearon et al., 2014). In adolescence and adulthood the operationalisation of attachment is focused on the way in which individuals think about their attachment relationships (Bakermans-Kranenburg & van IJzendoorn, 2009; Kobak & Sceery, 1988; Main, Kaplan, & Cassidy, 1985; Ravitz, Maunder, Hunter, Sthankiya, & Lancee, 2010). Measures have been developed based on the assumption that representations of the attachment system can be captured through the content, quality and style of language used to talk about relationships. The

ability to think coherently about, and reflect upon, relational episodes in an unbiased way characterises secure attachment beyond early childhood. Main (1996) proposed that reflection and coherence when talking about potentially difficult attachment experiences may make use of personal characteristics that are partly heritable. Considering this, there is the need to explore the behavioural genetics of attachment beyond early childhood.

Genetic and Environmental Contributions to Attachment beyond Infancy

Findings from studies investigating the role of genes and environment in individual differences in adults' self-reported attachment styles indicate a genetic influence on attachment anxiety. Brussoni, Jang, Livesley, and Macbeth (2000) found 37% heritability for attachment anxiety and 60% of the variance attributable to non-shared environmental factors. Similarly Crawford et al. (2007) estimated 40% of the variance in attachment anxiety to be due to genes. Interestingly neither study found any genetic contribution to attachment avoidance.

However, convergence between self-report measures of romantic attachment and interview-based measures of parental attachment is low (Bartholomew & Shaver, 1998) and it has been argued that self-report measures are unable to detect those attachment phenomena that need to be activated in order to be identified (Ravitz et al., 2010). Furthermore, questions still remain regarding the role of genes in attachment status in adolescence.

In view of this, Fearon and colleagues (Fearon et al., 2014) recently conducted the first study to explore the behavioural genetics of individual differences in attachment security in adolescence, using the Child Attachment Interview (Target, Fonagy, & Shmueli-Goetz, 2003), a well validated attachment interview designed for use in middle childhood and adolescence. The study utilised a large (n= 582 twin pairs) and representative sample of adolescents aged 15 years recruited from

the *Twins Early Development Study* (TEDS). The overall coherence scale of the Child Attachment Interview is the primary indicator for secure attachment and correlations between MZ twin scores for coherence were moderate ($r = .42$), whilst DZ twin associations were considerably weaker ($r = .20$), indicating genetic influence on adolescent attachment. A similar pattern emerged for associations between twins on their overall security; MZ twins scores correlated more highly than DZ twins. Structural equation modelling confirmed the significance of genetic influence; for ratings of coherence 38% of the variability was attributable to genes and for attachment classification (secure vs. insecure) 35% of the variability was attributable to genes. The remaining variance was attributable to non-shared environment and measurement error.

These findings suggest that a child's inherited characteristics play a significant role in their attachment status in adolescence, in contrast to infancy. The mechanism by which this change occurs is not yet known, but Fearon and colleagues propose that it may be a bidirectional mechanism where the child's genetic propensities evoke changes in the sensitivity of care provided by the caregiver, which leads to changes in security of attachment in the child-caregiver relationship. Thus, the evoked parenting mechanism may in part account for genetic variance in attachment security.

Genes Influence the Rearing Environment Provided By Parents

Research using genetic designs has identified that genetic factors often influence measures of the environment, particularly the family environment (Plomin et al., 2013). This 'nature of nurture' topic has been identified as the second most significant contribution from behavioural genetics, after the non-shared environment (Plomin, 2011). The phenomenon is known as a gene-environment correlation (r_{GE}) in quantitative genetics and refers to genetic influence on

exposure to environments; therefore genetic propensities and individual differences in environmental experiences are correlated (Kendler & Eaves, 1986).

Three types of *rGE* are commonly described: passive, active and evocative (Plomin, DeFries, & Loehlin, 1977; Scarr & McCartney, 1983). Passive *rGE* occurs when the child is the passive recipient of family environments (e.g. parenting) that correlate with heritable parental characteristics. Therefore, the 'G' in passive *rGE* concerns the genotype of the parents. For example, if positivity is heritable and children are therefore predisposed to positivity, and parents also have a positive interactive style influenced by the same genes, then passive *rGE* may account in part for the degree of parental positivity in the parent-child relationship. Evocative *rGE* occurs when genetically influenced characteristics in the child evoke particular responses from individuals around them (e.g. parents), thus the 'G' in evocative *rGE* concerns the child's genes rather than the parents (although the former must come from the latter). For example, a child characterised by high levels of positivity may elicit more positive responses from their parents than a child with low levels of positivity. Active *rGE* occurs when individuals seek out, modify or construct environments (e.g. friends, leisure time activities) that are consistent with their genetic characteristics. Again, the relevant genotype in active *rGE* is the child's.

In order to examine genetic influences on parenting, it is possible to use child-based designs (e.g. children-as-twins studies or adoptee studies) or parent-based designs (e.g. parents-as-twin studies). With a parent-based design, the focus is primarily on influences that stem from the parent, thus the heritability component will estimate genetic influences of the parent's genotype on their own parenting behaviour, i.e. passive *rGE*. Child-based designs focus on the differences and similarities in parenting between children with different genetic relatedness and assess influences that stem from the child. Estimates of genetic influences in this design are

therefore estimates of the influence of the child's genotype on parenting they receive, i.e. evocative *rGE*. Whilst in theory the heritability component could also reflect active *rGE*, this is unlikely as children are not able to make active choices about the parenting environment they receive. It is therefore evocative *rGE*- the influence of children's genes on parental care- that may in part account for genetic variance in attachment security (Fearon et al., 2014).

Evidence for the Influence of Children's Genes on Parenting (Evocative *rGE*)

There is currently good evidence that the genetically-based traits in children impact on parenting (Avinun & Knafo, 2014; Kendler & Baker, 2007; Klahr & Burt, 2014; Plomin & Bergeman, 1991). A recent meta-analysis (Avinun & Knafo, 2014) evaluated the extent to which children's genetic propensities are correlated with parenting; based on 32 children-as-twins studies of parental positivity and negativity the heritability estimate was 23%, indicating that the child plays a meaningful role in shaping parent behaviour. The shared-environmental component accounted for 43% of the variance and the non-shared environmental component accounted for 34% of the variance, suggesting consistency in parental behaviour as well as differential treatment of twins. Meanwhile, another meta-analysis (Klahr & Burt, 2014), which included children-as-twin and sibling/adoption studies ($n= 56$), indicated genetic influences were attributable to 23% of the variance in parental control, 26% of the variance in parental warmth and 40% of the variance in parental negativity. Across the phenotypes, 27% to 39% of the variance was attributable to shared environmental influences and 32% to 44% attributable to non-shared environmental influences. The genetic influence on the three phenotypes provides further evidence for the importance of evocative *rGE* effects on parenting.

Whilst these recent meta-analyses provide robust evidence for genetically based child effects on parenting, only a small number of studies included in the reviews used adolescent samples, and

these studies have tended to rely on parent- or adolescent- reports of parental behaviour (e.g. Button, Lau, Maughan, & Eley, 2008) or a composite measure (e.g. Neiderhiser et al., 2004). Only the *Non-Shared Environment and Adolescent Development Study* has explored the role of genetically based child effects on parent behaviour in adolescents using an observational measure of parenting (O'Connor, Hetherington, Reiss, & Plomin, 1995; Pike et al., 1996). The NEAD is a large US based study looking at the effects of non-shared environment on adolescent development using a twin and sibling child-based design. Six groups of siblings of varying genetic relatedness were included: MZ twins, DZ twins, full non-twin siblings in non-divorced families and full, half, and unrelated siblings in stepfamilies (n= 675 families). The sample comprised children aged between 10 and 18 years old and their siblings aged between 9 and 18 years old. In the study reported by O'Connor et al. (1995) participants completed a conflict-resolution task and a range of parent behaviours were rated by observers using the Family Interaction Coding System (Hetherington, Hagan, & Eisenberg, 1992). Univariate genetic analysis compared sibling correlations to estimate genetic and environmental contributions to quality of parenting. O'Connor et al. (1995) found children's genetic factors accounted for 38% of the variance in maternal negativity and 24% of the variance in paternal negativity, whilst 34% of the variance in maternal negativity was explained by shared environmental factors and 42% of the variance in paternal negativity was explained by shared environmental factors. The remaining variance (29%-34%) was explained by non-shared environmental factors. For positivity, results indicated 18% heritability for both maternal and paternal behaviour. In addition, 63% of the variance in parental positivity was attributable to non-shared environmental factors and 19% of the variance in parental positivity was accounted for by non-shared environmental influences.

Consequences of the Influence of Children's Genes on Parenting

As well as the extent to which genetic factors influence environmental measures, researchers have also considered the role of gene-environment correlations on development. That is, the extent to which common genetic factors might mediate associations between environmental measures and development outcomes (Plomin, 2009).

This has been demonstrated most clearly by data from the Non-Shared Environment and Adolescent Development Study. Pike and colleagues (1996) applied multivariate genetic analysis to associations between parental negativity, and depressive symptoms and antisocial behaviour to see if the relationship between parenting negativity and adolescent adjustment is mediated by common genes or common environments. Whilst univariate analysis estimates genetic and environmental influence on the variance of one phenotype, multivariate genetic analysis investigates the origins of the covariance between phenotypes (Martin & Eaves, 1977). Bivariate structural equation models can be used to infer genetic and environmental causes of covariation between measures of the family environment (in this case parental negativity) and developmental outcomes (in this case depressive symptoms/ antisocial behaviour) (Neale & Cardon, 1992). How much of the association is due to common genetic or environmental factors is estimated from the pattern of cross-twin correlations (the correlation between one twin's environmental measure and the second twin's outcome measure). If the cross-twin correlation is greater in MZ twins than in DZ twins then this indicates a common genetic influence in the association between the two measures. Whilst similar cross-twin correlations between MZ and DZ twins suggests that common environmental factors are responsible for the association.

For their study, Pike et al. (1996), created total composite ratings of maternal and paternal negativity based on parental report, adolescent report and observer ratings. The results

indicated that both twin-specific (non-shared) environments and common genes explained the association between parental negativity and adolescent adjustment. It was notable that genetic factors accounted for a large proportion of the correlation. These findings have been interpreted to indicate that heritable traits in the child evoke negativity in the parent, which in turn accounts for a significant proportion of the correlation between parental negativity and adolescent adjustment; the child's genes are reflected in the parent's behaviour and the adolescent's adjustment.

As proposed by Fearon and colleagues (2014), such evocative rGE effects are therefore a plausible explanation for the genetic influences on attachment (see figure 1 for a conceptual diagram of this proposed relationship). However, as yet no study has directly tested whether common genetic factors play a role in the association between quality of parenting and attachment security in adolescents.

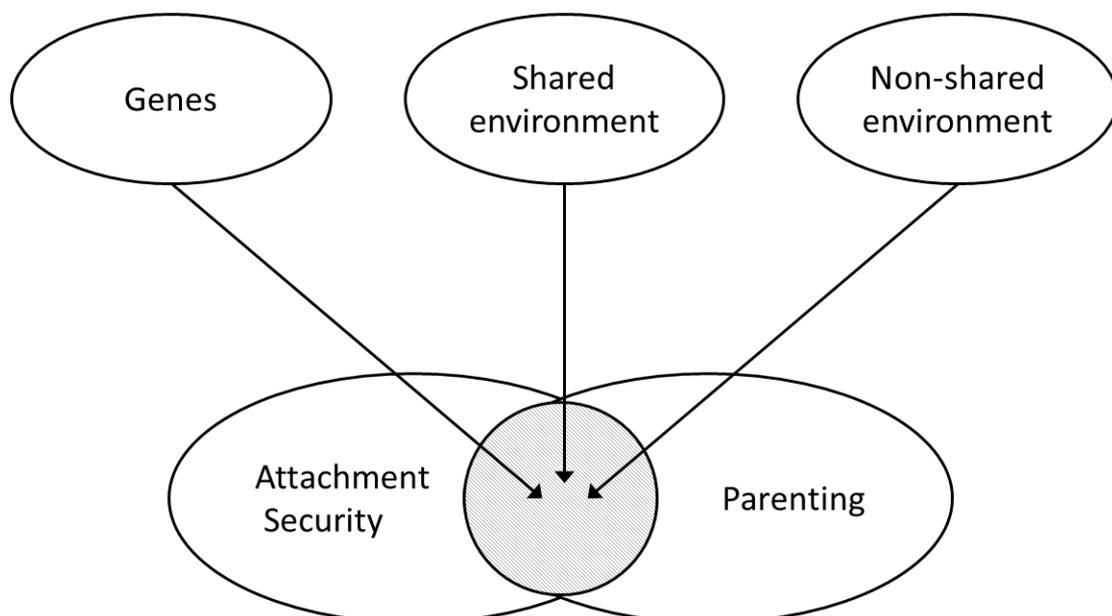


Figure 1 A conceptual model: Do common genes or common environments account for the covariation between parenting quality and attachment security in adolescence?

Study Aims

This study therefore aimed to firstly test the relative role of genetic and environmental components to the quality of parenting, using observational measures that assess a range of parenting behaviours, including aspects of parenting specifically deemed to be important for attachment security: parental sensitivity and mutuality (de Wolff & van Ijzendoorn, 1997; Glazebrook, 2015). If parenting is impacted by the child's genes, then MZ twins should experience more similar levels of quality of parenting than DZ twins.

Secondly, the study aimed to examine whether common genes or common environments might account for the covariation between parenting quality and attachment security in adolescent twin-pairs. That is, whether parenting and attachment are associated because they are both influenced by the same genes. If common genetic factors underlie the association between quality of parenting and attachment, then the quality of parenting expressed to one twin will be more strongly correlated with the other twin's attachment security in MZ twins than in DZ twins.

Research Questions

1. Are there genetically-based child effects on quality of parenting; that is, is the genetic make-up of the adolescent reflected in parenting behaviour (overall quality of parenting, parental sensitivity and mutuality), when rated by observers?
2. Do common genetic factors play a role in the association between parenting behaviour as rated by observers (overall quality of parenting, sensitivity and mutuality) and adolescent attachment security in twins; that is, is the correlation between parenting quality and attachment due to genes that influence both traits?

Method

Participants

Participants came from the *Twins Early Development Study* (TEDS), a large longitudinal cohort of twins born in England and Wales between 1994 and 1996. The recruitment process and nature of the assessments that have been administered are described in detail in papers by Haworth, Davis, and Plomin (2013), Oliver and Plomin (2007) and Trouton, Spinath, and Plomin (2002). The overall aim of TEDS is to gain a greater understanding of how our genes and environment influence learning abilities, cognitive abilities and behaviour, and how these relate to one another and change over time. The twins were initially identified from birth records of multiple births. More than 16,000 twin pairs (same-sex MZ twin-pairs and same-sex and opposite-sex DZ twin-pairs) were originally enrolled in TEDS and, at first contact, more than 14,000 families returned information. These families were highly representative of the general UK population (Haworth et al., 2013). Since the initial recruitment the families have since been invited to take part in studies when the twins were aged 2, 3, 4, 7, 8, 9, 10, 12, 14, and 16 years of age. Not all of the families are invited to take part at all ages (e.g. the 1996 cohort was excluded from some stages of assessment due to budget constraints) and families always have the option not participate in a particular stage of the study or to completely withdraw their participation from the study. Despite significant attrition since the first recruitment wave, the sample has remained reasonably representative of the UK population (Spinath, Ronald, Harlaar, Price, & Plomin, 2003).

Twin zygosity has been established through parent questionnaire rating of twins' physical similarity, which led to unambiguous identification in 95% of cases (Price et al., 2000). For

questionable cases, zygosity was verified using DNA was collected from cheek swabs and tested for multiple genetic markers; this method has a 99.9% accuracy.

More recently, the project investigated the role of genes and environment in parent-child attachment in adolescence, using data from a subsample of same-sex twin pairs. All families participating in TEDS who lived in the greater London area or urban areas with good transport links to London were approached to take part in the study. One thousand, two hundred and ninety-two families met the inclusion criteria (age 15 years \pm 14 months) and of these eligible families 694 initially agreed to participate (54% uptake). Of these, 582 were subsequently assessed. This subsample consisted of 320 female twin pairs and 262 male twin pairs and mean age at assessment was 15 years (range 13.9-16.4 years). Genetic influences may differ between sexes, in terms of gene expression and in the range of gene-environment interactions, thus using same-sex pairs avoids potential inflation of genetic estimates that could occur when opposite-sex DZ twins are included with same-sex DZ twins.

Current Study Participants

Participants in the current study were 100 same-sex twin pairs randomly selected from a sample of adolescents who participated in the study investigating the role of genes and environment in parent-child attachment in adolescence, as part of the TEDS. Twin-pairs with known zygosity were eligible for the current study.

Measures

Socio-Demographic Factors

Parents of participants provided information on the twin-pair's ethnicity, family income, maternal and paternal educational level and maternal and paternal employment status.

Child Attachment Interview (CAI; Target, Fonagy, Shmueli-Goetz, Datta, & Schneider, 2007)

The CAI was used to assess attachment security in adolescents. This semi-structured interview establishes attachment organisation by accessing adolescents' mental representations of attachment relationships. Developed based on the well-established Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985; Main & Goldwyn, 1984; Main et al., 1985) it asks about experiences with, and perceptions of, attachment figures. However, there are differences from the AAI which make the interview developmentally more appropriate, e.g. it is considerably shorter and focuses on recent relational episodes rather than retrospective accounts of interactions with attachment figures.

The interview consists of 17 questions which are designed to elicit the adolescent's self-representation and representation of his/her caregivers, particularly during situations in which the attachment system is thought to be activated (e.g. emotional upset, conflict, distress, illness, hurt, separation and loss). Adolescents are evaluated on their ability to coherently describe their experience and their reflective capacity when thinking about the impact of these experiences.

Prompts are used throughout the interview to encourage children to construct narratives with a

focus on emotional processing (e.g. asking how they felt during a relational episode, how others might feel etc.)

The interview is conducted by a trained interviewer and is filmed and later transcribed verbatim to aid with coding. Transcripts of the interview and relevant non-verbal behaviour (e.g. marked anxiety, maintenance of eye contact etc.) are coded according to nine scales; Emotional Openness, Use of Examples, Balance of Positive/Negative References to Attachment Figures, Preoccupied Anger, Idealisation, Dismissal, Disorganisation, Resolution of Conflict and Overall Coherence. The majority of the scales (Emotional Openness, Use of Examples, Balance of Positive/Negative References to Attachment Figures, Resolution of Conflict and Overall Coherence) examine the child's general state of mind with regard to attachment security (Target et al., 2003). Therefore ratings are given based on the overall content, quality and style of language used to talk about experiences with all of the child's primary caregivers. The remaining scales- Preoccupied Anger, Idealisation, Dismissal and Disorganisation- are rated separately for mother and father. From careful analysis of the narrative, a score of between 1 and 9 is assigned for each of the scales. Based on expected patterns on these rating scales, as well as evaluation of how well the narrative fits a prototypical profile outlined in the coding manual, a main attachment style can be assigned for the mother and father independently; secure attachment or an insecure attachment style (dismissing, preoccupied or disorganised).

Alternatively, the Overall Coherence scale can be used in place of attachment classifications, as this scale is the primary indicator for secure attachment (Shmueli-Goetz, Target, Fonagy, & Datta, 2008). The Overall Coherence score was therefore used in the current study. Scores on the Overall Coherence scale reflect the degree to which the child is able to discuss relationship episodes with their caregivers in a reflective, spontaneous, consistent and comprehensible way. Children are given high scores when they speak in coherent manner, with limited prompts from

the interviewer, and reflect on relationship episodes whilst holding in mind differing perspectives and feeling states of others involved, irrespective of their specific experience. Secure children score highly on this scale. Low scores are given where the narrative is marked by significant idealization of attachment figures, very brief or excessively long examples, contradictory descriptions, strong involving anger and a lack of 'fresh speech' or reflection.

The CAI was originally designed for use with individuals aged 8-12 years but has since been adapted and used with adolescents up to 17 years of age. The CAI has demonstrated sound psychometric properties in a community sample and clinical sample of UK children in middle childhood, with good criterion validity, discriminant validity and test-retest reliability at one-year (Shmueli-Goetz et al., 2008). More recently the psychometric properties of the CAI have been explored in a clinical sample of adolescents (12 - 17 years) in the US (Venta, Shmueli-Goetz, & Sharp, 2014). Factor analyses of the CAI indicated three factors (termed coherence, anger and idealization) that generally reflect those factors associated with the AAI. Furthermore, concurrent validity was indicated by agreement between the CAI and several self-report measures of parental availability, dependability, trust, care and overall attachment security. Convergent validity was supported by associations between attachment insecurity and self- and parent-reported externalizing problems as well as between insecurity and self-reported affective problems.

The Child Attachment Interviews were administered by research assistants trained by one of the authors (YSG). Coding was conducted by YSG and the research assistants, who achieved 80% or higher agreement for attachment classifications from a standard reliability set. Inter-rater reliability was established from an additional 59 interviews, with YSG serving as the "gold standard". The intra-class correlation for Overall Coherence was .72 and inter-rater agreement

for the secure vs non-secure split was 85% for mother ($\kappa = .69$) and 86% for father ($\kappa = .72$) (as reported in Fearon et al., 2014).

Assessment of Parenting Behaviour: Hot Topics Conflict Resolution Task

To assess quality of parenting, participants and their parents completed the 'Hot Topics' paradigm in which the parent and child are asked to discuss and resolve a topic chosen by the child that is leading to difficulty in their relationship. Adolescents were first given a list of areas that commonly lead to disagreements between parents and their children (money, friends, grades/schoolwork, chores, alcohol and drugs, dating, brothers or sisters, religion/going to church/participation in religious activities, phone, personal appearance (clothes, haircuts, etc.), use of computer, videogames, music, sleep habits, rules in the house and activities outside of school) and asked to select the two topics that they disagree about most with their parent. Adolescents were then reunited with their parent for the discussion task. Adolescents were instructed to describe the disagreement they have with their parent and to state their side of the disagreement followed by their parent's side of the disagreement. Adolescents and their parents were then instructed to discuss the disagreement so that they both understood each other's point of view and to try to resolve the disagreement. This process was repeated for the second topic of disagreement, if time permitted. The adolescent and their parents were given eight minutes for the task and the interaction was filmed. Conflict-resolution tasks (also known as 'revealed-difference' tasks) such as the one in the current study are commonly used to assess family interactions (Kerig & Lindahl, 2001; Margolin et al., 1998) and have been utilised to assess quality of parenting in a number of studies with adolescents and their parents (e.g. Beijersbergen, Juffer, Bakermans-Kranenburg, & van Ijzendoorn, 2012; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Scott, Briskman, Woolgar, Humayun, & O'Connor, 2011b).

Observational measures of parenting are considered the “gold-standard”, as self-report measures can be susceptible to bias (Sessa, Avenevoli, Steinberg, & Morris, 2001).

Rating of Quality of Parenting in the Conflict Resolution Task

The Family Interaction Coding System (Hetherington et al., 1992)

The Family Interaction Coding System was developed to code dyadic family interactions during a conflict-resolution task. The original scale consists of 12 general scales: *anger/rejection, warmth/support, coercion, assertiveness, involvement, transactional conflict, self-disclosure, communication skills, authority/control, depressed mood, positive mood* and *problem-solving* and two child scales: *prosocial* and *antisocial behaviour*. For all scales, members of the dyad are rated either separately or dyadically on the frequency and intensity with which they display particular behaviours (see Table 2.1 for a description of the scales). Each dimension is coded on a 5-point Likert scale, with higher scores indicating greater frequency and/or intensity of that behaviour.

Studies utilising the Family Interaction Coding System have typically condensed parenting ratings into positive and negative dimensions (Hetherington et al., 1999; Kim, Hetherington, & Reiss, 1999). Factor analyses have indicated that the scales, or a composite of the scales in combination with other parenting measures, load on a two factor structure (positivity and negativity) or a three factor structure (positivity, negativity and control) (Ganiban et al., 2007; Hetherington et al., 1999; O'Connor et al., 1995). The two factor structure has been indicated by factor analyses in recent studies assessing parent-adolescent interactions (Joseph, O'Connor, Briskman, Maughan, & Scott, 2014; Scott, Briskman, & Dadds, 2011a; Scott et al., 2011b).

The psychometric properties of the measure are sound. Scott et al. (2011b) found good inter-rater reliability, as indicated by intra-class correlations, for the positive factor comprising warmth (parent .82, child .84), communication (.81, .80), assertiveness (.92, .53) and involvement (.75, .74) and a negative factor comprising anger (.75, .71) and coerciveness (.67, .70). Parenting scales from the Family Interaction Coding System have been found to be related to self-reported parenting (Scott et al., 2011a) and parental monitoring (Kim et al., 1999; Scott et al., 2011b), indicating concurrent validity. Convergent validity is indicated by findings that parenting scales are associated with observed parental expressed emotion (Scott et al., 2011b), parental-reported history of abuse (Levendosky & Graham-Bermann, 2000) and observations of marital warmth and negativity (Ganiban et al., 2007). In addition, parenting scales have been found to be unrelated to demographic factors including ethnicity, child's age, mother's age and maternal education, indicating good discriminant validity (Levendosky & Graham-Bermann, 2000).

Table 2.1 Use and Adaptation of the Family Interaction Global Coding System in the Current Study

| Original global scale | Description | Rating | Use in current study |
|-------------------------------|--|--------------------------|--|
| <i>Anger/rejection</i> | The degree to which the target displays negative, angry, rejecting, or hostile behaviour | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Warmth/ support</i> | The degree to which the target is positive, nice and supportive towards the other | Both members of the dyad | Scale adapted for current study (parent rating only) |
| <i>Coercion</i> | The degree to which the target expresses his/her needs, wants and opinions; achieves goals; or attempts to change the opinion or behaviour of the other through negative or manipulative means | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Assertiveness</i> | The degree to which the target expresses his/her needs, wants, and opinions through appropriate and positive avenues, and displays self-confidence and patience when the other responds | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Involvement</i> | The degree to which the target is involved in the interaction; the target can be involved in a positive or negative manner | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Transactional conflict</i> | The level of conflict achieved by the parent and child together | Dyadic | Scale used without adaptation |
| <i>Self-disclosure</i> | The degree of intimacy of the target's disclosure of his/her feelings, emotions, values or beliefs about things or events important to him/her or about his/her relationship with the other, as well as the degree to which the target's verbal and non-verbal expressions make him/her vulnerable to criticism or rejection | Both members of the dyad | Not used in current study |
| <i>Communication skills</i> | The degree to which the target demonstrates good communication skills | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Authority/ control</i> | The degree to which the target demonstrates authority and successfully influences or controls the other's behaviours or opinions | Both members of the dyad | Not used in current study |
| <i>Depressed mood</i> | The degree to which the target verbal and non-verbal behaviour communicates emotional distress that is conveyed as dysphoria and/or anxiety | Both members of the dyad | Scale used without adaptation (parent rating only) |
| <i>Positive mood</i> | The degree to which the target appears happy, content and optimistic and/or demonstrates positive affect | Both members of the dyad | Scale used without adaptation (parent rating only) |

| | | | |
|-----------------------------|---|--------------------------|--|
| <i>Problem-solving</i> | The degree to which the target are able to progress toward the accomplishment of the task, i.e., find a resolution to the disagreement under discussion | Both members of the dyad | Scale adapted for current study (parent rating only) |
| <i>Prosocial behaviour</i> | A measure of the child's social competence; that is, their maturity, ability to relate to competently and effectively with others, and concern for the well-being of others | Child only | Not used in current study |
| <i>Antisocial behaviour</i> | The degree to which the child disrupts the interaction or is disrespectful toward authority or peers | Child only | Not used in current study |

Only parent ratings or dyadic ratings of the general scales were used for the current study. The *anger/rejection, coercion, assertiveness, involvement, transactional conflict, communication skills, depressed mood* and *positive mood* scales were used without adaptation. However, two existing coding schedules from the Family Interaction Global Coding system (*warmth/support* and *problem-solving*) were adapted by the author and another doctoral trainee, (NA; Ahmad, 2015; see Appendix 5 for overview of joint working), for the current study.

The *warmth/support* scale was adapted to give separate scales for *warmth* (see Appendix 6) and *support* (see Appendix 7) as research has found these constructs relate to adolescent attachment in different ways (Glazebrook, 2015). The revised *warmth* scale assesses the degree to which the parent/child is warm, enthusiastic, affectionate and kind towards the other, demonstrated through friendliness towards the other and general positive affect. The revised *support* scale measures the degree to which the target is actively interested in, and concerned for, the other's difficulties and needs. It considers the level of concern shown by the parent/child to difficulties the other may be facing. Furthermore, it considers how invested the parent/child seems to be in the other's wellbeing and how much they hold the other's best interest in mind.

In addition, the *problem-solving* scale was adapted to consider the process by which the parent and child worked towards accomplishing the task as well as the outcome (see Appendix 8). For example, if through the process of generating a solution, the parent/child subjugates their own needs and/or appeared to hold other's viewpoint as superior, or a solution is agreed but the process of problem-solving was one sided (one person acquiesces) the parent/child cannot score more than a '3' (out of a maximum of '5'). Furthermore, a parent/child may reach a resolution but in order to score a maximum of '5' they must have first identified the problem, understood

the issues (discussed each other's view points), tried to generate solutions, and then agreed on an outcome or a compromise.

The Coding of Attachment Related Parenting (CARP; Matias, Scott, & O'Connor, 2006)

The CARP is a global measure of parent-child interaction quality developed for use with school-age children and includes measures of parental *sensitive responding*, *positive affect*, *negative affect* and *mutuality*. The *sensitive responding* scale assesses the degree to which the parent shows awareness of, and responds sensitively to, the child's needs. The *mutuality* scale assesses the degree to which the parent and child encourage each other's engagement in the task, maintain joint attention, reciprocate affection and positive behaviours and keep physical proximity during the interaction. The *positive* and *negative affect* scales assess the degree to which the parent generally displays positive and negative moods.

Sensitivity and mutuality are aspects of parenting that relate to attachment security in children and adolescents (de Wolff & van Ijzendoorn, 1997; Glazebrook, 2015) and are not explicitly assessed in the Family Interaction Coding System (Hetherington et al., 1992). The *sensitive responding* and *mutuality* scales of the CARP were therefore utilised in the current study.

However, parental positive and negative affect are aspects of parenting captured by the *positive mood* and *depressed mood* scales of the Family Interaction Coding System and thus the *positive* and *negative affect* scales of the CARP were not used in the current study.

Although the CARP was developed relatively recently, research has demonstrated that the *sensitive responding* and *mutuality* scales have good psychometric properties. Sensitive responding has been shown to be related to aspects of parenting as reported by the parent in an interview, including sensitivity ($r = .39, p < .01$), communication ($r = .44, p < .01$) and disciplinary

aggression ($r = -.26, p < .05$), indicating concurrent validity (Matias, 2007). Mutuality has also been found to be related to parent reported sensitivity ($r = .25, p < .05$) and communication ($r = .30, p < .01$), however the scale was unrelated to any negative aspects of parenting, as reported by the parent.

In addition, observer ratings of parental sensitive responding and mutuality significantly correlate with security of the child's attachment narrative from a story stem procedure ($r = .20, p < .05$ for *sensitive responding* and $r = .32, p < .001$ for *mutuality*), indicating convergent validity. Furthermore, convergent validity is suggested from the finding that greater sensitive responding is related to peer-rated popularity ($r = .28, p < .01$) and levels of mutuality are related to both peer-rated popularity ($r = .25, p < .05$) and rejection ($r = -.23, p < .05$) (Matias, O'Connor, Futh, & Scott, 2014). A recent study by Matias et al. (2014) found adequate inter-rater reliability; across 30 parent-child observations intra-class correlations were .73 for *sensitive responding* and .81 for *mutuality*.

The CARP was designed to code play-based interactions between parents and young children and has reportedly been used to code interactions between parents and adolescents with little adaptation (S. Scott, personal communication, 21st October, 2014). However, following scrutiny of the content of the scales several adaptations were made by the author and NA in order to more accurately code interactions between adolescents and parents during a structured task.

For the sensitive responding scale, reference to "play" or examples using play behaviour were removed and references to the "conversation", "discussion" or "task" were used instead (see Appendix 9). For example, for the operationalisation of the 'responsiveness to child's non-verbal seeking-behaviour' category the description was changed from "*this category is used if the child gets "stuck" with the play (non-verbal behaviour), and doesn't know what to do with a certain*

toy/object, and sends clear behavioural cues/signals that he/she needs the parent's assistance" (Matias et al., 2006, p. 1) to *"this category is used if the child gets "stuck" in the conversation and doesn't know what to say or how to continue the task, and sends clear behavioural cues/signals that he/she may need the parent's assistance."* Detail was added to the description of the 'sensitive child mindedness' category to more accurately capture this construct in a discussion-based task, e.g. *"responsive parents are not entrenched in their position regarding a topic and are able to 'shift' perspective during a conversation upon discussion."* Furthermore, the 'warmth' category was removed as this construct was already measured as part of the Family Interaction Coding System.

The *mutuality* scale was also adapted to substitute any reference to "play" or examples using play behaviour with reference to "conversations" or "the task" (see Appendix 10). For example, the original measure described mutuality as involving 'interactive-reciprocal play/turn-taking', where *"instead of playing separately as a parallel activity, both parent and child coordinate their efforts by building on each other's input in order to move the play along, thus reaching together a certain result)"* (Matias et al., 2006, p. 14). The adapted scale reframed the construct as 'interactive-reciprocal dialogue/turn-taking', in which *"the parent and child are able to have a cooperative conversation. It is clear that the purpose of their conversation is to find a solution to the specified problem; not to simply get their view point across/ have their own way. Despite having different viewpoints, they are able to have some "give and take", allowing them to cooperate on the task."* Furthermore, in original measure the operationalisation of the 'mirroring/matching' category describes how *"parent and child match/imitate each other's behaviours and/or verbalisations while playing. This behaviour will provide the observer with the sense that both parent and child are having fun during the interaction and learning from one another while playing. It's a type of modelling behaviour from both "partners" that, in the context of the interaction, work as a "team" in order to embellish the play, thus keeping the "pleasurable joint*

activity” going” (Matias et al., 2006, p. 14). In the adapted scale the concept is operationalised as the “parent and child are oriented towards each other, and not mismatched in positioning. They are working as a team to embellish the discussion and achieve the goal (...the parent and child are seen to be on the same level, with a sense of being “in it together”). They are not shutting each other down, but working together to reach conclusions.”

As with the original scales, the adapted *sensitive responding* scale rates the parents’ behaviour only and the *mutuality* scale is a dyadic scale that rates the parent and children’s behaviour together. Furthermore, dimensions are coded on a 7-point Likert scale, with higher scores indicating greater levels of sensitivity and mutuality respectively.

Openness and Underlying Tension Scale

This scale was developed for the study by the author and NA and comprises two scales which capture those aspects of parenting not encompassed by the Family Interaction Coding System or the CARP. The first scale- *openness*- assesses the degree to which a genuine, open and comfortable interaction is demonstrated in the dyad. That is, how at ease the dyad appear together, including any sense of playfulness and good humour (see Appendix 11). Parents and adolescents are rated separately on the *openness* scale.

The second scale- *underlying tension*- assesses interactions where the discussion between the parent and the child seems strained and both sides appear reluctant to change their own ideas or demands. The measure examines the degree to which both parent and child seem equally determined to get what they want, with little room for compromise, i.e. there is a battle of wills (see Appendix 12). This scale was designed to code for subtle interactions and tension rather than overt conflicts (which are assessed in the *transactional conflict* scale of the Family

Interaction Global Coding System). The level of underlying tension is rated according to the behaviour of the parent and child as a dyad.

Both the *openness* and *underlying tension* scales are rated on 7-point Likert scales, with higher scores indicating greater levels of openness and underlying tension respectively.

Procedure

Participants who took part in the TED study investigating the role of genes and environment in parent-child attachment in adolescence (Fearon et al., 2014) were interviewed using the Child Attachment Interview (Target et al., 2003) and participants and their parents completed a battery of questionnaires assessing socio-demographics factors, psychopathology, parental discipline, callous and unemotional traits and peer relationships. In addition, participants and their parents were recorded taking part in the Hot Topics discussion, a conflict-resolution task.

All participant recruitment and data collection was conducted by research assistants employed as part of the TED study. Child Attachment Interviews were then subsequently coded by one of the authors of the measure (YSG) and the research assistants. However, the Hot Topics discussion tasks were not coded as part of this project.

Current study procedure

The current study used archived data from a subsample of the participants who took part in a TEDS study investigating the role of genes and environment in parent-child attachment in adolescence. Data on socio-demographic information, twin zygosity and adolescent attachment

quality were extracted; other variables (psychopathology, parental discipline, callous and unemotional traits and peer relationships) were not utilised.

Videos of participants and their parents completing the Hot Topics task were also used, in order to explore quality of parenting in parent-child interactions. Preliminary work was therefore initially conducted by the author and NA to determine which observational coding systems would be best used to assess parenting behaviour in parent-child interactions. The Family Interaction Coding System (Hetherington et al., 1992) was selected because it is a reliable and valid measure of parent-child interaction quality that assesses a range of parenting behaviours. The *mutuality* and *sensitive responding* scales of the Coding of Attachment Related Parenting (Matias et al., 2006) were also selected because they measure attachment-relevant aspects of parenting that are not included in the Family Interaction Coding System. After scrutiny of taped interactions between parents and twins identified to have secure or insecure attachment, some aspects of these existing coding schedules were adapted and new schedules generated for the current study (details of the measures used and any adaptations are described in the measures section).

Once this preliminary work had been undertaken, a separate subsample of 100 same-sex twin-pairs (50 MZ and 50 DZ twin-pairs) was randomly selected from the TEDS dataset. Twin-pairs were excluded where data from a twin-pair had been examined as part of the development of the quality of parenting measures (n= 4) or when was no video-recording of the Hot Topics task available (n= 3). In these cases alternative twin-pairs were randomly selected.

Participant tapes of the Hot Topics discussion tasks were then coded by the author and NA, who each coded one member of the twin pair (twins had already been labelled as twin 1 or twin 2 by researchers as part of the wider TEDS study, with the label of 'twin 1' being assigned to the

eldest twin). Coders were blind to twin zygosity as well as to the adolescent's attachment style and other demographic information; these data were subsequently extracted. The majority of the Hot Topic tasks were completed by adolescents and their mothers ($n= 95$), only five twin pairs completed the task with their father. One twin-pair had completed the discussion task with both their mother and father, however only the tape with the mother was coded.

Inter-Rater Reliability for Parenting Variables

To establish inter-rater reliability between coders across all parenting variables, the author and NA initially rated 20 videos. To check for possible drift in ratings, the author and NA also coded every tenth video of the final sample ($n= 10$). Across the 30 videos rated, inter-rater reliability between the coders was found to be adequate for the majority of scales, with intra-class correlations (ICCs) $\geq .70$ (Table 2.2). The ICC for the communication scale was very low and so this scale was excluded from analysis. The ICCs for the coercion, assertiveness and involvement scales fell below $.70$, however the r values were in line with the range of ICCs reported in other studies using the Family Interaction Coding System (e.g. Dietz et al., 2008; Hetherington et al., 1999; Kim et al., 1999), therefore these scales were included in the analyses.

Table 2.2 Inter-Rater Reliability for Parenting Scales Indicated by Intra-Class Correlations

| Scale | <i>r</i> (n= 30) |
|---------------------------------|-------------------------|
| Anger/ rejection | .87 |
| Warmth | .78 |
| Support | .75 |
| Coercion | .58 |
| Assertiveness | .68 |
| Involvement | .52 |
| Transactional conflict (dyadic) | .86 |
| Communication | .16 |
| Depressed mood | .84 |
| Positive mood | .72 |
| Problem-solving | .77 |
| Sensitive responding | .70 |
| Mutuality (dyadic) | .81 |
| Openness | .74 |
| Underlying tension (dyadic) | .79 |

Ethics

Ethical approval for the Twins Early Development Study has been provided by the King's College London ethics committee, reference number: 05/Q0706/228. Ethical approval for the Attachment sub-study was provided by the University of Reading Research Ethics Committee (*ref: Title: 10/10: The TEDS Family Study #10/10*).

Data Analysis

Principal components analysis was first used to reduce the large number of observed parenting variables. Next, univariate genetic analysis compared monozygotic and dizygotic twin correlations to estimate genetic and environmental contributions to parenting. Analyses were based on standard biometrical analyses of twin data (Neale & Cardon, 1992). It was assumed that the total phenotypic variance for quality of parenting can be decomposed into additive genetic effects, shared environmental effects, and non-shared environmental (i.e. individual-specific) effects. Structural equation modelling techniques were used to estimate the proportion of variance in a trait that is attributable to additive genes (labelled 'A'), shared environment (labelled 'C') and non-shared environment (labelled 'E'). Residual effects (e.g. measurement error) also form part of the non-shared environment component and are not explicitly included in the model (Neale & Cardon, 1992). The specific model used is depicted in Figure 1. The correlation between twins is set as 1.0 for MZ twins and .50 for DZ twins. The shared environment is correlated 1.0 for all twin pairs and the non-shared environment is correlated 0 for all twin pairs.

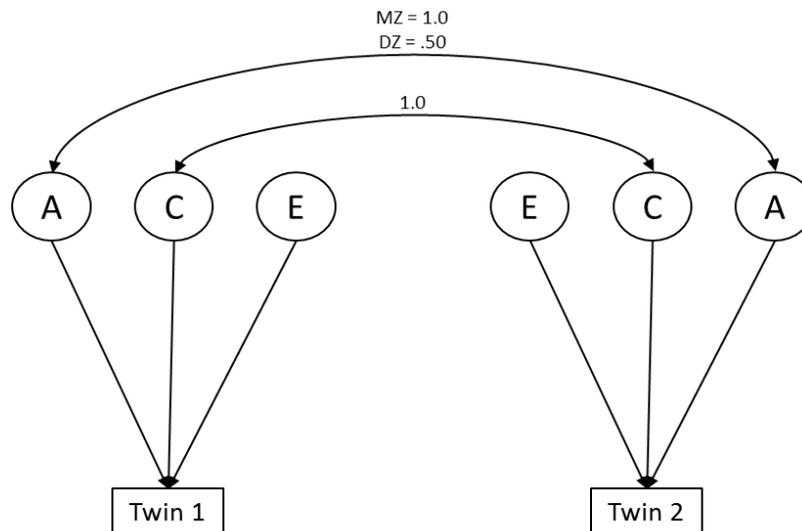


Figure 2 Univariate Quantitative Genetic Model

The relative contribution of the A, C and E variance components are first estimated in a saturated ACE model and then the significance of individual components are tested in reduced models that remove the effects of (1) genetic variance (CE model), (2) shared environment variance (AE model) and (3) both genetic and shared environment variance (E model).

Indices of model fit are used to establish whether overall the model is acceptable. The fit is judged to be acceptable for models with a root mean square error of approximation (RMSEA; an absolute fit index) less than 0.08 (Browne & Cudeck, 1993), whilst incremental fit indexes such as comparative fit index (CFI) with values above 0.90 generally indicate models with acceptable fit (Markland, 2007). Smaller, non-significant chi-square values also indicate a better fit. The significance of model parameters (A, C, or E) can be tested by the increase in chi-square when a parameter is deleted from the model. An increase in a chi-square greater than 3.84 for a single degree of freedom when a specific variance component is removed indicates a significant deterioration of model fit. Typically the best fitting model is the one with the fewest number of parameters that can be achieved without significantly reducing model fit.

Univariate genetic analysis was then re-run to establish the genetic-environmental nature of the variance of specific attachment-relevant aspects of parenting: parental sensitivity and mutuality. All model fitting was conducted with the computer program Mplus (version 7.0) (Muthén & Muthén, 2012).

Cross-twin correlations were conducted to explore whether genetic factors play a role in the association between interactive parenting behaviour and adolescent attachment security (using the Overall Coherence scale of the Child Attachment Interview as the primary indicator for secure attachment). A cross-twin correlation is the correlation between one twin's environmental measure and the second twin's outcome measure. A greater cross-twin correlation (the correlation between one twin's parenting rating and the other twin's attachment security) in MZ twins than in DZ twins indicates a common genetic influence in the association between quality of parenting and attachment. That is, the quality of parenting expressed towards one twin is a better predictor of the other twin's attachment quality in identical twins than non-identical twins. Whereas similar cross-twin correlations between MZ and DZ twins suggests that environmental factors are responsible for the association between the two measures. A shared environmental influence is indicated if the within-twin correlation (the correlation between parenting and attachment for one twin, i.e. the "phenotypic correlation") is high and the cross-twin correlation is high, in both MZ and DZ twins. This indicates that the attachment security for one twin could be estimated from the parenting shown towards the other twin as well as from their own parenting, regardless of twin zygosity. Meanwhile, a non-shared environmental influence is indicated if the within-twin correlation is high but the cross-twin correlation is low. That is, whilst there is a relationship between quality of parenting to one twin and that same twin's attachment security, the quality of parenting shown to one twin has no bearing on the other twin's attachment security. This implies that the association between parenting and attachment originates from a process that is specific to each

twin. The first set of cross-twin and within-twin correlations used overall quality of parenting as the environmental measure. Analyses were subsequently re-run with parental sensitivity and then mutuality as the environmental measures. The small sample size precluded formal multivariate genetic analysis.

Results

Overview

The results of the study are divided into three sections. The first section presents descriptive statistics of the sample demographics and the parenting and attachment variables, and data reduction of the parenting variables. In the second section analyses are presented that examine the role of genetically based child effects on overall quality of parenting, sensitivity and mutuality. Descriptive statistics and covariance matrices are reported and then a basic univariate genetic analysis is presented. In the final section, cross-twin correlational analyses are presented aimed at exploring whether common genetic factors play a role in the association between parenting (overall quality of parenting, sensitivity and mutuality) and adolescent attachment security.

Preliminary Analysis

Descriptive Statistics

Demographic information for the sample is presented in Table 2.3. The sample comprised slightly more female twin pairs (55.0%) than males, in line with the original study. The median

age for twins was 14.83 years (interquartile range 14.75-15.0 years) and parents' ascribed ethnicity for the twin-pairs is predominantly white British. The majority of participants' parents had some form of employment; for approximately a third of participants the total family income was £30,000-£50,000. Twenty-three percent ($n= 23$) of participants' mothers had degree level education.

Means and standard deviations for parenting and attachment scales according to twin-pair's zygosity and gender are presented in Table 2.4. Across all twin-pairs, there were no differences in mean scores between twin 1 and twin 2 on any the parenting or attachment variables. Furthermore, examining twin-pairs by zygosity revealed there were no differences in mean scores between twin 1 and twin 2 on any of the parenting and attachment variables. However, examination of twin pairs by gender revealed that for female twin-pairs, twins 1 and 2 scored significantly differently on the support scale ($t(54)= -2.07, p= .043$). Furthermore, for male twin-pairs, twins scored significantly differently on the anger scale ($t(44)= -2.07, p= .044$) and the transactional conflict scale ($t(44)= -2.24, p= .030$). However, after applying Bonferroni corrections for multiple comparisons no statistically significant differences were found between either the male or female twins.

Table 2.3 Demographic Information for Sample

| | All twin-pairs (n= 100) | Monozygotic twin-pairs (n= 50) | Dizygotic twin-pairs (n=50) |
|--|------------------------------------|---|--|
| Gender | | | |
| N Female (%) | 55 (55.0) | 27 (54) | 28 (56) |
| Mdn Age (IQR) | | | |
| | 14.83 (14.75-15.0) | 14.83 (14.75-15.00) | 14.83 (14.75-15.02) |
| Ethnicity | | | |
| <i>Asian or Asian British</i> | | | |
| N Bangladeshi (%) | 0 | 0 | 0 |
| N Indian (%) | 2 (2.0) | 0 | 2 (4.0) |
| N Pakistani (%) | 0 | 0 | 0 |
| N Other Asian background (%) | 1 (1.0) | 1 (2.0) | 0 |
| <i>Black or Black British</i> | | | |
| N African (%) | 1 (1.0) | 0 | 1 (2.0) |
| N Caribbean (%) | 2 (2.0) | 1 (2.0) | 1 (2.0) |
| N Any other Black background (%) | 0 | 0 | 0 |
| <i>Mixed ethnicity</i> | | | |
| N White & Asian (%) | 1 (1.0) | 1 (2.0) | 0 |
| N White & Black African (%) | 0 | 0 | 0 |
| N White and Black Caribbean (%) | 0 | 0 | 0 |
| N Other Mixed background (%) | 1 (1.0) | 1 (2.0) | 0 |
| <i>White</i> | | | |
| N British (%) | 80 (80.0) | 36 (72.0) | 44 (88.0) |
| N Irish | 2 (2.0) | 2 (4.0) | 0 |
| N Other White (%) | 4 (4.0) | 3 (6.0) | 1 (2.0) |
| <i>Other ethnic group</i> | | | |
| N Chinese (%) | 0 | 0 | 0 |
| N Any other Ethnic group | 2 (2.0) | 2 (4.0) | 0 |
| N No disclosure (%) | 1 (1.0) | 1 (2.0) | 0 |
| N Missing (%) | 3 (3.0) | 2 (4.0) | 1 (2.0) |
| Household income | | | |
| N £0-10,000 (%) | 3 (3.0) | 2 (4.0) | 1 (2.0) |
| N £10,000-20,000 (%) | 7 (7.0) | 3 (6.0) | 4 (8.0) |
| N £20,000-30,000 (%) | 14 (14.0) | 6 (12.0) | 8 (16.0) |
| N £30,000-50,000 (%) | 32 (32.0) | 18 (36.0) | 14 (28.0) |
| N £50,000-70,000 (%) | 17 (17.0) | 9 (18.0) | 8 (16.0) |
| N £70,000+ (%) | 22 (22.0) | 10 (20.0) | 12 (24.0) |
| N Missing (%) | 5 (5.0) | 2 (4.0) | 3 (6.0) |
| Highest level of maternal education | | | |
| N None (%) | 4 (4.0) | 1 (2.0) | 3 (6.0) |
| N GCSEs/ O-levels (%) | 15 (15.0) | 7 (14.0) | 8 (16.0) |
| N NVQ/HND (%) | 24 (24.0) | 13 (26.0) | 11 (22.0) |
| N A-levels (%) | 10 (10.0) | 5 (10.0) | 5 (10.0) |
| N Degree (%) | 23 (23.0) | 13 (26.0) | 10 (20.0) |
| N Postgraduate (%) | 13 (13.0) | 6 (12.0) | 7 (14.0) |
| N Other | 5 (5.0) | 0 | 5 (10.0) |
| N Missing (%) | 4 (4.0) | 3 (6.0) | 1 (2.0) |

| | All twin-pairs (n= 100) | Monozygotic twin-pairs (n= 50) | Dizygotic twin-pairs (n=50) |
|--|----------------------------|-----------------------------------|--------------------------------|
| Highest level of paternal education | | | |
| N None (%) | 4 (4.0) | 1 (2.0) | 3 (6.0) |
| N GCSEs/ O-levels (%) | 22 (22.0) | 12 (24.0) | 10 (20.0) |
| N NVQ/HND (%) | 21 (21.0) | 11 (22.0) | 10 (20.0) |
| N A-levels (%) | 6 (6.0) | 3 (6.0) | 3 (6.0) |
| N Degree (%) | 27 (27.0) | 14 (28.0) | 13 (26.0) |
| N Postgraduate (%) | 10 (10.0) | 3 (6.0) | 7 (14.0) |
| N Other (%) | 2 (2.0) | 2 (4.0) | 0 |
| N Missing (%) | 5 (5.0) | 4 (8.0) | 1 (2.0) |
| Maternal occupation status | | | |
| N Unemployed (%) | 11 (11.0) | 8 (16.0) | 3 (6.0) |
| N Self-employed (%) | 10 (10.0) | 8 (16.0) | 2 (4.0) |
| N Employed part-time (%) | 36 (36.0) | 18 (36.0) | 18 (36.0) |
| N Employed full-time (%) | 39 (39.0) | 14 (28.0) | 25 (50.0) |
| N Missing (%) | 4 (4.0) | 2 (4.0) | 2 (4.0) |
| Paternal occupation status | | | |
| N Unemployed (%) | 4 (4.0) | 2 (4.0) | 2 (4.0) |
| N Self-employed (%) | 14 (14.0) | 6 (12.0) | 8 (16.0) |
| N Employed part-time (%) | 1 (1.0) | 1 (2.0) | 0 |
| N Employed full-time (%) | 73 (73.0) | 36 (72.0) | 37 (74.0) |
| N Missing (%) | 8 (8.0) | 5 (10.0) | 3 (6.0) |

NB. *Mdn*= median, *IQR*= interquartile range

Table 2.4 Means and Standard Deviations for Scales by Twin Zygosity and Gender

| Scale | All twins (n= 100 twin-pairs) | | Monozygotic twins (n= 50 twin-pairs) | | Dizygotic twins (n= 50 twin-pairs) | | Female twins (n= 55 twin-pairs) | | Male twins (n= 45 twin-pairs) | |
|---|----------------------------------|-------------------|---|-------------------|---------------------------------------|-------------------|------------------------------------|-------------------|----------------------------------|-------------------|
| | Twin 1 (M, SD) | Twin 2 (M, SD) | Twin 1 (M, SD) | Twin 2 (M, SD) | Twin 1 (M, SD) | Twin 2 (M, SD) | Twin 1 (M, SD) | Twin 2 (M, SD) | Twin 1 (M, SD) | Twin 2 (M, SD) |
| <i>Parenting scales</i> | | | | | | | | | | |
| Family Interaction Coding System | | | | | | | | | | |
| Anger | 1.87 (1.19) | 2.00 (1.05) | 1.60 (.96) | 1.84 (1.09) | 2.08 (1.35) | 2.16 (1.00) | 2.00 (1.20) | 1.95 (1.06) | 1.71 (1.16) | 2.10 (1.05)* |
| Warmth | 3.55 (1.12) | 3.52 (1.09) | 3.74 (.99) | 3.64 (1.22) | 3.36 (1.22) | 3.40 (.93) | 3.45 (1.07) | 3.65 (.97) | 3.67 (1.19) | 3.36 (1.21) |
| Support | 3.66 (1.07) | 3.70 (1.09) | 3.88 (.87) | 3.84 (1.13) | 3.44 (1.20) | 3.56 (1.03) | 3.56 (1.08) | 3.91 (1.06)* | 3.78 (1.04) | 3.44 (1.08) |
| Coercion | 1.80 (1.21) | 1.80 (1.01) | 1.64 (1.03) | 1.72 (1.13) | 1.96 (1.35) | 1.88 (.87) | 1.89 (1.26) | 1.62 (.89) | 1.69 (1.14) | 2.02 (1.20) |
| Assertiveness | 4.02 (1.06) | 4.14 (.83) | 4.24 (.80) | 4.14 (.93) | 3.80 (1.25) | 4.14 (.73) | 4.04 (1.10) | 4.24 (.74) | 4.00 (1.02) | 4.02 (.917) |
| Transactional conflict | 4.46 (.64) | 4.46 (.69) | 1.76 (.98) | 1.72 (.99) | 1.90 (1.02) | 2.14 (1.03) | 1.95 (1.11) | 1.85 (1.04) | 1.69 (.82) | 2.02 (1.01)* |
| Involvement | 1.83 (1.00) | 1.93 (1.03) | 4.48 (.61) | 4.42 (.78) | 4.44 (.67) | 4.50 (.58) | 4.51 (.63) | 4.49 (.66) | 4.40 (.65) | 4.42 (.72) |
| Positive mood | 1.15 (.46) | 1.13 (.42) | 3.80 (.88) | 3.78 (1.07) | 3.34 (1.19) | 3.34 (.82) | 3.62 (1.06) | 3.73 (.87) | 3.51 (1.08) | 3.36 (1.07) |
| Depressed mood | 3.57 (1.07) | 3.56 (.98) | 1.12 (.39) | 1.16 (.42) | 1.18 (.52) | 1.10 (.42) | 1.07 (.26) | 1.11 (.42) | 1.24 (.61) | 1.16 (.42) |
| Problem-solving | 3.96 (.98) | 3.89 (.94) | 4.02 (.94) | 3.98 (.91) | 3.90 (1.04) | 3.80 (.97) | 4.02 (.97) | 4.00 (.92) | 3.89 (1.01) | 3.76 (.96) |
| Coding of Attachment Related Parenting | | | | | | | | | | |
| Sensitivity | 4.89 (1.54) | 4.89 (1.42) | 5.10 (1.30) | 5.12 (1.52) | 4.68 (1.73) | 4.66 (1.29) | 4.87 (1.43) | 5.13 (1.38) | 4.91 (1.68) | 4.60 (1.44) |
| Mutuality | 4.91 (1.63) | 4.86 (1.31) | 5.06 (1.33) | 5.04 (1.40) | 4.76 (1.89) | 4.68 (1.20) | 5.16 (1.42) | 5.15 (1.30) | 4.60 (1.83) | 4.51 (1.25) |
| Openness and tension scale | | | | | | | | | | |
| Openness | 5.43 (1.51) | 5.34 (1.27) | 5.64 (1.17) | 5.52 (1.39) | 5.22 (1.76) | 5.16 (1.13) | 5.45 (1.45) | 5.64 (1.11) | 5.40 (1.59) | 4.98 (1.37) |
| Underlying tension | 2.49 (1.78) | 2.57 (1.70) | 2.24 (1.42) | 2.34 (1.77) | 2.74 (2.06) | 2.80 (1.60) | 2.36 (1.74) | 2.31 (1.61) | 2.64 (1.84) | 2.89 (1.76) |
| <i>Attachment scale</i> | | | | | | | | | | |
| Child Attachment Interview | | | | | | | | | | |
| Coherence | 5.13 (1.75) ^a | 5.16 (1.79) | 5.02 (1.79) | 5.29 (1.98) | 5.25 (1.71) ^b | 5.02 (1.59) | 5.65 (1.60) ^c | 5.42 (1.72) | 4.51 (1.73) | 4.83 (1.85) |

Note. **a** n= 99; **b** n= 49; **c** n= 54

* $p < .05$

Data Reduction

In order to extract the underlying factor structure for the observed parenting variables, all parenting items for twin 1 (label assigned to eldest member of the twin pair) were subjected to a principal components analysis. Two criteria were used to decide the number of factors to be retained for rotation: the Kaiser criterion and the scree test. The Kaiser criterion refers to the retention of factors with eigenvalues greater than one. The scree test involves examination of the scree plot of the eigenvalues and looking for the break point in the data where the curve levels out; the number of data-points above the “break” indicates the number of factors to retain.

For twin 1, the Kaiser criterion and the scree test indicated that there were two factors to retain. After this initial extraction, the factors were subjected to oblimin rotation (non-orthogonal) in order to increase interpretability. A two factor solution was specified. Almost all of the items loaded onto the first factor; the second factor was a very small factor with only two items, involvement and depression (see Appendix 13).

The principal components analysis was then re-run for twin 2. When the Kaiser criterion and scree test were applied two factors arose. However, after rotation examination of the correlation matrices indicated only one reliable factor. It was observed that the depression and involvement scales had low loadings on the factor and thus were dropped (see Appendix 13).

As analyses indicated stronger evidence for one latent variable, a ‘total quality of parenting’ score was created by taking the sum of the ratings for anger, warmth, support, coercion, assertiveness, transactional conflict, positive mood, problem-solving, sensitivity, mutuality, openness and underlying tension (negative variables were recoded). The possible range of

scores was 12 – 68, with higher scores indicating better quality of parenting. Actual scores ranged from 15 – 68 for twin 1 (*Mdn* = 54.00, IQR= 46.00 – 62.00) and 19 – 68 for twin 2 (*Mdn*= 54.00, IQR= 44.25 – 60.00). The overall quality of parenting factor was found to have good internal consistency (Cronbach’s α = .96 for twin 1, .92 for twin 2).

Genetically Based Child Effects on Parenting: Descriptive Statistics

Overall Quality of Parenting

Table 2.5 presents descriptive statistics and a covariance matrix for the overall quality of parenting variable for MZ and DZ twins. There were no differences in mean scores between twin 1 and twin 2 on the parenting variable for MZ or DZ twins. The twin correlations were stronger for MZ twins ($r(50) = .52, p < .001$) than for DZ twins ($r(50) = .33, p = .018$). However, the difference between the correlations was not statistically significant ($Z = 1.13, p = .13$).

Table 2.5 Descriptive Statistics and Covariance Matrix for Overall Quality of Parenting for MZ and DZ Twins

| | All twins | | Monozygotic twins | | Dizygotic twins | |
|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) |
| <i>Descriptive statistics</i> | | | | | | |
| Mean | 52.00 | 51.60 | 54.18 | 53.44 | 49.82 | 49.76 |
| SD | 12.78 | 11.18 | 10.35 | 12.29 | 14.60 | 9.73 |
| N | 100 | 100 | 50 | 50 | 50 | 50 |
| <i>Covariance matrix</i> | | | | | | |
| Twin 1 | 163.41 ^c | .42 ^b | 107.17 ^c | .52 ^b | 213.29 ^c | .33 ^b |
| Twin 2 | 60.35 ^a | 125.07 ^c | 66.35 ^a | 151.15 ^c | 47.41 ^a | 94.64 ^c |

NB. ^aCovariance, ^bCorrelation, ^cVariance

Parental Sensitive Responding

Table 2.6 presents descriptive statistics and a covariance matrix for the parental sensitive responding variable for MZ and DZ twins. There were no differences in mean scores between twin 1 and twin 2 on the sensitive responding variable for MZ or DZ twin-pairs. The twin correlations were .31 ($p = .026$, $n = 50$) for MZ twin-pairs and .22 ($p = .12$, $n = 50$) for DZ twin-pairs. However, the difference between the correlations was not statistically significant ($Z = .47$, $p = .32$).

Table 2.6 Descriptive Statistics and Covariance Matrix for Parental Sensitivity for MZ and DZ Twins

| | All twins | | Monozygotic twins | | Dizygotic twins | |
|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) |
| <i>Descriptive statistics</i> | | | | | | |
| Mean | 4.89 | 4.89 | 5.10 | 5.12 | 4.68 | 4.66 |
| SD | 1.54 | 1.42 | 1.30 | 1.52 | 1.73 | 1.29 |
| N | 100 | 100 | 50 | 50 | 50 | 50 |
| <i>Covariance matrix</i> | | | | | | |
| Twin 1 | 2.36 ^c | .28 ^b | 1.68 ^c | .31 ^b | 3.00 ^c | .22 ^b |
| Twin 2 | .61 ^a | 2.02 ^c | .61 ^a | 2.31 ^c | .49 ^a | 1.66 ^c |

^aCovariance, ^bCorrelation, ^cVariance

Mutuality

Table 2.7 presents descriptive statistics and a covariance matrix for the mutuality variable for MZ and DZ twins. There were no differences in mean scores between twin 1 and twin 2 on the mutuality variable for MZ or DZ twins. The correlations between twins were .47 ($p = .001$, $n = 50$) for MZ twin-pairs and .17 ($p = .23$, $n = 50$) for DZ twin-pairs. The difference between the correlations was statistically significant ($Z = 1.64$, $p = .05$ (one-tailed test)). However, correlations do not give direct estimates of genetic and environmental effects and thus structural equation model-fitting results for these data are described in the following section.

Table 2.7 Descriptive Statistics and Covariance Matrix for Mutuality for MZ and DZ Twins

| | All twins | | Monozygotic twins | | Dizygotic twins | |
|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) | Twin 1 (<i>M, SD</i>) | Twin 2 (<i>M, SD</i>) |
| <i>Descriptive statistics</i> | | | | | | |
| Mean | 4.91 | 4.86 | 5.06 | 5.04 | 4.76 | 4.68 |
| SD | (1.63) | (1.31) | (1.33) | (1.40) | (1.89) | (1.20) |
| N | 100 | 100 | 50 | 50 | 50 | 50 |
| <i>Covariance matrix</i> | | | | | | |
| Twin 1 | 2.67 ^c | .31 ^b | 1.77 ^c | .47 ^b | 3.57 ^c | .17 ^b |
| Twin 2 | .66 ^a | 1.71 ^c | .88 ^a | 1.96 ^c | .39 ^a | 1.45 ^c |

^aCovariance, ^bCorrelation, ^cVariance

Genetically Based Child Effects on Parenting: ACE Twin Modelling

Structural equation modelling allows formal testing of the role of genes and environment in individual differences in measured traits.

Overall Quality of Parenting

On initially running the saturated ACE model for overall quality of parenting, the chi-square test of model fit indicated there to be a large discrepancy between the model and the data ($\chi^2(6)=15.83$, $p=.015$). Scrutiny of the data revealed that there was greater variability in the data for twin 1 of the dizygotic twin-pairs (see Table 2.5) and descriptively there were four cases which scored distinctly lower in this group. The data was transformed (square root transformation) and the four lower scoring cases were removed. The ACE model was then re-run and the results of the modelling are presented in Table 2.8. The fit for the ACE model was adequate ($\chi^2(6)=7.83$, $p=.25$) and this saturated model yielded estimates of genetic influences on parenting as 38% and non-shared environmental influences were estimated as 49%. The estimate of the influence of shared environmental effects was small (13%).

The reduced AE model, which allows for genetic plus non-shared environmental effects, but constrains the shared environmental term to be zero, did not significantly reduce the model fit ($\Delta \chi^2(1) = .20, p = .65$), i.e. the shared environment effect was not significant. The removal of the genetic parameter (A) from the ACE model (the CE model), also led to a non-significant reduction in model fit ($\Delta \chi^2(1) = 1.44, p = .23$), i.e. the genetic effect was not significant. However, the AE model proved a better fit for the data than the CE model based on inspection of goodness of fit criteria. Deletion of the genetic parameter and the shared environment parameter from the ACE model (the E model) lead to a very poor fit to the data ($\chi^2(8) = 28.43, p = .0004$) and a significant decrease in model fit was observed ($\Delta \chi^2(2) = 20.60, p < .0001$). These findings suggest there are familial contributions to quality of parenting, and favours the AE model (indicating genetic and non-shared influences). However, the analysis was not able to rule out the CE model either, which suggests that there was not sufficient power in the univariate model to reliably distinguish between the effects of genes and shared environment.

Table 2.8 ACE model Fitting Statistics for Quality of Parenting

| <i>Models</i> | χ^2 | RMSEA | CFI | Model statistics | | Model parameter estimates | | |
|---------------|----------|-------|-----|------------------|----------|---------------------------|----------|----------|
| | | | | <i>Df</i> | <i>P</i> | <i>A</i> | <i>C</i> | <i>E</i> |
| ACE model | 7.83 | .08 | .90 | 6 | .25 | .38 | .13 | .49 |
| AE model | 8.03 | .06 | .95 | 7 | .33 | .52 | - | .48 |
| CE model | 9.27 | .08 | .88 | 7 | .23 | - | .43 | .57 |
| E model | 28.43 | .23 | .00 | 8 | .0004 | - | - | 1.00 |

Parental Sensitive Responding

On running the saturated ACE model for parental sensitivity, the fit was found to be adequate ($\chi^2(6) = 10.02, p = .12$). This saturated model yielded slightly lower estimates of genetic influences on parental sensitivity (27%) than in the saturated model for quality of parenting and the variance was absorbed by non-shared environmental influences (estimated as 65%). The

estimate of the influence of shared environmental effects was smaller than was found in the saturated model for overall quality of parenting (8%) (Table 2.9).

The reduced AE model, which includes parameters for genetic variance and non-shared environment, did not significantly reduce the model fit ($\Delta \chi^2(1) = .08$, $p = .77$), i.e. the shared environment effect was not significant. The removal of the genetic parameter (A) from the ACE model (the CE model), also led to a non-significant reduction in model fit ($\Delta \chi^2(1) = .55$, $p = .46$), i.e. the genetic effect was not significant. However, as with overall quality of parenting, the AE model proved a better fit for the data than the CE model based on inspection of goodness of fit criteria. Again the E model, which only includes parameters for non-shared environment, was a very poor fit for the data ($\chi^2(8) = 18.49$, $p = .018$) and a significant decrease in model fit was observed ($\Delta \chi^2(2) = 8.47$, $p = .014$). These findings suggest there are familial contributions to parental sensitivity, and favours the AE model (suggesting genetic and non-shared influences). However, the analysis was not able to rule out the CE, which again indicates that there was not sufficient power in the univariate model to reliably distinguish between the effects of genes and shared environment.

Table 2.9 ACE Model Fitting Statistics for Sensitivity

| <i>Models</i> | χ^2 | RMSEA | CFI | Model statistics | | Model parameter estimates | | |
|---------------|----------|-------|-----|------------------|----------|---------------------------|----------|----------|
| | | | | <i>Df</i> | <i>p</i> | <i>A</i> | <i>C</i> | <i>E</i> |
| ACE model | 10.02 | .12 | .31 | 6 | .12 | .27 | .08 | .65 |
| AE model | 10.10 | .09 | .47 | 7 | .18 | .37 | - | .63 |
| CE model | 10.57 | .10 | .38 | 7 | .16 | - | .28 | .72 |
| E model | 18.49 | .16 | .00 | 8 | .018 | - | - | 1.0 |

Mutuality

On running the saturated ACE model for mutuality, the chi-square test of model fit indicated there to be a large discrepancy between the model and the data ($\chi^2(6) = 15.06$, $p = .02$). Similar to

the overall quality of parenting variable, scrutiny of the data revealed that there was greater variability in the data for twin 1 of the dizygotic twin-pairs (Table 2.7) and descriptively there were four cases which scored distinctly lower in this group. The data was transformed (square root transformation) and the four lower scoring cases were removed. The ACE model was then re-run and the fit for the ACE model was improved ($\chi^2(6)= 6.08, p= .41$) (Table 2.10). Of all of the ACE models for the parenting variables, this saturated model yielded the greatest estimate of genetic influences on parenting at 43%. Non-shared environmental influences were estimated as 57%. The influence of shared environmental effects was estimated at zero.

The removal of the parameter for shared environment (AE model) did not significantly reduce the model fit ($\chi^2(7)= 6.08, p= .53$), i.e. the shared environment effect was not significant. The CE model, which includes parameters for shared and non-shared environment, led to a trend-level reduction in model fit ($\Delta \chi^2(1)= 3.03, p= .08$), i.e. the genetic effect approached trend levels of significance. In line the overall quality of parenting and parental sensitivity variables, based on inspection of goodness of fit criteria the AE model proved a better fit for the data than the CE model. Again the E model was a very poor fit for the data ($\chi^2(8)=17.65, p= .024$) and a significant decrease in model fit was observed ($\Delta \chi^2(2)= 11.57, p= .003$).

These findings suggest there are familial contributions to parent-child mutuality, and favours the AE model. Based on inspection of goodness of fit criteria, the AE model for mutuality was a better fit for the data than the AE models for overall quality of parenting and parental sensitivity variables. However, the analysis was still not able to rule out the CE model.

Table 2.10 ACE Model Fitting Statistics for Mutuality

| <i>Models</i> | χ^2 | Model statistics | | | | Model parameter estimates | | |
|---------------|----------|------------------|------|-----------|----------|---------------------------|----------|----------|
| | | RMSEA | CFI | <i>Df</i> | <i>p</i> | <i>A</i> | <i>C</i> | <i>E</i> |
| ACE model | 6.08 | .016 | .99 | 6 | .41 | .43 | 0.00 | .57 |
| AE model | 6.08 | .00 | 1.00 | 7 | .53 | .43 | - | .57 |
| CE model | 9.11 | .079 | .80 | 7 | .24 | - | .29 | .71 |
| E model | 17.65 | .16 | .06 | 8 | .024 | - | - | 1.00 |

Genetic Factors in the Association between Quality of Parenting and Adolescent Attachment

Security

Overall Quality of Parenting

Within-twin and cross-twin correlations for overall quality of parenting and adolescent attachment security are presented in Table 2.11. Cross-twin correlations between quality of parenting and attachment were greater in MZ twins ($r = .22$) than DZ twins ($r = .12$), potentially indicating a common genetic influence in the association between overall quality of parenting and attachment. However, the difference between the correlations was not statistically significant ($Z = 0.5$, $p = .31$). The within-twin correlations were of similar magnitudes to the cross-twin correlations for MZ twin-pairs ($r = .19$) and DZ twin-pairs ($r = .13$), which indicates little evidence of non-shared environmental effects.

Table 2.11 Mean Within-Twin and Cross-Twin Correlations for Overall Quality of Parenting and Attachment Security

| | MZ (n= 50 twin-pairs) | DZ (n= 49 twin-pairs) |
|-------------------------|-----------------------|-----------------------|
| Within-twin correlation | .19 | .13 |
| Cross-twin correlation | .22 | .12 |

Parental Sensitive Responding

Within-twin and cross-twin correlations for parental sensitivity and adolescent attachment security are presented in Table 2.12. Cross-twin correlations between parental sensitivity and attachment were greater in MZ twin-pairs ($r = .25$) than DZ twin-pairs ($r = .035$), potentially indicating a common genetic influence in the association between parental sensitivity and attachment security. However, the difference between the correlations was not statistically significant ($Z = 1.07$, $p = .14$). The average within-twin correlation ($r = .17$) was of similar magnitude to the cross-twin correlation for MZ twin-pairs ($r = .25$), but there was greater difference between average within-twin ($r = .13$) and cross-twin correlations ($r = .035$) for DZ twin-pairs, indicating little evidence of non-shared environmental effects.

Table 2.12 Mean Within-Twin and Cross-Twin Correlations for Parental Sensitivity and Attachment Security

| | MZ (n= 50 twin pairs) | DZ (n= 49 twin pairs) |
|-------------------------|-----------------------|-----------------------|
| Within-twin correlation | .17 | .13 |
| Cross-twin correlation | .25 | .035 |

Mutuality

Within-twin and cross-twin correlations for mutuality and adolescent attachment coherence are presented in Table 2.13. Cross-twin correlations between mutuality and attachment were greater in MZ twin-pairs ($r = .25$) than DZ twin-pairs ($r = .11$), potentially indicating common genetic processes play a role in the association between mutuality and adolescent attachment. However, the difference between the correlations was not statistically significant ($Z = 0.7$, $p = .24$). The within-twin correlations reveal that of all the parenting variables, mutuality was most strongly related to adolescent attachment security. The within-twin correlations were of greater magnitude than the cross-twin correlations for MZ twin-pairs ($r = .28$) and DZ twin-pairs ($r = .19$),

suggesting non-shared environmental processes may also contribute to the association between mutuality and adolescent attachment security.

Table 2.13 Mean Within-Twin and Cross-Twin Correlations for Mutuality and Attachment Security

| | MZ (n= 50 twin-pairs) | DZ (n= 49 twin-pairs) |
|-------------------------|-----------------------|-----------------------|
| Within-twin correlation | .28 | .19 |
| Cross-twin correlation | .25 | .11 |

Discussion

The aims of this study were two-fold. Firstly, the study aimed to examine the relative role of genetic and environmental components to the quality of parenting, using observational measures that assess a range of parenting behaviours, including aspects of parenting associated with attachment security (parental sensitivity and mutuality). Descriptive analyses revealed that between-twin correlations were higher for MZ twin-pairs compared with DZ twin-pairs for all parenting variables, although a statistically significant difference was only found for the mutuality variable. These findings indicated possible genetically-based child effects on the quality of parenting and were further investigated by model-fitting analysis. The AE model, which allows for genetic plus non-shared environmental effects, was the best fitting reduced model for all parenting variables (overall quality of parenting, sensitivity and mutuality) according to the goodness of fit criteria. Across the three variables, evocative genetic effects on parenting ranged from 37- 52% of the variance, whilst the variance attributable to non-shared environmental effects ranged from 48- 63%. However, removal of the genetic parameter (the CE model) did not lead to a reduction in model fit for the overall quality of parenting and sensitivity variables, indicating the genetic effect was not significant. Removal of the genetic parameter did lead to a trend-level reduction in model fit for the mutuality variable, indicating possible genetic

effects on maternal mutuality. Formal comparisons did not demonstrate a superior fit for the AE model compared to the CE models for any of the parenting variables.

The findings from the univariate genetic analysis are somewhat ambiguous, largely due to a lack of statistical power and possibly due to measurement unreliability. Nevertheless, it is tentatively suggested that the findings from this preliminary study indicate that adolescents' genetically influenced characteristics may effect, at least in part, the overall quality of parenting they receive, as well as attachment-related aspects of parenting such as the degree of sensitivity and mutuality in the parent-child relationship. These results are in line with previous meta-analyses highlighting that the genetic characteristics of the child influence parenting behaviour (Avinun & Knafo, 2014; Kendler & Baker, 2007; Klahr & Burt, 2014). Furthermore, findings from the current study indicate that variance in parenting is also attributable to twin-specific (non-shared) environmental experiences. That is, the degree of overall quality of parenting, sensitivity and mutuality in parent-child relationships differ for adolescents 'within' families. This differential parenting of twins may result from the twins gaining greater autonomy and individual experiences as they progress through adolescence. Age has been established as a moderator of the strength of the genetic and environmental effects on parental behaviour (Avinun & Knafo, 2014; Klahr & Burt, 2014). Therefore, the results from this study may reflect the finding that non-shared environmental influences on parenting increase from childhood to adolescence, as shared environmental factors decrease (Klahr & Burt, 2014). Furthermore, it has been established that the impact of genetic effects of children on parenting increase with children's age. Marceau et al. (2015) used a dual sample approach to test for age-related differences in evocative and passive *rGE* in adolescence. In both the *Non-Shared Environment and Adolescent Development Study* (NEADS) sample and the *Twin and Offspring Study in Sweden* (TOSS) sample parental positivity were measured by parent and adolescent report. Findings indicated evocative *rGE* has a greater role for parental positivity in parent-adolescent relationships in families with

older adolescents than in families with younger adolescents, whilst passive *rGE* was shown to play a stronger role for parental positivity in families with younger adolescents. Given the median age of adolescents in this study was nearly 15 years old, the current study findings appear to be in line with those results found in the study by Marceau et al. (2015).

This study was one of only a few studies to explore the role of genetic influences on parenting of adolescents using observational measures (O'Connor et al., 1995; Pike et al., 1996). Self-report measures of parenting can be susceptible to bias (Sessa et al., 2001) and observational methods can therefore be the 'gold standard' for assessing the quality of parent-child interactions (Scott et al., 2011b). Across studies examining the aetiology of parenting behaviours there have been found to be greater estimates of shared environmental influences in studies measuring parenting through parent-report measures, and it has been suggested that parents may be influenced by a desire to emphasise that they do not treat their children differently and/or a wish to portray their children in a positive light (Klahr & Burt, 2014). Parents report only modest differential parenting of children, whilst children report greater discrepancies in the parenting they receive compared to their siblings. Observations of interactions have been found to be more in line with child-report measures (Reiss, Neiderhiser, Hetherington, & Plomin, 2000). It may be, therefore, that the nature of the assessment method used in this study is reflected in the estimates of genetic and environmental contributions to quality of parenting. This is not to disregard the possible presence of shared environmental effects, as the analysis was not able to rule out the CE model, which includes parameters for shared and non-shared environment. It is likely that due to the small sample size of this preliminary study, the univariate model was not powered to reliably distinguish between the effects of genes and shared environment.

Secondly, the study aimed to examine whether common genes or common environments might account for the covariation between parenting quality and adolescent attachment security in

twins. This is hitherto an unexplored area of research and a strength of this study was that it combined an observational measure of parenting with the gold standard attachment interview: arguably the most valid way to measure attachment security in adolescence (Shmueli-Goetz et al., 2008). Cross-twin correlations were greater in MZ twin-pairs than DZ twin-pairs for all of the parenting variables, indicating a common genetic influence in the association between parenting (overall quality of parenting, sensitivity and mutuality) and attachment. These findings may indicate heritable traits in the child evoke greater quality of parenting in the parent, which in turn accounts for a significant proportion of the correlation between quality of parenting and adolescent attachment security. This finding is in line with the study by Pike et al. (1996), which found common genes accounted for most of the association between parental negativity and adolescent adjustment. In addition, the within-twin correlations were higher than the cross-twin correlations, suggesting non-shared environmental processes may also contribute to the association between mutuality and adolescent attachment. That is, the extent to which parents differentially interact with twins will relate to differences in attachment security. This finding is again in line with research by Pike et al. (1996), which found the relationship between parental negativity and adolescent adjustment is also mediated by non-shared environmental processes (although genetic factors account for most of the association). It is noted that across the three parenting variables, the difference between the cross-twin correlations were not statistically significant. Furthermore, multivariate genetic analysis was beyond the scope of the current study due to the small sample size. It is therefore not possible to precisely estimate the extent to which genetic effects underlie the association between quality of parenting and attachment security in adolescents. Nevertheless, findings from this preliminary study indicate that the degree to which genetic and environmental components account for the association between quality of parenting and attachment may vary based on the type of parenting variable measured and this is an area of research that warrants further investigation.

Of all the parenting variables, the within-twin correlations were greatest between mutuality and attachment. This finding is in keeping with the meta-analysis by de Wolff and van Ijzendoorn (1997) which found mutuality to be the parenting variable most strongly related to attachment security in infancy. It also supports previous research which has revealed observed parent-adolescent relatedness assessed when adolescents are 16 years old is significantly associated with concurrent attachment security and attachment security when assessed two years later (Allen, McElhaney, Kuperminc, & Jodl, 2004). It is suggested, therefore, that the degree of mutuality in the relationship is as important as, if not more important than, the level of sensitivity provided by the parent, in outcomes for attachment security. Furthermore, the finding that the mutuality scale was most strongly related to attachment security demonstrates the validity of the adapted measure.

Limitations

There were several methodological limitations to this preliminary study which should be considered. As previously mentioned, the sample size was small which meant that the univariate model was not powered to reliably distinguish between the effects of genes and shared environment. Additionally, the small sample size meant it was not feasible to run multivariate genetic analysis to formally test the degree to which genetic and environmental components mediate the association between quality of parenting and attachment.

The sample studied was predominantly white British and generally from a middle class background. The majority of participants' parents had some form of employment and for approximately a third of participants the total family income was £30,000-£50,000. About a quarter of participants' parents had a degree level education. This indicates that disadvantaged communities were under-represented in the sample, therefore limiting the generalisability of

the findings. Furthermore, 95% of the discussion tasks took place with adolescents' mothers and thus it is not known whether the findings are generalisable to father-child interactions.

Clinical Implications

Findings from the current study indicate adolescents are not simply passive recipients of the parenting they receive, but that their genetic characteristics contribute to the quality of the parent-child interaction. This information may be useful for developing successful interventions aimed at improving the quality of parenting of adolescents. It has been suggested, for example, that helping parents to recognise and reciprocate positivity in their teenage children might be beneficial in bolstering parent-child relationships (Marceau et al., 2015). The current study findings highlight that interventions specifically focused on helping parents to identify and reciprocate mutuality with their adolescent children might also be particularly beneficial in enhancing the attachment relationship. Whilst there is a number of intervention programmes designed to improve attachment relationships in infancy, there is a considerable dearth of such measures for adolescents (Moretti & Obsuth, 2011). Research has shown mothers remain important for fulfilling the secure-base function of attachment during adolescence and into early adulthood, regardless of whether young people report having a romantic partner (Markiewicz, Lawford, Doyle, & Haggart, 2006). As attachment has significant implications for socio-emotional adjustment throughout adolescence (Allen, Moore, Kuperminc, & Bell, 1998; Allen, Porter, McFarland, McElhane, & Marsh, 2007), the development of effective parenting interventions aimed at increasing attachment is crucial. Furthermore, placing emphasis on both individuals in the dyad may help to reduce any sense of blame felt by parents.

Future Research

It is important that this preliminary study be extended using a larger sample of adolescents in order to ensure enough power to detect and compare estimates of common genetic and environmental effects on the quality of parenting received by adolescents. The research should also be extended to include interactions with fathers and the sample should ensure greater representation of disadvantaged or “at risk” adolescents, to establish whether findings are generalisable to these populations. Furthermore, future research should utilise a model-fitting approach to establish the genetic-environmental basis of the covariance between quality of parenting (particularly attachment-related measures of parenting such as sensitivity and mutuality) and adolescent attachment security. The current study utilised concurrent measures of parenting and attachment and longitudinal designs should therefore also be employed to explore genetic mediation of longitudinal associations between quality of parenting and later attachment.

Conclusions

Findings from this preliminary study suggest that adolescent’s genetic characteristics might influence the quality of parenting they receive, including attachment-related aspects of parenting (sensitivity and mutuality). However, there were limits to reliably distinguishing between the effects of genes and shared environment due to the small size of the sample. In addition, findings indicate that an adolescent’s genetic propensities that lead to poor parenting quality may also lead to attachment insecurity. Future research should therefore aim to extend the current study using larger and more representative samples of twin-pairs, as well as using multivariate techniques to more accurately estimate genetic and environmental components in the association between parenting quality and adolescent attachment security.

References

- Ahmad, N. (2015). *Parenting, attachment security and adjustment outcomes: The role of non-shared environment*. Unpublished manuscript, University College London, UK.
- Ainsworth, M. D. S., & Wittig, B. A. (1969). Attachment and exploratory behavior of one year olds in a strange situation. In B. M. Foss (Ed.), *Determinants of infant behavior* (Vol. 4, pp. 111-136). London: Methuen.
- Allen, J. P., McElhaney, K. B., Kuperminc, G. P., & Jodl, K. M. (2004). Stability and change in attachment security across adolescence. *Child Development, 75*(6), 1792-1805.
- Allen, J. P., Moore, C., Kuperminc, G., & Bell, K. (1998). Attachment and adolescent psychosocial functioning. *Child Development, 69*(5), 1406-1419.
- Allen, J. P., Porter, M., McFarland, C., McElhaney, K. B., & Marsh, P. (2007). The relation of attachment security to adolescents' paternal and peer relationships, depression, and externalizing behavior. *Child Development, 78*(4), 1222-1239.
- Avinun, R., & Knafo, A. (2014). Parenting as a reaction evoked by children's genotype: A meta-analysis of children-as-twins studies. *Personality and Social Psychology Review, 18*(1), 87-102.
- Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2009). The first 10,000 Adult Attachment Interviews: Distributions of adult attachment representations in clinical and non-clinical groups. *Attachment & Human Development, 11*(3), 223-263.
- Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Bokhorst, C. L., & Schuengel, C. (2004). The importance of shared environment in infant-father attachment: a behavioral genetic study of the attachment Q-sort. *Journal of Family Psychology, 18*(3), 545.
- Bartholomew, K., & Shaver, P. R. (1998). Methods of assessing adult attachment. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment Theory and Close Relationships* (pp. 25-45). New York, NY: Guilford.
- Beijersbergen, M. D., Juffer, F., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2012). Remaining or becoming secure: Parental sensitive support predicts attachment continuity from infancy to adolescence in a longitudinal adoption study. *Developmental Psychology, 48*(5), 1277-1282.
- Bokhorst, C. L., Bakermans-Kranenburg, M. J., Fearon, R. P., van IJzendoorn, M., Fonagy, P., & Schuengel, C. (2003). The importance of shared environment in mother-infant attachment security: A behavioral genetic study. *Child Development, 74*(6), 1769-1782.
- Bowlby, J. (1969/1982). *Attachment and loss: Vol.1. Attachment* (2nd ed.). New York: Basic Books (Original work published 1969).
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury, CA: Sage.
- Brussoni, M. J., Jang, K. L., Livesley, W., & Macbeth, T. M. (2000). Genetic and environmental influences on adult attachment styles. *Personal Relationships, 7*(3), 283-289.
- Button, T. M. M., Lau, J. Y. F., Maughan, B., & Eley, T. C. (2008). Parental punitive discipline, negative life events and gene-environment interplay in the development of externalizing behavior. *Psychological Medicine, 38*(01), 29-39.
- Crawford, T. N., John Livesley, W., Jang, K. L., Shaver, P. R., Cohen, P., & Ganiban, J. (2007). Insecure attachment and personality disorder: a twin study of adults. *European Journal of Personality, 21*(2), 191-208.
- de Wolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*(4), 571-591.
- Dietz, L. J., Birmaher, B., Williamson, D. E., Silk, J. S., Dahl, R. E., Axelson, D. A., . . . Ryan, N. D. (2008). Mother-child interactions in depressed children and children at high risk and low

- risk for future depression. *Journal of the American Academy of Child & Adolescent Psychiatry*, 47(5), 574-582.
- Dunn, J., & Plomin, R. (1990). *Separate lives: Why siblings are so different*. New York, NY: Basic Books.
- Fearon, R. P., Shmueli-Goetz, Y., Viding, E., Fonagy, P., & Plomin, R. (2014). Genetic and environmental influences on adolescent attachment. *Journal of Child Psychology and Psychiatry*, 55(9), 1033-1041.
- Ganiban, J. M., Spotts, E. L., Lichtenstein, P., Khera, G. S., Reiss, D., & Neiderhiser, J. M. (2007). Can genetic factors explain the spillover of warmth and negativity across family relationships? *Twin Research and Human Genetics*, 10(02), 299-313.
- George, C., Kaplan, N., & Main, M. (1985). *Adult Attachment Interview*. Unpublished manuscript, University of California, Berkeley.
- Glazebrook, K. (2015). *Interactive determinants of attachment beyond infancy: A systematic literature review*. Unpublished manuscript, University College London, UK.
- Grossmann, K. E., Grossmann, K., & Waters, E. (2005). *Attachment from infancy to adulthood: The major longitudinal studies*. New York, NY: Guilford Press.
- Haworth, C., Davis, O., & Plomin, R. (2013). Twins Early Development Study (TEDS): A genetically sensitive investigation of cognitive and behavioral development from childhood to young adulthood. *Twin Research and Human Genetics*, 16(01), 117-125.
- Hetherington, E. M., Hagan, M. S., & Eisenberg, M. M. (1992). *Family interaction global coding system*. Unpublished manual, Department of Psychology, University of Virginia, USA.
- Hetherington, E. M., Henderson, S. H., Reiss, D., Anderson, E. R., Bridges, M., Chan, R. W., . . . Mitchell, A. S. (1999). Adolescent siblings in stepfamilies: Family functioning and adolescent adjustment. *Monographs of the Society for Research in Child Development*, 64(4), 26-49.
- Joseph, M. A., O'Connor, T. G., Briskman, J. A., Maughan, B., & Scott, S. (2014). The formation of secure new attachments by children who were maltreated: An observational study of adolescents in foster care. *Development and Psychopathology*, 26(1), 67-80.
- Kendler, K. S., & Baker, J. H. (2007). Genetic influences on measures of the environment: a systematic review. *Psychological Medicine*, 37(05), 615-626.
- Kendler, K. S., & Eaves, L. J. (1986). Models for the joint effect of genotype and environment on liability to psychiatric illness. *The American Journal of Psychiatry*.
- Kerig, P. K., & Lindahl, K. M. (2001). *Family Observational Coding Systems: Resources for Systemic Research*. Mahwah, NJ: Erlbaum.
- Kim, J. E., Hetherington, E. M., & Reiss, D. (1999). Associations among family relationships, antisocial peers, and adolescents' externalizing behaviors: Gender and family type differences. *Child Development*, 70(5), 1209-1230.
- Klahr, A. M., & Burt, S. A. (2014). Elucidating the etiology of individual differences in parenting: A meta-analysis of behavioral genetic research. *Psychological Bulletin*, 140(2), 544.
- Kobak, R. R., Cole, H. E., Ferenz-Gillies, R., Fleming, W. S., & Gamble, W. (1993). Attachment and emotion regulation during mother-teen problem solving: a control theory analysis. *Child Development*, 64(1), 231-245.
- Kobak, R. R., & Sceery, A. (1988). Attachment in late adolescence: Working models, affect regulation, and representations of self and others. *Child Development*, 135-146.
- Levendosky, A. A., & Graham-Bermann, S. A. (2000). Behavioral observations of parenting in battered women. *Journal of Family Psychology*, 14(1), 80.
- Luijk, M. P., Roisman, G. I., Haltigan, J. D., Tiemeier, H., Booth-LaForce, C., van Ijzendoorn, M. H., . . . Bakermans-Kranenburg, M. J. (2011). Dopaminergic, serotonergic, and oxytonergic candidate genes associated with infant attachment security and disorganization? In search of main and interaction effects. *Journal of Child Psychology and Psychiatry*, 52(12), 1295-1307.

- Madigan, S., Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., Moran, G., Pederson, D. R., & Benoit, D. (2006). Unresolved states of mind, anomalous parental behavior, and disorganized attachment: A review and meta-analysis of a transmission gap. *Attachment & Human Development, 8*(2), 89-111.
- Main, M. (1996). Introduction to the special section on attachment and psychopathology: 2. Overview of the field of attachment. *Journal of Consulting and Clinical Psychology, 64*(2), 237.
- Main, M., & Goldwyn, R. (1984). *Adult attachment scoring and classification system*. Unpublished scoring manual, University of California, Berkeley.
- Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood, and adulthood: A move to the level of representation. *Monographs of the Society for Research in Child Development, 50*(1-2), 66-104.
- Marceau, K., Knopik, V. S., Neiderhiser, J. M., Lichtenstein, P., Spotts, E. L., Ganiban, J. M., & Reiss, D. (2015). Adolescent age moderates genetic and environmental influences on parent-adolescent positivity and negativity: Implications for genotype-environment correlation. *Development and Psychopathology, 1-18*.
- Margolin, G., Oliver, P. H., Gordis, E. B., O'Hearn, H. G., Medina, A. M., Ghosh, C. M., & Morland, L. (1998). The nuts and bolts of behavioral observation of marital and family interaction. *Clinical Child and Family Psychology Review, 1*(4), 195-213.
- Markiewicz, D., Lawford, H., Doyle, A. B., & Haggart, N. (2006). Developmental differences in adolescents' and young adults' use of mothers, fathers, best friends, and romantic partners to fulfill attachment needs. *Journal of Youth and Adolescence, 35*(1), 121-134.
- Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*(5), 851-858.
- Martin, N., & Eaves, L. (1977). The genetical analysis of covariance structure. *Heredity, 38*(1), 79-95.
- Matias, C. (2007). *Direct observation of parent-child interaction based on attachment theory*. Unpublished doctoral thesis, Institute of Psychiatry, King's College London, UK.
- Matias, C., O'Connor, T. G., Futh, A., & Scott, S. (2014). Observational attachment theory-based parenting measures predict children's attachment narratives independently from social learning theory-based measures. *Attachment & Human Development, 16*(1), 77-92.
- Matias, C., Scott, S., & O'Connor, T. G. (2006). *Coding of Attachment-Related Parenting (CARP)*. Unpublished manuscript, Institute of Psychiatry, King's College London, UK.
- Moretti, M. M., & Obsuth, I. (2011). Attachment and aggression: From paradox to principles of intervention to reduce risk of violence in teens. In M. Kerr, H. Stattin, R. Engels, G. Overbeek & A. Andershed (Eds.), *Understanding girls' problem behavior: How girls' delinquency develops in the context of maturity and health, co-occurring problems, and relationships* (pp. 187-207). New York, NY: Wiley.
- Muthén, L. K., & Muthén, B. O. (2012). *Mplus Version 7*. Los Angeles, CA: Muthén & Muthén.
- Neale, M. C., & Cardon, L. R. (1992). *Methodology for genetic studies of twins and families* (Vol. xxv). Dordrecht, Netherlands: Kluwer Academic Publishers.
- Neiderhiser, J. M., Reiss, D., Pedersen, N. L., Lichtenstein, P., Spotts, E. L., Hansson, K., . . . Elthammer, O. (2004). Genetic and environmental influences on mothering of adolescents: a comparison of two samples. *Developmental Psychology, 40*(3), 335.
- O'Connor, T. G., & Croft, C. M. (2001). A twin study of attachment in preschool children. *Child Development, 72*(5), 1501-1511.
- O'Connor, T. G., Hetherington, E. M., Reiss, D., & Plomin, R. (1995). A twin-sibling study of observed parent-adolescent interactions. *Child Development, 66*(3), 812-829.

- Oliver, B. R., & Plomin, R. (2007). Twins' Early Development Study (TEDS): a multivariate, longitudinal genetic investigation of language, cognition and behavior problems from childhood through adolescence. *Twin Research and Human Genetics*, *10*(01), 96-105.
- Pike, A., McGuire, S., Hetherington, E. M., Reiss, D., & Plomin, R. (1996). Family environment and adolescent depressive symptoms and antisocial behavior: a multivariate genetic analysis. *Developmental Psychology*, *32*(4), 590.
- Pike, A., & Plomin, R. (1996). Importance of nonshared environmental factors for childhood and adolescent psychopathology. *Journal of the American Academy of Child & Adolescent Psychiatry*, *35*(5), 560-570.
- Plomin, R. (2009). The nature of nurture. In K. McCartney & R. A. Weinberg (Eds.), *Experience and development: A festschrift in honor of Sandra Wood Scarr* (pp. 61-80). New York, NY: Psychology Press.
- Plomin, R. (2011). Commentary: Why are children in the same family so different? Non-shared environment three decades later. *International journal of epidemiology*, *40*(3), 582-592.
- Plomin, R., & Bergeman, C. S. (1991). Nature and nurture. *Behavioral and Brain Sciences*, *14*(03), 414-427.
- Plomin, R., DeFries, J. C., Knopik, V. S., & Neiderhiser, J. M. (2013). *Behavioral Genetics* (6th ed.). New York, NY: Worth Publishers.
- Plomin, R., DeFries, J. C., & Loehlin, J. C. (1977). Genotype-environment interaction and correlation in the analysis of human behavior. *Psychological Bulletin*, *84*(2), 309.
- Price, T. S., Freeman, B., Craig, I., Petrill, S. A., Ebersole, L., & Plomin, R. (2000). Infant zygosity can be assigned by parental report questionnaire data. *Twin Research*, *3*(3), 129-133.
- Ravitz, P., Maunder, R., Hunter, J., Sthankiya, B., & Lancee, W. (2010). Adult attachment measures: A 25-year review. *Journal of Psychosomatic Research*, *69*(4), 419-432.
- Reiss, D., Neiderhiser, J. M., Hetherington, E. M., & Plomin, R. (2000). *The relationship code: Deciphering genetic and social patterns in adolescent development*. Cambridge, MA: Harvard University Press.
- Rijsdijk, F. V., & Sham, P. C. (2002). Analytic approaches to twin data using structural equation models. *Briefings in bioinformatics*, *3*(2), 119-133.
- Roisman, G. I., & Fraley, R. C. (2008). A behavior-genetic study of parenting quality, infant attachment security, and their covariation in a nationally representative sample. *Developmental Psychology*, *44*(3), 831.
- Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype→ environment effects. *Child Development*, 424-435.
- Scott, S., Briskman, J., & Dadds, M. R. (2011a). Measuring parenting in community and public health research using brief child and parent reports. *Journal of Child and Family Studies*, *20*(3), 343-352.
- Scott, S., Briskman, J., Woolgar, M., Humayun, S., & O'Connor, T. G. (2011b). Attachment in adolescence: Overlap with parenting and unique prediction of behavioural adjustment. *Journal of Child Psychology and Psychiatry*, *52*(10), 1052-1062.
- Sessa, F. M., Avenevoli, S., Steinberg, L., & Morris, A. S. (2001). Correspondence among informants on parenting: Preschool children, mothers, and observers. *Journal of Family Psychology*, *15*(1), 53.
- Shmueli-Goetz, Y., Target, M., Fonagy, P., & Datta, A. (2008). The Child Attachment Interview: A psychometric study of reliability and discriminant validity. *Developmental Psychology*, *44*(4), 939-956.
- Spinath, F. M., Ronald, A., Harlaar, N., Price, T. S., & Plomin, R. (2003). Phenotypic 'g' early in life: On the etiology of general cognitive ability in a large population sample of twin children aged 2–4 years. *Intelligence*, *31*(2), 195-210.

- Target, M., Fonagy, P., & Shmueli-Goetz, Y. (2003). Attachment representations in school-age children: the development of the Child Attachment Interview (CAI). *Journal of Child Psychotherapy, 29*(2), 171-186.
- Target, M., Fonagy, P., Shmueli-Goetz, Y., Datta, A., & Schneider, T. (2007). *The Child Attachment Interview (CAI) protocol*. Unpublished manuscript, University College London, London, UK.
- Trouton, A., Spinath, F. M., & Plomin, R. (2002). Twins early development study (TEDS): a multivariate, longitudinal genetic investigation of language, cognition and behavior problems in childhood. *Twin Research, 5*(05), 444-448.
- van den Dries, L., Juffer, F., van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2009). Fostering security? A meta-analysis of attachment in adopted children. *Children and Youth Services Review, 31*(3), 410-421.
- van IJzendoorn, M. H., Goldberg, S., Kroonenberg, P. M., & Frenkel, O. J. (1992). The relative effects of maternal and child problems on the quality of attachment: a meta-analysis of attachment in clinical samples. *Child Development, 63*(4), 840-858.
- van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11*(02), 225-250.
- Venta, A., Shmueli-Goetz, Y., & Sharp, C. (2014). Assessing attachment in adolescence: A psychometric study of the Child Attachment Interview. *Psychological Assessment, 26*(1), 238.

**Critically Examining the Research Process: Conceptual Issues and
Dilemmas in Conducting Observational Research**

Introduction

This appraisal critically examines the research process involved in studying the role of genetic influences in quality of parenting and adolescent attachment security. It discusses the conceptualisation and implementation of the research project, including the strengths and limitations associated with joining an established research project as well as issues relating to measurement and design. In particular, it considers the conceptual issues and dilemmas involved in observational research and how these were managed within the study. Finally, this appraisal reflects on the implications of the research findings for future research and clinical practice.

Conceptualisation and Design of the Research Project

The research project was designed to investigate the role of genes in quality of parenting and adolescent attachment security, using data from a subsample of same-sex twin pairs participating in the *Twins Early Development Study* (TEDS). The TEDS is a large longitudinal cohort of twins that have been studied since infancy and is one of the most significant ongoing twin studies of its kind in the world, with approximately 13,000 twin pairs currently involved in the project. The project is directed by Professor Robert Plomin, an eminent psychologist who is an expert in behavioural genetics, and at present there are more than 100 collaborators using TEDS data as a resource (King's College London, 2010). Twin studies provide naturally occurring experimental situations that allow researchers to examine the relative contributions of nature and nurture to specific traits and on the relationship between traits (Kovas et al., 2007).

The study aimed to firstly test the relative role of genetic and environmental influences on the quality of parenting and to secondly examine whether common genes or common environments

might account for the covariation between parenting quality and adolescent attachment security in twins, an area of research that had yet to be investigated. The research topic appealed to me because I have an interest in adolescent attachment; I explored the role of attachment in outcomes for self-harm and problem-solving for a PhD completed prior to clinical psychology training. However, I did not have any experience of conducting behavioural-genetic research, and therefore there were real challenges to understanding some of the complex concepts and analytical methods in this research domain.

Working as Part of an Established Research Project

There were advantages to joining an established research project, particularly one as substantial as TEDS. The breadth and scope the TEDS project means that research that emerges is fundamental in establishing how genes and environments contribute to individual development from early childhood to adulthood. It was therefore exciting to use data collected for TEDS for part of my doctoral research and be part of such a large project.

Furthermore, using archived data meant that I did not need to recruit and test participants and could devote maximum time to obtaining reliable observational data from existing videotaped interactions. Having previously conducted research with adolescents I was aware how time-consuming this aspect of research can be. Although I really enjoyed the process of interviewing adolescents for my PhD (and ultimately this part of the research had been what spurred me on to apply for clinical training), having access to archived data ensured the project was more time-efficient and impactful, particularly given the relatively short period of time allocated for clinical psychology doctoral research.

However, there were limitations to joining a large research team and using archived data. The measures had already been selected and administered by the TEDS research team and so I was unable to contribute to this process. The current study utilised data on twin zygosity, socio-demographic factors, child attachment coherence and observed parenting behaviour. Not being involved in the data collection meant there were challenges associated with understanding what the variables represented and how they were collected. There were often times when it was necessary to look beyond the database and revert to the original data. For example, in order to establish how the ethnicity data had been collected I had to go back to the socio-demographic questionnaire given to parents, as it was not possible to accurately represent that information using the database alone. This meant I had to rely on obtaining the necessary information from my supervisors, who had been involved in the data collection process, which was probably a bit frustrating for all parties involved.

For the study, adolescent attachment was established through responses to the Child Attachment Interview (CAI; Target, Fonagy, & Shmueli-Goetz, 2003), an attachment interview specifically designed for use with young people. Although I did not administer or code any of the interviews in the current project, I am trained to administer and reliably code the CAI as I used this for research in my PhD. It was certainly useful to have a theoretical and practical understanding of the Child Attachment Interview, as there was a risk with using archived data that I may not have fully understood the subtleties associated with this method of classifying attachment representations. I felt confident with using the data generated from this measure.

Observational Research on Parent-Child Interactions

The research team had selected to use an observational method of parent-child interactions. Although costly and labour intensive, observational measures are useful in exploring the

mechanisms linking parenting behaviour and child development or outcomes (Kerig & Lindahl, 2001). Observational research is suited to studying parenting behaviour because it provides data on interactional behaviour, rather than individual characteristics (Burbach & Borduin, 1986). Furthermore, it offers data on parental behaviour independent of the parent's own appraisal of their behaviour. Questions regarding parenting are often sensitive in nature and tend to have response choices that are more or less socially desirable (Morsbach & Prinz, 2006), therefore responses to self-report measures may be influenced by biases (e.g. social desirability or recall biases). In addition, observational measures can capture aspects of interactions that may be difficult to describe in a questionnaire, such as affective expressions and non-verbal behaviour (Kerig & Lindahl, 2001).

Considerations in Observational Research

Whilst there are clear advantages to using observational measures of parent-child interactions, there are also a number of methodological issues to consider, which have been discussed in reviews by Gardner and colleagues (Aspland & Gardner, 2003; Couteur & Gardner, 2008; Gardner, 1997, 2000). The subsequent sections of this appraisal will therefore summarise the main measurement issues associated with observational research and consider how these were managed in studying the role of genetic influences in quality of parenting and adolescent attachment security.

Task and Setting

Selection of an observational instrument should be driven by the research questions that the study aims to answer. However there will inevitably be practical and economic constraints which

impact on the decision making process (Aspland & Gardner, 2003). As the study used archived data, the selection of an observational task and the setting within which this took place had been decided by researchers in the TEDS research team. The team selected the 'Hot Topics' paradigm, a conflict-resolution task, in order to assess parent-child interactions. Conflict-resolution tasks are commonly used to assess family interactions (Margolin et al., 1998) and have been utilised to assess quality of parenting in a number of studies with adolescents and their parents (e.g. Joseph, O'Connor, Briskman, Maughan, & Scott, 2014; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Scott, Briskman, & Dadds, 2011a). Although not a "naturalistic" observation, using brief structured tasks such as the Hot Topics paradigm can increase the likelihood of certain behaviours occurring, which are of theoretical interest to the investigator (Aspland & Gardner, 2003). The Hot Topics task encourages problem-solving based interactions between parents and their children, meaning that relational concepts (e.g. warmth, conflict, anger etc.) can be more easily assessed. Furthermore, using a structured task allows for more accurate comparison between participants (Kerig & Lindahl, 2001).

However, the task, setting and duration of observations all have implications for the generalisability or ecological validity of the observational data (Couteur & Gardner, 2008). Considering that participants' behaviours are known to be influenced by the nature of the task (Donenberg & Weisz, 1997; Ginsburg, Grover, Cord, & Ialongo, 2006), the behaviours elicited during structured tasks might not always be representative of typical unstructured interactions in the home (Gardner, 2000). Furthermore, participants were aware they were being watched as they completed the task, which is likely to have influenced their behaviour (McBride, 2013). The influence of being observed on behaviour is known as "reactivity" and also impacts the generalisability of findings. Reactivity can be reduced by giving participants time to become familiar with the observation process or minimising the intrusiveness of the recording equipment (Aspland & Gardner, 2003). The recording equipment was set up in front of the

adolescent and their parent to ensure that all aspects of the interaction were captured.

However, on reflection it would have been useful to be able to have had a camera somewhere more discreet (e.g. in the corner of the room). Furthermore, it is likely that participants could have benefitted from a “warm-up” task to allow time to feel comfortable interacting in front of the camera.

The relatively brief length of time (8 minutes) allocated for the task may have also impacted on the frequency and intensity of behaviours elicited. There was also variation in the settings in which the task took place (the home or the laboratory). The laboratory is a novel setting which may have impacted how comfortable participants felt during the interaction (Kerig & Lindahl, 2001). Ideally all participants should have been assessed under the same conditions, to ensure consistency between observations; however there were practical limitations that prevented this from happening.

Selection of Observational Coding Systems

As with other decisions, selection of the behaviours to be measured should be informed by the research questions the study is investigating (Aspland & Gardner, 2003). The study examined the contribution of genetic influences to the quality of parenting adolescents receive and adolescent attachment security. Therefore, it was necessary to select coding systems which assessed interactional quality, including those behaviours known to relate to adolescent attachment security.

Whilst the observational instrument had been chosen by the research team, deciding which coding systems to use was an area where I was able to contribute to the decision making progress. Much of the preliminary work for the current study therefore involved adapting and

developing scales to assess quality of parenting during the Hot Topic discussion task. The selection and development of the observational coding systems used in the research project was conducted in collaboration with another clinical psychology trainee, NA, who was investigating the role of non-shared environment in parenting, attachment security and adjustment outcomes (Ahmad, 2015). Working with NA allowed for a shared workload and joint problem-solving of any issues that arose, as well as mutual support throughout the project. However, with both trainees utilising the parenting measure it also required complete agreement of any decisions made. Although in general we had a similar way of thinking about the how the parenting scales should be developed and used, there were inevitably some differences of opinion that were challenging to negotiate.

Following discussions with our supervisors and literature searches we selected two established measures of parenting quality: The Family Interaction Coding System (Hetherington, Hagan, & Eisenberg, 1992) and the Coding of Attachment Related Parenting (CARP; Matias, Scott, & O'Connor, 2006). The Family Interaction Coding System was selected because it assesses a range of parenting behaviours relating to the quality of the interaction and the CARP was chosen because it measures parenting behaviours specifically associated with children's attachment security. In addition, we developed two new scales which we believed described aspects of parenting relevant to adolescent attachment that were not included in the existing scales.

Reliability and Validity

As with any measure there are many methods for computing the reliability and validity of an observational coding system, however inter-rater reliability is most commonly considered (Dorsey, Nelson, & Hayes, 1986). Inter-rater reliability measures the extent to which two observers agree on the behaviours that are occurring in the interaction. The complexity of the

observational coding system used and the nature and frequency of the behaviour assessed, all influence how reliable coders can become (Dorsey et al., 1986). To reduce the risk of bias, NA and I spent a significant amount of time familiarising ourselves with the measures. Prior to coding the data for our studies we watched and scored a number of Hot Topics tasks and then compared our scores, to look for any inconsistencies. This allowed us to clarify discrepancies and refine our understanding and perception of the behaviour being assessed. Obtaining adequate inter-rater reliability was crucial in order to demonstrate that NA and I were in agreement on the frequency and intensity of behaviour displayed by parents. However, when watching and discussing parent and adolescent interactions there were times when we had differences in opinions about what behaviour was being observed. This reflects that our interpretations were likely to have been influenced by our own experiences, interests and expectations. As I have a particular interest in attachment theory I would often think about the interactions with this framework in mind. Furthermore, I am currently working clinically with adolescents and their families using Mentalization Based Therapy, which is grounded in attachment theory. Mentalization is the capacity to understand behaviour of the self and other in relation to mental states such as thoughts and feelings, and so it is likely that my interpretations were coloured by how much adolescents and their parents demonstrated this capacity in their interactions. I certainly advocated for including the concept of mentalization in the sensitive responding scale. Whilst NA will have had different beliefs, interests or clinical experiences that will have shaped his interpretations. Sometimes it was hard to relinquish my views in order to come to an agreement. This was, therefore, one of the most demanding aspects the research process.

Inter-rater reliability was assessed using intra-class correlations (ICCs). Unlike product-moment correlation coefficients, ICCs take account of the variance between the raters and thus are most commonly used to assess inter-rater reliability (Hallgren, 2012). It was a relief to discover that the majority of our ratings had ICCs > .70, which is generally accepted as demonstrating

adequate consistency between raters (Shrout & Fleiss, 1979). It is also recommended that reliability should be checked throughout the coding process to prevent rater “drift” away from the original coding definitions (Patterson, 1982), and NA and I therefore coded every tenth participant to check for any rater drift. In addition, global measures can be more easily influenced by rater expectations (Patterson, 1982) and so NA and I coded blind to socio-demographic information and the attachment status of the participant. It is hoped that these methods helped to reduced bias and human error.

It is also important to consider the validity of observational measures. Research has established concurrent and convergent validity of the Family Interaction Coding System (Kim, Hetherington, & Reiss, 1999; Scott et al., 2011a; Scott, Briskman, Woolgar, Humayun, & O'Connor, 2011b) and the CARP (Matias, 2007; Matias, O'Connor, Futh, & Scott, 2014), therefore we could be confident that the instruments were measuring what they purport to measure.

Development of New Scales

In order to determine whether the selected coding systems would accurately capture aspects of parenting relevant to adolescent attachment we watched a number of taped interactions between parents and twins identified as having secure or insecure attachment styles. We examined how we rated the parents of securely and insecurely attachment twins according to the existing measures and we also considered aspects of parenting we observed that were not included in the existing scales.

One aspect of parental behaviour seen in interactions with adolescents with secure attachment that did not seem to be captured by the existing scales was a sense of comfort, ease and playfulness. In order to assess this parenting behaviour we created the ‘openness’ scale. Whilst

an aspect that seemed to characterise interactions with insecurely attached adolescents was that of an underlying state of mind that was irritated, combative and resistant (rather than overtly confrontational) and this was incorporated into the 'underlying tension' scale. As part of this preliminary work, NA and I thought carefully about the operationalisation of these constructs as well the nature of the Likert scale and how the scales should be rated (i.e. individually or by dyad). These scales were included in the final battery of measures. On analysing the results, it was found that scores on the openness and underlying tension scales correlated with other aspects of parenting measured and that there was good internal consistency across the overall quality of parenting variable. Further research could be conducted to establish the reliability and validity of these newly developed scales. Unfortunately this was beyond the scope of the current project.

Adaptation of Existing Scales

The Family Interaction Coding System

As well as developing our own scales, NA and I adapted a number of the existing scales. The Family Interaction Coding System consists of 12 general scales: *anger/rejection, warmth/support, coercion, assertiveness, involvement, transactional conflict, self-disclosure, communication skills, authority/control, depressed mood, positive mood* and *problem-solving* and eight of scales were included without adaptation. Following scrutiny of the global scales and discussions with our supervisors, NA and I also adapted two of the original scales from the Family Interaction Coding System: *warmth/support* and *problem-solving*. We adapted the *warmth/support* scale to make separate *warmth* and *support* scales. This decision was supported by the literature review conducted for the current project, which found that *warmth* and *support* relate to adolescent attachment in different ways. We also adapted the *problem-*

solving scale to incorporate more the *process* of completing the conflict-resolution task, which was felt to be missing in the existing scale. It is well established that problem-solving is associated with adolescent attachment security; observations of conflict-resolution tasks have revealed securely attached adolescents demonstrate more constructive problem-solving and are able to balance striving for autonomy whilst maintaining a positive relationship with their parents (Allen, Hauser, & Borman-Spurrell, 1996; Kobak et al., 1993). It was important, therefore, to capture the means in which the dyad solved the problem, not just the success of the task.

In general, high scores on the positive scales (e.g. assertiveness, involvement etc.) seemed to capture aspects of parenting that would be related to secure attachment and low scores corresponded to parenting behaviour that would be related to insecure attachment. For the negative scales (e.g. transactional conflict, anger/ rejection etc.) high scores the seemed to capture aspects of parenting that would be related to insecure attachment and low scores corresponded to parenting scores would be related to secure attachment. However, two of the general scales (self-disclosure and authority/ control) were excluded based on the rationale that the descriptions associated with high and low scores did not correspond to this pattern.

The authority/ control scale assess the degree to which the target demonstrates authority and successfully influences or controls the other's behaviours or opinions. For this scale, a parent receives a score of '1' when "the [parent] exercises little authority. This may occur either because the [parent] makes few attempts to influence or control the [child's] behaviour or opinions or because the [parent's] attempts are ineffective" and a score of '5' is awarded when "the [parent] consistently exercises authority, consistently influences or controls the [child's] behaviours or opinions. The [parent] displays a high degree of self-confidence and consistently receives respect and/or compliance from the [child]" (Hetherington et al., 1992, p. 23). There is

evidence that the way in which parents exert authority impacts on children's developmental outcomes (Barber, 1996; Baumrind, 1991). Authoritative parenting is characterised by high levels of warm involvement, promoting of autonomy and behavioural monitoring (Baumrind, 1966), with appropriate and consistent punishments for unwanted behaviour. This parenting style is associated with self-reported secure attachment in adolescence (Karavasilis, Doyle, & Markiewicz, 2003). Whereas authoritarian parenting involves high demands of children, forceful methods to gain compliance, and implementation of punishments which are unresponsive to the children's needs (Baumrind, 1966). Neglectful parenting is the label attributed to parenting that is uninvolved and low in control (Baumrind, 1991). Examination of the authority/ control scale indicated that score of '5' seemed to correspond to a description similar to authoritarian parenting and a score of "1" appeared to corresponded with a description akin to neglectful parenting; both styles which are related to insecure adolescent attachment (Karavasilis et al., 2003). This was therefore inconsistent with other positive scales and as a result the scale was not included in the current study. Future work could be conducted to adapt the scale so that high scores depict positive aspects of authority and control (as in authoritative parenting behaviour) and low scores represent misuse of authority and control (as in authoritarian and neglectful parenting styles).

The self-disclosure scale assesses the degree of intimacy of the target's discussion of their feelings, emotions, values or beliefs about things or events important to them or about their relationship with the other, as well as the degree to which the target's verbal and non-verbal expressions make them vulnerable to criticism or rejection. Parents receive a score of "1" when "the [parent] virtually never reveals emotions, beliefs or values" and a score of "5" is awarded when "the content of the [parent's] speech is characterised as very self disclosing and intimate, and makes the [parent] very vulnerable to criticism or rejection. The [parent] may make only one or two very intense self-disclosing statements which make him/her extremely vulnerable to

criticism or rejection by the [child]" (Hetherington et al., 1992, p. 19). NA and I assumed that the low score would relate to insecure adolescent attachment, but we thought that the description of parenting for the high score depicted an unboundaried style that may not relate to more secure attachment. For this reason we excluded the self-disclosure scale. Subsequent literature searches have indicated that self-disclosure varies with young adults' self-reported attachment styles. University students with insecure-avoidant attachment styles report less disclosure of intimate topics to their mothers and fathers than securely attached students (Mikulincer & Nachshon, 1991). Furthermore, university students who report insecure attachment styles are generally less comfortable to disclose negative emotions and thoughts (Garrison, Kahn, Sauer, & Florczak, 2012; Wei, Russell, & Zakalik, 2005). This indicates that the degree of self-disclosure between parents and their children would have likely to have varied depending on the adolescent's attachment style. Upon reflection, therefore, it would have been of benefit to have included this scale in the study. Although a significant proportion of the time on this project was spent developing and adapting scales, this issue highlights the importance of ensuring comprehensive preliminary research is conducted in order to make informed decisions regarding the methodology, rather than a reliance on a researcher's "intuition"!

The Coding of Attachment Related Parenting

The CARP was designed to code play-based interactions between parents and school-age children. The CARP was designed for use with younger children, although the sensitive responding subscale has recently been used in research with adolescents (mean age 13.86 years) (Joseph et al., 2014). In their paper, Joseph and colleagues reported adapting the sensitive responding scale and so we were keen to utilise this adapted version in our research. Yet correspondence with the authors indicated that any adaptations made had been minimal and the scales had worked well generally unchanged. Following scrutiny of the content of the

mutuality and sensitive responding scales, NA and I decided to make our own adaptations in order to more accurately code interactions between adolescents and parents during a structured task. It was promising to find that that parental score on the adapted sensitive responding and mutuality scales were related to adolescents' attachment coherence in the current study. This indicates the convergent validity of the scales. It is hoped that these adapted scales could be used in future research. It is important, therefore, that we make the authors of the CARP aware of these adaptations, to avoid duplication of adaptations to measures. Kerig and Lindahl (2001) stress the continual development of new coding systems as a hindrance to the progress and cohesion in the field of observational family research. If coding systems are used in very few studies there are limitations to inferences that can be made about their generalisability, reliability, validity and utility. Furthermore, it makes comparisons across studies difficult.

Implications of the Research Findings for Clinical Practice

Adolescence is marked by significant biological, social and relational changes. It is a period that offers the opportunity for growth and positive development, but it is also related to the onset of a range of mental health problems, including anxiety, depression, substance use, conduct disorders and eating disorders (Compas, Hinden, & Gerhardt, 1995; Spear, 2013). Despite evidence demonstrating greater attachment security is associated with fewer social-emotional and behavioural problems in adolescence (Allen et al., 1998; Allen, Porter, McFarland, McElhaney, & Marsh, 2007), attachment-based parenting interventions for adolescents have not been developed or implemented at the same rate as interventions for infants (Moretti & Obsuth, 2011). It has only been in the last decade that attachment-based interventions for adolescents have been recognised as a viable treatment option and it was pleasing to discover

that they were the topic of a recent special issue in the journal *Attachment & Human Development* (Kobak & Kerig, 2015).

Articles included in the special issue described recent attachment-based interventions and attachment-based elements of treatment used to increase security in caregiver-adolescent relationships. Interventions have targeted various components of the caregiver–adolescent bond. Adolescent Mentalization-Based Integrative Treatment (AMBIT) has been developed to change the caregiving context in families with “hard-to-reach” adolescents with multiple risk factors (Bevington, Fuggle, & Fonagy, 2015), whilst the mechanism of change in other interventions has been the caregivers’ internal working model of the adolescent (Moretti, Obsuth, Craig, & Bartolo, 2015; Scharf, Mayseless, & Kivenson-Baron, 2015) or the adolescents’ internal working model of the caregiver (Ewing, Diamond, & Levy, 2015).

Findings from the study investigating the role of genetic influences in quality of parenting and adolescent attachment security indicate adolescents are not simply passive recipients of the parenting they receive, but that their genetic characteristics contribute to quality of the parent-child interaction. Furthermore, the same genetic characteristics may in turn account for variability in attachment relationship. When formulating and implementing my own clinical interventions, I wonder how often I make the assumption that adolescents are wholly shaped by the environments they are in, particularly the environment provided by the caregiver. Whilst this aspect is still important to consider, the study findings also emphasise the importance of the adolescents’ genetic qualities and the significance of considering both members of the dyad when supporting adolescents and their parents. For example, the information could be useful for implementing successful interventions to help parents to recognise and reciprocate positive aspects of behaviour in their adolescent children and thus improve attachment security. In interventions with infants and young children, attachment based video feedback interventions

have been found to enhance maternal sensitivity (Steele et al., 2014) and it is possible that this method could also be used in a clinical setting with parents of adolescents.

The study findings also highlight that interventions specifically focused on helping parents to identify and reciprocate mutuality with their adolescent children might also be particularly beneficial in enhancing the attachment relationship. Increasing mutuality is a treatment component of the Connect intervention, delivered in a group setting to parents of at-risk anti-social pre-teens and adolescents (Moretti & Obsuth, 2009, 2011; Moretti et al., 2015). Results from a recent non-randomised trial revealed that following the 10-week programme, parents (n = 540) reported a significant decrease in their child's externalising and internalising symptoms. A decrease in adolescent attachment avoidance (based on parent-report) was related to a reduction in adolescents' externalising over the course of the treatment whilst a decrease in attachment anxiety (as rated by parents) was associated with decreases in adolescents' internalising symptoms. However, non-randomised trials are only able to establish associations between interventions and outcomes and thus there is the possibility that any change in outcome was the result of another confounding factor (Sibbald & Roland, 1998). A randomised, controlled trial is needed to establish whether the Connect programme was the origin of change in adolescents' internalising and externalising symptoms. Furthermore, it would be valuable to establish the role of enhanced mutuality in any improvement in outcomes.

Implications for Future Research

It has been highlighted in the empirical paper that this preliminary study should be extended using a larger sample of adolescents in order to ensure enough power to detect and compare estimates of common genetic and environmental effects on the quality of parenting received by adolescents. Furthermore, a larger sample would enable researchers to use a model-fitting

approach to establish the genetic-environmental basis of the covariance between quality of parenting and adolescent attachment security. As this study used data from a subset of a much bigger sample, there is undoubtedly scope for extending the study in this way. The additional work would be centred on coding the Hot Topics tasks, and it is possible the coding could focus on using the measures most closely related to attachment such as the adapted sensitivity and mutuality scales. I would certainly be keen to be involved in extending the study in this way and I have considered looking for sources of funding in order to accomplish this.

Conclusions

This appraisal critically examined the research process involved in studying the role of genetic influences in quality of parenting and adolescent attachment security. There were a number of methodological issues relating to the measurement and design of the project, some of which were easier to overcome than others. However, overall the study was able to offer preliminary answers to the research study questions posed and findings from the study could have important implications for clinical practice.

References

- Ahmad, N. (2015). *Parenting, attachment security and adjustment outcomes: The role of non-shared environment*. Unpublished manuscript, University College London, UK.
- Allen, J. P., Hauser, S. T., Bell, K. L., McElhaney, K. B., Tate, D. C., & Insabella, G. M. (1998). *The autonomy and relatedness coding system*. Unpublished manuscript, University of Virginia, USA.
- Allen, J. P., Hauser, S. T., & Borman-Spurrell, E. (1996). Attachment theory as a framework for understanding sequelae of severe adolescent psychopathology: An 11-year follow-up study. *Journal of Consulting and Clinical Psychology, 64*(2), 254-263.
- Allen, J. P., Porter, M., McFarland, C., McElhaney, K. B., & Marsh, P. (2007). The relation of attachment security to adolescents' paternal and peer relationships, depression, and externalizing behavior. *Child Development, 78*(4), 1222-1239.
- Aspland, H., & Gardner, F. (2003). Observational measures of parent-child interaction: An introductory review. *Child and Adolescent Mental Health, 8*(3), 136-143.
- Barber, B. K. (1996). Parental psychological control: Revisiting a neglected construct. *Child Development, 67*(6), 3296-3319.
- Baumrind, D. (1966). Effects of authoritative parental control on child behavior. *Child Development, 37*, 887-907.
- Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *The Journal of Early Adolescence, 11*(1), 56-95.
- Bevington, D., Fuggle, P., & Fonagy, P. (2015). Applying attachment theory to effective practice with hard-to-reach youth: the AMBIT approach. *Attachment & Human Development, 17*(2), 157-174.
- Burbach, D. J., & Borduin, C. M. (1986). Parent-child relations and the etiology of depression: A review of methods and findings. *Clinical Psychology Review, 6*(2), 133-153.
- Compas, B. E., Hinden, B. R., & Gerhardt, C. A. (1995). Adolescent development: Pathways and processes of risk and resilience. *Annual Review of Psychology, 46*(1), 265-293.
- Couteur, A. L., & Gardner, F. (2008). Use of structured interviews and observational methods in clinical settings. In M. Rutter, D. Bishop, D. Pine, S. Scott, J. S. Stevenson, E. A. Taylor & A. Thapar (Eds.), *Rutter's Child and Adolescent Psychiatry* (5th ed., pp. 269-288). Oxford, UK: Wiley-Blackwell Publishing.
- Donenberg, G. R., & Weisz, J. R. (1997). Experimental task and speaker effects on parent-child interactions of aggressive and depressed/anxious children. *Journal of Abnormal Child Psychology, 25*(5), 367-387.
- Dorsey, B., Nelson, R., & Hayes, S. (1986). The effects of code complexity and of behavioral frequency on observer accuracy and interobserver agreement. *Behavioral Assessment, 8*(4), 349-363.
- Ewing, E. S. K., Diamond, G., & Levy, S. (2015). Attachment-based family therapy for depressed and suicidal adolescents: theory, clinical model and empirical support. *Attachment & Human Development, 17*(2), 136-156.
- Gardner, F. (1997). Observational methods for recording parent-child interaction: How generalisable are the findings? *Child Psychology and Psychiatry Review, 2*(2), 70-74.
- Gardner, F. (2000). Methodological issues in the direct observation of parent-child interaction: Do observational findings reflect the natural behavior of participants? *Clinical Child and Family Psychology Review, 3*(3), 185-198.
- Garrison, A. M., Kahn, J. H., Sauer, E. M., & Florczak, M. A. (2012). Disentangling the effects of depression symptoms and adult attachment on emotional disclosure. *Journal of Counseling Psychology, 59*(2), 230.

- Ginsburg, G. S., Grover, R. L., Cord, J. J., & Ialongo, N. (2006). Observational measures of parenting in anxious and nonanxious mothers: does type of task matter? *Journal of Clinical Child and Adolescent Psychology, 35*(2), 323-328.
- Hallgren, K. A. (2012). Computing inter-rater reliability for observational data: an overview and tutorial. *Tutorials in Quantitative Methods for Psychology, 8*(1), 23.
- Hetherington, E. M., Hagan, M. S., & Eisenberg, M. M. (1992). *Family interaction global coding system*. Unpublished manual, Department of Psychology, University of Virginia, USA.
- Joseph, M. A., O'Connor, T. G., Briskman, J. A., Maughan, B., & Scott, S. (2014). The formation of secure new attachments by children who were maltreated: An observational study of adolescents in foster care. *Development and Psychopathology, 26*(1), 67-80.
- Karavasilis, L., Doyle, A. B., & Markiewicz, D. (2003). Associations between parenting style and attachment to mother in middle childhood and adolescence. *International Journal of Behavioral Development, 27*(2), 153-164.
- Kerig, P. K., & Lindahl, K. M. (2001). *Family Observational Coding Systems: Resources for Systemic Research*. Mahwah, NJ: Erlbaum.
- Kim, J. E., Hetherington, E. M., & Reiss, D. (1999). Associations among family relationships, antisocial peers, and adolescents' externalizing behaviors: Gender and family type differences. *Child Development, 70*(5), 1209-1230.
- King's College London. (2010). *TEDS Research*. Accessed from <http://www.teds.ac.uk/research.html> on 9th June 2015.
- Kobak, R. R., Cole, H. E., Ferenz-Gillies, R., Fleming, W. S., & Gamble, W. (1993). Attachment and emotion regulation during mother-teen problem solving: a control theory analysis. *Child Development, 64*(1), 231-245.
- Kobak, R. R., & Kerig, P. K. (2015). Introduction to the special issue: attachment-based treatments for adolescents. *Attachment & Human Development, 17*(2), 111-118.
- Kovas, Y., Haworth, C., Dale, P. S., Plomin, R., Weinberg, R. A., Thomson, J. M., & Fischer, K. W. (2007). The genetic and environmental origins of learning abilities and disabilities in the early school years. *Monographs of the Society for Research in Child Development, 72*(3).
- Margolin, G., Oliver, P. H., Gordis, E. B., O'Hearn, H. G., Medina, A. M., Ghosh, C. M., & Morland, L. (1998). The nuts and bolts of behavioral observation of marital and family interaction. *Clinical Child and Family Psychology Review, 1*(4), 195-213.
- Matias, C. (2007). *Direct observation of parent-child interaction based on attachment theory*. Unpublished doctoral thesis, Institute of Psychiatry, King's College London, UK.
- Matias, C., O'Connor, T. G., Futh, A., & Scott, S. (2014). Observational attachment theory-based parenting measures predict children's attachment narratives independently from social learning theory-based measures. *Attachment & Human Development, 16*(1), 77-92.
- Matias, C., Scott, S., & O'Connor, T. G. (2006). *Coding of Attachment-Related Parenting (CARP)*. Unpublished manuscript, Institute of Psychiatry, King's College London, UK.
- McBride, D. M. (2013). *The Process of Research in Psychology*. Newbury, CA: Sage Publications, Inc.
- Mikulincer, M., & Nachshon, O. (1991). Attachment styles and patterns of self-disclosure. *Journal of Personality and Social Psychology, 61*(2), 321.
- Moretti, M. M., & Obsuth, I. (2009). Effectiveness of an attachment-focused manualized intervention for parents of teens at risk for aggressive behaviour: The Connect Program. *Journal of Adolescence, 32*(6), 1347-1357.
- Moretti, M. M., & Obsuth, I. (2011). Attachment and aggression: From paradox to principles of intervention to reduce risk of violence in teens. In M. Kerr, H. Stattin, R. Engels, G. Overbeek & A. Andershed (Eds.), *Understanding girls' problem behavior: How girls' delinquency develops in the context of maturity and health, co-occurring problems, and relationships* (pp. 187-207). New York, NY: Wiley.

- Moretti, M. M., Obsuth, I., Craig, S. G., & Bartolo, T. (2015). An attachment-based intervention for parents of adolescents at risk: mechanisms of change. *Attachment & Human Development, 17*(2), 119-135.
- Morsbach, S. K., & Prinz, R. J. (2006). Understanding and improving the validity of self-report of parenting. *Clinical Child and Family Psychology Review, 9*(1), 1-21.
- Patterson, G. R. (1982). *Coercive family process* (Vol. 3). Eugene, OR: Castalia Publishing Company.
- Scharf, M., Mayseless, O., & Kivenson-Baron, I. (2015). The viability of the Parenting Representations Interview for assessing and measuring change in parents of adolescents. *Attachment & Human Development, 17*(2), 199-219.
- Scott, S., Briskman, J., & Dadds, M. R. (2011a). Measuring parenting in community and public health research using brief child and parent reports. *Journal of Child and Family Studies, 20*(3), 343-352.
- Scott, S., Briskman, J., Woolgar, M., Humayun, S., & O'Connor, T. G. (2011b). Attachment in adolescence: Overlap with parenting and unique prediction of behavioural adjustment. *Journal of Child Psychology and Psychiatry, 52*(10), 1052-1062.
- Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420.
- Sibbald, B., & Roland, M. (1998). Understanding controlled trials. Why are randomised controlled trials important? *British Medical Journal, 316*(7126), 201-202.
- Spear, L. P. (2013). Adolescent neurodevelopment. *Journal of Adolescent Health, 52*(2), S7-S13.
- Steele, M., Steele, H., Bate, J., Knafo, H., Kinsey, M., Bonuck, K., . . . Murphy, A. (2014). Looking from the outside in: The use of video in attachment-based interventions. *Attachment & Human Development, 16*(4), 402-415.
- Target, M., Fonagy, P., & Shmueli-Goetz, Y. (2003). Attachment representations in school-age children: the development of the Child Attachment Interview (CAI). *Journal of Child Psychotherapy, 29*(2), 171-186.
- Wei, M., Russell, D. W., & Zakalik, R. A. (2005). Adult attachment, social self-efficacy, self-disclosure, loneliness, and subsequent depression for freshman college students: A longitudinal study. *Journal of Counseling Psychology, 52*(4), 602.

Appendices

Appendix 1: Search Terms

1. Child*
2. Adolescen*
3. Juvenile*
4. Teen*
5. Youth*
6. Infant*
7. Toddler*
8. #1 or #2 or #3 or #4 or #5 or #6 or #7

9. /Attachment behavi\$
10. /Attachment theory
11. Attachment
12. #9 or #10 or #11

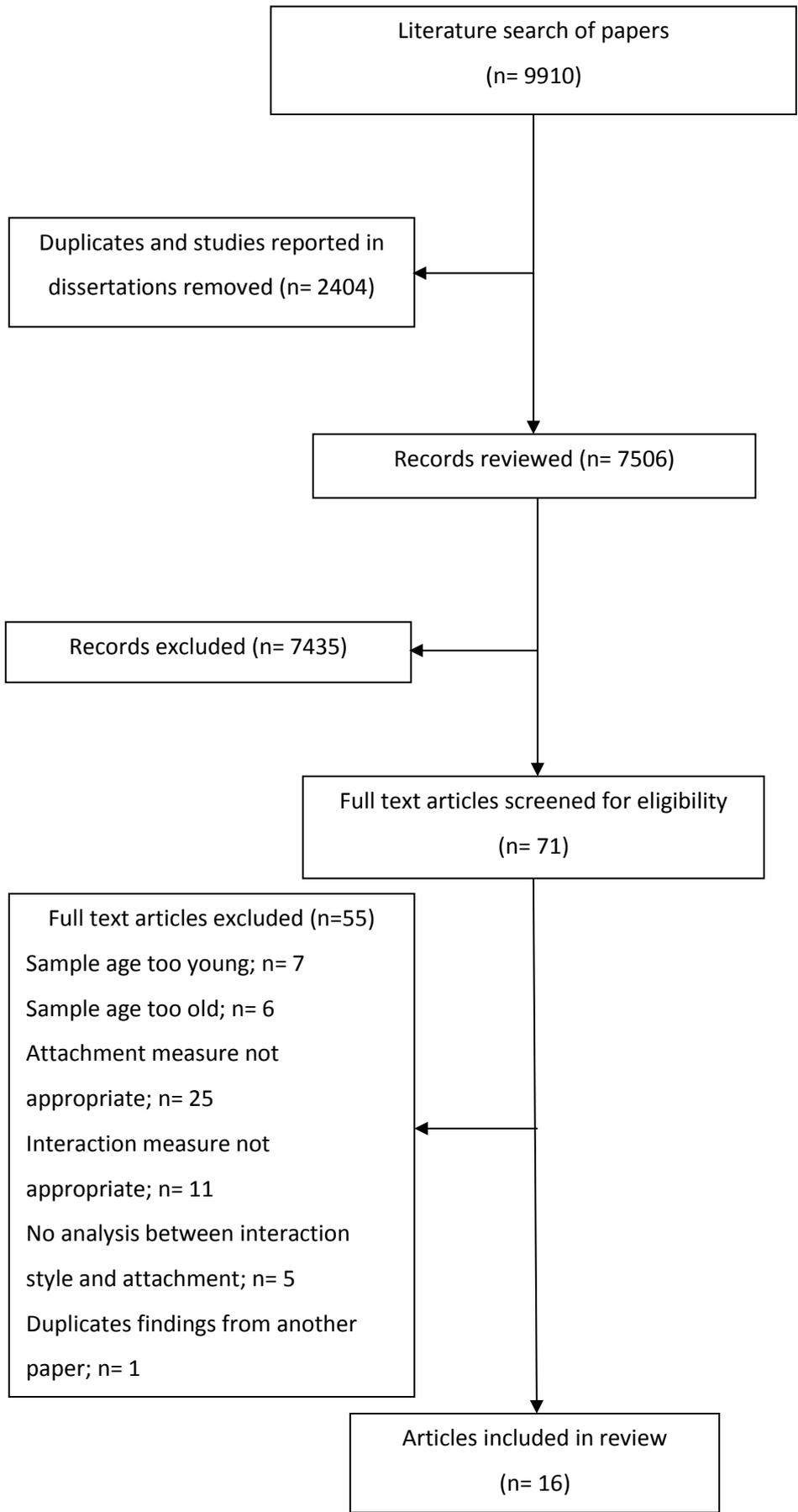
13. /parents
14. Parent*
15. maternal
16. paternal
17. mother*
18. father*
19. caregiver*
20. guardian*
21. #13 or #14 or #15 or #16 or #17 or #18 or #19 or 20

22. Observation or observations or observe or observed or observing or observes
23. Interaction or interactions or interact or interacted or interacting or interacts
24. Dyadic or dyad
25. Assessment*
26. ##22 or #23 or 24 or 25

27. #8 and #12 and #21 and #26

/= key word

Appendix 2: Study Flow Diagram



Appendix 3: Quality Assessment Tool

Note. Study can be awarded a maximum of two stars for numbered items 2, 3, 7 and 10 and one star for numbered items 1, 4, 5, 6, 8, 9, 11 and 12.

Participants

1. Sample size
 - $\geq 100^*$
 - < 100

2. Response rate
 - $\geq 70\%^{**}$
 - 31%- 69% *
 - Not stated or $\leq 30\%$

3. Missing data
 - Missing data reported and $\leq 5\%^{**}$
 - Missing data reported and $> 5\%^*$
 - Missing data not accounted for or N size not reported

Design

4. Study design
 - Longitudinal design*
 - Cross-sectional design

Exposure measure

5. Assessment of interaction
 - Independent blind assessment*
 - Assessor not blinded to outcome
 - Blinding not reported

6. Validity of measure
 - Validated measure*

- Non-validated measure
 - Validity not referenced
7. Reliability of measure
- Inter-rater reliability reported and $\geq 70\%^{**}$
 - Inter-rater reliability reported and $< 70\%^{*}$
 - Inter-rater reliability not reported

Outcome measure

8. Assessment of attachment
- Independent blind assessment*
 - Assessor not blinded to outcome
 - Blinding not reported
9. Validity of measure
- Validated measure*
 - Non-validated measure
 - Validity not referenced
10. Reliability of measure
- Inter-rater reliability reported and $\geq 70\%^{**}$
 - Inter-rater reliability reported and $< 70\%^{*}$
 - Inter-rater reliability not reported

Statistical analyses

11. Accounting for confounding independent variables
- Controls for relevant potentially confounding independent variables*
 - No control of potentially confounding independent variables
12. Accounting for baseline attachment
- Controls for baseline attachment*
 - No control of baseline attachment

Appendix 4: Quality Assessment Scores

Quality Scores for Studies Included in Literature Review

| Study | Participants | | | Design | Exposure measure | | | Outcome measure | | | Statistical analyses | | Total score (max. 16) | Qualitative rating 0-3= poor 4-8= moderate 9-12= good 13-16= excellent |
|---|--------------|----------------|--------------|----------------|---------------------|---------------------|------------------------|--------------------|---------------------|------------------------|--------------------------------|------------------------------------|-----------------------|--|
| | Sample size | Response rate | Missing data | | Asst of interaction | Validity of measure | Reliability of measure | Asst of attachment | Validity of measure | Reliability of measure | Adjustment for confounding IVs | Adjustment for baseline attachment | | |
| Allen et al. (2002) | * | * | * | * ² | * | ** | * | * | ** | | | 11 | Good | |
| Allen, McElhaney, Kuperminc, and Jodl (2004) | * | * ³ | * | * | * | ** | * | * ⁴ | ** | * | * | 13 | Excellent | |
| Allen et al. (2003) | * | * [∅] | | | * | ** | * | * ⁵ | ** | * | | 10 | Good | |
| Allen, Porter, McFarland, Marsh, and McElhaney (2005) | * | * | ** | * | | ** | * | * ⁶ | ** | | | 11 | Good | |

² Longitudinal study but relationship between parenting and attachment only explored using cross-sectional data

³ Response rate not reported in this paper but deduced from information provided in Allen et al. (2002)

⁴ Validity of outcome measure not reported in this paper but validity of the measure has been reported in other papers (e.g. Allen et al., 2002)

[∅] Response rate not reported in this paper but deduced from information provided in Allen et al. (2002)

⁵ Validity of outcome measure not reported in this paper but validity of the measure has been reported in other papers (e.g. Allen et al., 2002)

⁶ Validity of outcome measure not reported in this paper but validity of the measure has been reported in other papers (e.g. Allen et al., 2002)

| Study | Participants | | | Design | Exposure measure | | | Outcome measure | | | Statistical analyses | | Total score (max. 16) | Qualitative rating 0-3= poor 4-8= moderate 9-12= good 13-16= excellent |
|--|--------------|---------------|--------------|----------------|---------------------|---------------------|------------------------|--------------------|---------------------|------------------------|--------------------------------|------------------------------------|-----------------------|--|
| | Sample size | Response rate | Missing data | Study design | Asst of interaction | Validity of measure | Reliability of measure | Asst of attachment | Validity of measure | Reliability of measure | Adjustment for confounding IVs | Adjustment for baseline attachment | | |
| Beijersbergen, Juffer, Bakermans-Kranenburg, and van Ijzendoorn (2012) | * | | ** | * ⁷ | * [≈] | * [∞] | ** | * | * | ** | | | 12 | Good |
| Dubois-Comtois, Cyr, and Moss (2011) | | | * | * | * | * | ** | * | * | ** | | | 10 | Good |
| Dubois-Comtois and Moss (2008) | | | * | * | * | * | ** | * | * | ** | | | 10 | Good |
| Hershenberg et al. (2011) | | * | * | | | | ** | | * [∂] | ** | | | 7 | Moderate |
| Joseph, O'Connor, Briskman, Maughan, and Scott (2014) | | * | * | | * | * [∞] | ** | * | * [∂] | ** | * | | 11 | Good |

⁷ Longitudinal study but relationship between parenting and attachment only explored using cross-sectional data

[≈] Blinding of assessors not reported in this paper but reported in Beijersbergen, Bakermans-Kranenburg, van Ijzendoorn, and Juffer (2008)

[∞] Validity of exposure measure not reported in this paper but validity of the measure has been reported in other papers (e.g. Allen et al., 2002)

[∂] Validity of outcome measure not reported in this paper but this has been reported in other papers (e.g. Griffin & Bartholomew, 1994)

| Study | Participants | | | Design | Exposure measure | | | Outcome measure | | | Statistical analyses | | Total score (max. 16) | Qualitative rating 0-3= poor 4-8= moderate 9-12= good 13-16= excellent |
|---|--------------|---------------|--------------|--------------|---------------------|---------------------|------------------------|--------------------|---------------------|------------------------|--------------------------------|------------------------------------|-----------------------|--|
| | Sample size | Response rate | Missing data | Study design | Asst of interaction | Validity of measure | Reliability of measure | Asst of attachment | Validity of measure | Reliability of measure | Adjustment for confounding IVs | Adjustment for baseline attachment | | |
| Kerns, Brumariu, and Seibert (2011) | | | ** | | * | * ^o | * | * | | ** | | | 8 | Good |
| Kobak, Cole, Ferenz-Gillies, Fleming, and Gamble (1993) | | | ** | | * | * [∇] | ** | * | * | ** | | | 10 | Good |
| Macfie, Swan, Fitzpatrick, Watkins, and Rivas (2014) | | | | | * | | ** | * | * ^φ | ** | | | 7 | Moderate |
| Matias, O'Connor, Futh, and Scott (2014) | * | ** | * | | * | * | ** | * | * | * | | | 11 | Good |

^o Validity of exposure measure not reported in this paper but this has been established in previous research (Feinberg & Hetherington, 2001; Hetherington et al., 1999)

[∇] Validity of outcome measure not reported in this paper but this has been reported in another paper (Shmueli-Goetz, Target, Fonagy, & Datta, 2008)

^o Validity of exposure measure not reported in this paper but this has been established in previous research (Gini, Oppenheim, & Sagi-Schwartz, 2007)

[∇] Validity of exposure measure not reported in this paper but the validity of an adapted version of this measure has been reported elsewhere (e.g. Allen et al., 2002)

^φ Validity of outcome measure not reported in this paper but this has been established in previous research (Bretherton & Oppenheim, 2003)

| Study | Participants | | | Design | Exposure measure | | | Outcome measure | | | Statistical analyses | | Total score (max. 16) | Qualitative rating 0-3= poor 4-8= moderate 9-12= good 13-16= excellent |
|---|--------------|---------------|--------------|--------|------------------|---------------------|---------------------|------------------------|--------------------|---------------------|------------------------|--------------------------------|-----------------------|--|
| | Sample size | Response rate | Missing data | | Study design | Asst of interaction | Validity of measure | Reliability of measure | Asst of attachment | Validity of measure | Reliability of measure | Adjustment for confounding IVs | | |
| Obsuth, Hennighausen, Brumariu, and Lyons-Ruth (2014) | * | | | | | * ³ | ** | * | * | ** | * | | 9 | Good |
| Roisman, Madsen, Hennighausen, Sroufe, and Collins (2001) | | | * | * | | | * | | * | ** | | | 6 | Moderate |
| Scott, Briskman, Woolgar, Humayun, and O'Connor (2011) | * | ** | * | | | * ^o | ** | * | * | ** | | | 11 | Good |

³ Validity of exposure measure established as part of this paper

^o Validity of exposure measure not reported in this paper but this has been established in previous research (Feinberg & Hetherington, 2001; Hetherington et al., 1999)

References

- Allen, J. P., Marsh, P., McFarland, C., McElhaney, K. B., Land, D. J., Jodl, K. M., & Peck, S. (2002). Attachment and autonomy as predictors of the development of social skills and delinquency during midadolescence. *Journal of Consulting and Clinical Psychology, 70*(1), 56-66.
- Allen, J. P., McElhaney, K. B., Kuperminc, G. P., & Jodl, K. M. (2004). Stability and change in attachment security across adolescence. *Child Development, 75*(6), 1792-1805.
- Allen, J. P., McElhaney, K. B., Land, D. J., Kuperminc, G. P., Moore, C. W., O'Beirne-Kelly, H., & Kilmer, S. L. (2003). A secure base in adolescence: Markers of attachment security in the mother-adolescent relationship. *Child Development, 74*(1), 292-307.
- Allen, J. P., Porter, M. R., McFarland, F. C., Marsh, P., & McElhaney, K. B. (2005). The two faces of adolescents' success with peers: Adolescent popularity, social adaptation, and deviant behavior. *Child Development, 76*(3), 747-760.
- Beijersbergen, M. D., Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., & Juffer, F. (2008). Stress regulation in adolescents: Physiological reactivity during the Adult Attachment Interview and conflict interaction. *Child Development, 79*(6), 1707-1720.
- Beijersbergen, M. D., Juffer, F., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2012). Remaining or becoming secure: Parental sensitive support predicts attachment continuity from infancy to adolescence in a longitudinal adoption study. *Developmental Psychology, 48*(5), 1277-1282.
- Bretherton, I., & Oppenheim, D. (2003). The MacArthur Story Stem Battery: development, administration, reliability, validity, and reflections about meaning. In R. Emde, D. P. Wolf & D. Oppenheim (Eds.), *Revealing the inner worlds of young children: The MacArthur Story Stem Battery and parent-child narratives* (pp. 55-89). New York, NY: Oxford University Press.
- Dubois-Comtois, K., Cyr, C., & Moss, E. (2011). Attachment behavior and mother-child conversations as predictors of attachment representations in middle childhood: A longitudinal study. *Attachment & Human Development, 13*(4), 335-357.
- Dubois-Comtois, K., & Moss, E. (2008). Beyond the dyad: Do family interactions influence children's attachment representations in middle childhood? *Attachment & Human Development, 10*(4), 415-431.
- Feinberg, M., & Hetherington, E. M. (2001). Differential parenting as a within-family variable. *Journal of Family Psychology, 15*(1), 22.
- Gini, M., Oppenheim, D., & Sagi-Schwartz, A. (2007). Negotiation styles in mother-child narrative co-construction in middle childhood: Associations with early attachment. *International Journal of Behavioral Development, 31*(2), 149-160.
- Griffin, D. W., & Bartholomew, K. (1994). Models of the self and other: Fundamental dimensions underlying measures of adult attachment. *Journal of Personality and Social Psychology, 67*(3), 430-445.
- Hershenberg, R., Davila, J., Yoneda, A., Starr, L. R., Miller, M. R., Stroud, C. B., & Feinstein, B. A. (2011). What I like about you: The association between adolescent attachment security and emotional behavior in a relationship promoting context. *Journal of Adolescence, 34*(5), 1017-1024.
- Hetherington, E. M., Henderson, S. H., Reiss, D., Anderson, E. R., Bridges, M., Chan, R. W., . . . Mitchell, A. S. (1999). Adolescent siblings in stepfamilies: Family functioning and adolescent adjustment. *Monographs of the Society for Research in Child Development, 64*(4), 26-49.
- Joseph, M. A., O'Connor, T. G., Briskman, J. A., Maughan, B., & Scott, S. (2014). The formation of secure new attachments by children who were maltreated: An observational study of adolescents in foster care. *Development and Psychopathology, 26*(1), 67-80.

- Kerns, K. A., Brumariu, L. E., & Seibert, A. (2011). Multi-method assessment of mother-child attachment: Links to parenting and child depressive symptoms in middle childhood. *Attachment & Human Development, 13*(4), 315-333.
- Kobak, R. R., Cole, H. E., Ferenz-Gillies, R., Fleming, W. S., & Gamble, W. (1993). Attachment and emotion regulation during mother-teen problem solving: a control theory analysis. *Child Development, 64*(1), 231-245.
- Macfie, J., Swan, S. A., Fitzpatrick, K. L., Watkins, C. D., & Rivas, E. M. (2014). Mothers with borderline personality and their young children: Adult Attachment Interviews, mother-child interactions, and children's narrative representations. *Development and Psychopathology, 26*(2), 539-551.
- Matias, C., O'Connor, T. G., Futh, A., & Scott, S. (2014). Observational attachment theory-based parenting measures predict children's attachment narratives independently from social learning theory-based measures. *Attachment & Human Development, 16*(1), 77-92.
- Obsuth, I., Hennighausen, K., Brumariu, L. E., & Lyons-Ruth, K. (2014). Disorganized behavior in adolescent-parent interaction: Relations to attachment state of mind, partner abuse, and psychopathology. *Child Development, 85*(1), 370-387.
- Roisman, G. I., Madsen, S. D., Hennighausen, K. H., Sroufe, L., & Collins, W. (2001). The coherence of dyadic behavior across parent-child and romantic relationships as mediated by the internalized representation of experience. *Attachment & Human Development, 3*(2), 156-172.
- Scott, S., Briskman, J., Woolgar, M., Humayun, S., & O'Connor, T. G. (2011). Attachment in adolescence: Overlap with parenting and unique prediction of behavioural adjustment. *Journal of Child Psychology and Psychiatry, 52*(10), 1052-1062.
- Shmueli-Goetz, Y., Target, M., Fonagy, P., & Datta, A. (2008). The Child Attachment Interview: A psychometric study of reliability and discriminant validity. *Developmental Psychology, 44*(4), 939-956.

Appendix 5: Overview of Joint Working

The current project used data collected as part of a study investigating the role of genes and environment in parent-child attachment in adolescence (Fearon, Shmueli-Goetz, Viding, Fonagy, & Plomin, 2014). This wider study was conducted as part of Twins Early Development Study (TEDS). The current project was also carried out in conjunction with another Doctorate in Clinical Psychology trainee, Nadim Ahmad, who was exploring non-shared environmental influences on parenting, attachment security and adjustment outcomes.

The points below outline the nature of the relationship between the current study and these two projects.

The Twins Early Development Study (TEDS) data:

- The current project used archived data from the TEDS study investigating the role of genes and environment in parent-child attachment in adolescence. Therefore, all participant recruitment, allocation of identification numbers and data collection was conducted by research assistants employed as part of the study.
- As part of the TEDS study participants were interviewed using an attachment interview designed for young people and completed a battery of questionnaires assessing socio-demographic factors, psychopathology, parental discipline, callous and unemotional traits and peer relationships. In addition, participants and their parents were recorded taking part in the 'Hot Topics' discussion, a conflict-resolution task. Attachment interviews were later coded by one of the authors of the measure (Yael Shmueli-Goetz) and the research assistants.
- The current study utilised existing data on socio-demographic factors and adolescent attachment style.

- In addition, the project used taped interactions of the hot-topics task, which were subsequently coded by the author (KG) and NA.

Work in conjunction with Nadim Ahmad:

- Preliminary work was conducted by the author and NA to examine whether two existing coding schedules, the Family Interaction Coding System (Hetherington, Hagan, & Eisenberg, 1992) and the Coding of Attachment Related Parenting (Matias, Scott, & O'Connor, 2006), accurately captured quality of parenting, as related to attachment style, in the parent-child interactions. For this, the author and NA watched taped interactions between parents and children with secure and insecure attachment and based on these observations adapted pre-existing scales and developed new scales.
- Participant tapes of the 'Hot Topics' discussion tasks were coded for quality of parenting by the author and NA, who each coded one member of the twin pair.
- The author and NA both used the data collected on socio-demographic factors, adolescent attachment security and quality of parenting.
- For the current project, the author designed and ran a factor analysis to extract latent variables from the parenting data. The analyses indicated a one factor model and the output was given to NA for use in a path analysis.
- The theoretical conceptualisation for the two projects was conducted independently and the focus of the projects was different, with NA exploring the role of non-shared environment in parenting, attachment security and adjustment outcomes (Ahmad, 2015). Furthermore, additional data analysis and the write-up of the projects were conducted independently.

References

- Ahmad, N. (2015). *Parenting, attachment security and adjustment outcomes: The role of non-shared environment*. Unpublished manuscript, University College London, UK.
- Fearon, R. P., Shmueli-Goetz, Y., Viding, E., Fonagy, P., & Plomin, R. (2014). Genetic and environmental influences on adolescent attachment. *Journal of Child Psychology and Psychiatry*, 55(9), 1033-1041.
- Hetherington, E. M., Hagan, M. S., & Eisenberg, M. M. (1992). *Family interaction global coding system*. Unpublished manual, Department of Psychology, University of Virginia, USA.
- Matias, C., Scott, S., & O'Connor, T. G. (2006). *Coding of Attachment-Related Parenting (CARP)*. Unpublished manuscript, Institute of Psychiatry, King's College London, UK.

Appendix 6: Adapted Warmth Scale

Warmth

Rate: All

This scale measures the degree to which the target is warm, enthusiastic, affectionate and kind towards the other. This can be demonstrated through *friendliness* towards the other and *general positive affect*.

NON-VERBAL COMMUNICATION e.g. touching, kissing, hugging, holding hands

EMOTIONAL EXPRESSION e.g. smiling, laughing, happy or good humoured

1. The target RARELY OR NEVER displays examples of warmth for the other. He/she maybe MINIMALLY RESPONSIVE to the other and/or OVERLY COLD AND UNFRIENDLY and does not appear to be enjoying the interaction or the other's company. He/she does not go out of his/her way to be nice to the other.
2. The target displays SOME EVIDENCE of warmth. He/she is OCCASIONALLY caring AND/OR displays some evidence of enjoying the other's company. There is some evidence that the target is nice to the other.
3. The target displays MORE FREQUENT AND INTENSE warmth. He/she is ATTENTIVE to the other and displays more POSITIVE EMOTIONAL EXPRESSIONS (i.e. smiles, frequent eye contact and touching).
4. The target is USUALLY warm. He/she USUALLY displays high warmth and/or the target may display a high degree of touching, smiling, eye contact or laughing. The target is USUALLY NICE and FRIENDLY to the other.
5. The target is HIGHLY and CONSISTENTLY warm. He/she CONSISTENTLY offers a high degree of warmth; maintains eye contact, FREQUENTLY touches, smiles at or laughs with the other. The target is GENUINELY NICE and FRIENDLY to the other, even if the other is angry, rejecting or coercive.

Appendix 7: Adapted Support Scale

Support

Rate: All

This scale measures the degree to which the target is actively interested in and concerned for the other's difficulties and needs. Attention is paid to what is communicated by the other and concern is shown to apparent difficulties the other may be facing. The parent/child appears to be invested in the other's wellbeing and holds the other's best interest in mind.

BODY POSTURE (relaxed, sitting close, facing the other)

SUPPORT such as responsiveness, showing concerns for the other's welfare, offering encouragement and help, offering to change behaviour for the other

CONTENT of the statements such as "I'm concerned about..." or "you're doing much better"

1. The target RARELY OR NEVER displays examples support for the other. He/she maybe MINIMALLY RESPONSIVE to the other and/or OVERLY REJECTING OR DISMISSING and does not appear to be interested in the interaction or the other's company.
2. The target displays SOME EVIDENCE of support. He/she is OCCASIONALLY concerned or encouraging; is RESPONSIVE to the other and displays SOME INTEREST in the other (i.e. solicits other's opinions or concerns) or makes an occasional encouraging, enthusiastic or helpful remark.
3. The target displays MORE FREQUENT AND INTENSE support. He/she is RESPONSIVE and INTERESTED in the other and may offer to change his/her behaviour after hearing the other's needs. He/she displays more SUPPORT (i.e. interested in other's concerns, low level sympathy, some helpful advice or eliciting other's point of view even if it is in conflict with his/her own).
4. The target is USUALLY supportive. He/she USUALLY displays high support, actively soliciting information about the other's concerns, offering a high degree of encouragement and validation. The target usually appears to be invested in the other's wellbeing and holds the other's best interest in mind.
5. The target is HIGHLY and CONSISTENTLY supportive. He/she offers a high degree of support, help, encouragement, validation and approval;

actively solicits the other's opinions and concerns. He/she consistently appears to be invested in the other's wellbeing, holds the other's best interest in mind and is able to offer to change their behaviour.

Appendix 8: Adapted Problem-Solving Scale

Problem Solving

Rate: All

This scale assesses the degree to which the members of the dyad are able to progress toward the accomplishment of the task, i.e., the resolution of disagreements or problems under discussion. Take into account how clearly the target defines important aspects of the problems; the quality of suggested solutions; offers to compromise; and agreements on solutions. The target is rated based on how high up he/she progresses on the scale below.

Assess process by which they work towards accomplishing the task as well as the outcome.

The targets' scores are based on the highest level they reach in the interaction on any of the issues discussed (see clarification (a)).

1. Clear definition of the Problems(s):

Score "1" if he/she does no more than clearly define the problem or topic of disagreement.

2. Defining Aspects of the Problem(s)

Score "2" for the target is he/she goes beyond the definition of the topic to give reasons for why the problem developed or to describe aspects of the problems discussed, or solicits this information from the other.

OR a suggested solution may be rejected or not acknowledged by target without offering an alternative

The dyad may not have listened to and discussed each other's viewpoints, tried to generate solutions or agreed on an outcome.

3. Offering a Solution or Solutions to the Problems(s):

Score a "3" for the target if he/she offers an APPROPRIATE and PLAUSIBLE SOLUTION to the disagreement or the problem, but may not have fully identified the problem, discussed the other's viewpoint, or tried to generate more than one solution. This can include reasonable arguments for why the status quo is acceptable

During problem-solving process target may subjugate own needs and/or appear to hold other's viewpoint as superior.

OR a solution is agreed but the process of problem-solving was one sided (one person acquiesces).

4. Offering a Compromise OR Reaching a Vague or Unclear Resolution:

Score “4” if the target may have identified the problem, understood the issues (discussed each other’s view points), tried to generate solutions but if he/she OFFERS TO YIELD IN PART to a solution offered by the other or OFFERS TO COMPROMISE with the other, but in either case the other does not agree.

OR

Both targets receive “4’s” if they identified the problem, understood the issues (discussed each other’s view points), tried to generate solutions but agree to a solution that is very VAGUE (e.g. agreeing that the child will “do better”), or if one agrees that the other’s solution is plausible but it is UNCLEAR whether he/she has agreed to actually try it.

5. Reaching a Resolution to the Problem(s):

Score “5” for both members of the dyad when they have identified the problem, understood the issues (discussed each other’s view points), tried to generate solutions, and agreed on an outcome or a compromise. BOTH HAVE AGREED TO TRY A SOLUTION to a problem or have agreed to a compromise.

Clarification: Problem Solving:

- a. The targets score is based on the highest level he/she demonstrates across the whole tape. For example: A target offers solutions for one problem but is unable to move beyond describing aspects of other problems introduced. In this instance, the target would receive a “3” as it is assumed that if the target is able to find appropriate and plausible solutions to one problem, he/she possesses the skills necessary to find solutions to other problems.
- b. If the targets are discussing a problem that they have already resolved, they may be scored 5’s even if they did not decide on the solution during the eight minute interaction. In order to be scored “5’s”, however, they must discuss what that solution was. They do not get credit if they just read the paper and state they have solved the problem already.

Appendix 9: Adapted Sensitive Responding Scale

Sensitive responding

Rate: Parent only

Responsiveness emphasises the parent's awareness of the child's needs in the room and regarding topics discussed and sensitivity to his/her signals (verbal and non-verbal). Ideal sensitive responding involves initially noticing the child's cues/signals; appropriate interpretation of these cues; responding in a timely manner and this response fitting the needs of the child.

Consider here *how* and *when* the parent responds to verbal and/or non-verbal cues elicited by the child during the course of the interaction.

Operationalisation

Examples:

a) Responsiveness to child's non-verbal seeking-behaviour

This category is used if the child gets "stuck" in the conversation and doesn't know what to say or how to continue the task, and sends clear behavioural cues/signals that he/she may need the parent's assistance. In these situations, a responsive parent will offer verbal help in a prompt, contingent, warm, supportive, empathic, and/or interested manner.

b) Responsiveness to child's needing behaviour (emotional needs)

This behaviour relates to situations where there is no clear agenda and the child doesn't send signals seeking any help from his/her parent, either verbally or non-verbally e.g. if child is unhappy, frustrated, lost and/or hurt; parent picks up on emotional needs and responds, e.g. by comfort, reassurance or validation.

Or, if child comments on physical need; e.g. they are hungry, a responsive parent will promptly and appropriately offer the child a solution to the need.

c) Responsiveness to child's verbal seeking behaviour

If a child verbally refers to the parent asking for help and/or assistance or comments how difficult a certain task might be, a responsive parent will offer either verbal or instrument help in a prompt, contingent, warm, supportive, empathic and/or interested manner (e.g. looking at sheet and trying to help child with task)

d) Responsive Engagement

Responsive parents will make enthusiastic comments and praise the child's ideas. Responsive parents will keep an attentive attitude towards child's conversation. This attitude on the part of the parent is basically a child-focused one: letting child take lead/direction of conversation, "following" the child.

e) Sensitive Child Mindedness – Mentalization

Sensitive parents are aware of the child's emotional/affective states. They can recognise the child's internal mental state and use mental state language that shows awareness of what the child might be thinking and feeling, e.g. suggesting that the child is bored, worried, sad, excited. These assertions may also appear in the form of linkages the parent makes between a past event in the child's life that has an obvious relation to the child's current affective state- i.e. validating current feelings and feelings relating to past events.

Responsive parents are not entrenched in their position regarding a topic and are able to 'shift' perspective during a conversation upon discussion. In the task, they are able to revise their thinking having acquired new understanding from their child; in effect understanding another's position but not cancelling out their own perspective. This skill also relies on following and responding to a child's cues.

f) Responsive Facilitation

Responsive/ facilitative parent will "pick up" that child is stuck with not knowing what to do (e.g. with task itself or in issues raised by the task), and will provide assistance to the child even if not directly requested.

g) Encouraging/Promoting Autonomy

Responsive parents will perform behaviours and/or make verbalisations in order to encourage their children to carry out tasks by themselves. They can encourage autonomy by asking the child's opinion and providing solutions that promote autonomy.

Scores

1- Unresponsive/Insensitive Parent

Note: There has to be: a) clear pervasiveness (i.e. presence for most of the time) of absence of responsive behaviours displayed by the parent as defined above;

or b) one modest example of responsiveness against a background of pervasive and intense non-responsiveness. Specific examples are shown below:

- a) Parent does not respond to the child's verbal or non-verbal seeking behaviours. Example: child directly requests help with task and the parent does not make a responsive comment or does not offer responsive instrumental help attuned to the child's needs.
- b) Disengaged parent. Example: during the task, parent is silent most of the time, is passive towards the task; not taking the initiative to interact with the child and, if child does not "invite" the parent to complete the task with her/him, the parent will accept this type of "arrangement" keeping himself/herself distanced and dismissed from what the child is doing. On the other hand, the parent can be very talkative but nevertheless is still unresponsive to the child.
- c) Absence of child mindedness (mentalization). Example: In a situation where the child shows obvious signs of frustration or boredom with regards to the task, his/her parent does not comment on this emotional state.
- d) No facilitation. Example: The parent does not encourage the child to perform a task if it's obvious to the observer that the child is able to do it alone. Also, if the child presents the parent with some ideas as to how to move the task along, the parent will not provide support to the child's ideas.

2- Minimally Responsive/Sensitive Parent

Note: There may be e.g. one or two examples of responsiveness. However, the degree of pervasiveness and degree of intensity indicates predominantly non-responsive behaviours towards the child. A '2' differs from a '1' in showing at least two modest examples of responsive behaviours amidst a general pattern of non-responsive behaviours.

3- Somewhat Responsive/Sensitive Parent

Note: To score a 3, the parent will show some scattered evidence of responsiveness, but this will not constitute a strong/obvious sign of responsiveness on their part. Overall, he/she is more non-responsive than responsive; or he/she shows two strong examples of sensitive responsiveness amidst a strong pattern of insensitive responsiveness.

4- Moderately Responsive/Sensitive Parent

Note: The intensity/frequency in which responsive behaviours are displayed is balanced by the intensity/frequency by which non-responsive behaviours are displayed. Thus, several examples of responsive behaviours will be balanced with several examples of non-responsive behaviours. The overall impression would be that this is a parent that is partly responsive and partly non-responsive; neither style dominates.

5- Good Responsive/Sensitive Parent

Note: There is an overall pattern in which responsive behaviours are greater/more prominent than non-responsive behaviours. Thus, the general style is responsive. These examples of responsive behaviours are clear examples and unambiguous. This is offset by modest and infrequent examples of non-responsive behaviours.

6- Very Good Responsive/Sensitive Parent

Note: There is a consistent pattern where episodes of responsive behaviour are displayed. The parent/child consistently shows signs of responsiveness as defined above. However, although consistently exhibiting signs of responsiveness, there may be at least one example where responsive behaviour might be expected but is not seen.

7- Extremely Responsive/Sensitive Parent

Note: The parent/child either displays all the above criteria or those that are displayed must be extreme manifestations of responsive behaviour. The various types of responsive behaviour are pervasive and unambiguous to the observer.

Appendix 10: Adapted Mutuality Scale

Mutuality

Rate: Parent and child DYADICALLY

This code is a dyadic-based one. The intention is to code the quality of the interaction between parent and child but seeing both of them as a unique feature of the relationship (i.e. parent and child interacting are not separate things).

Operationalisation

Examples

a) Seeking parent's involvement in the task

There has to be clear evidence that as the child initiates a conversation, he/she will spontaneously "invite" the parent in order to allow them to be part of the process of the task and their thinking. The child will feel comfortable if the parent gets involved in the conversation (e.g. they may allocate a task for the parent to complete).

b) Both parent and child interacting together

Through interactive-reciprocal dialogue/turn-taking, the parent and child are able to have a cooperative conversation. It is clear that the purpose of their conversation is to find a solution to the specified problem; not for them to simply get their view point across/ have their own way. Despite having different viewpoints, they are able to have some "give and take", allowing them to cooperate on the task.

c) Shared attention

Through appropriate eye contact and/or attentiveness to each other's comments and actions regarding the task. They are able to respond accordingly and maintain a joint attention on the topic.

d) Reciprocated positive affect

e.g. if child looks at the parent smiling, the parent reciprocates this same behaviour immediately or with a complimentary behaviour such as shared laughter.

e) Mirroring/ matching

Parent and child are observed to be oriented towards each other, and not mismatched in positioning. They are working as a team to embellish the discussion and achieve the goal (the task is based on an area of disagreement so the focus is not about having “fun”, but the parent and child are seen to be on the same level, with a sense of being “in it together”). They are not shutting each other down, but working together to reach conclusions.

f) Fluid conversation

This is the opposite of “dead air” (i.e. moments of silence). Both parent and child keep a joint conversation on the task. Comments made by parent not ignored by the child and vice-versa; or the parent and the child do not follow “different directions” in discussion.

g) Coordinated Shared Body Orientation

Parent and child keep closeness to each other, their bodies are coordinated/oriented towards one another during the task. They appear to be engaged in a shared task rather than separate activities.

Scores

1- No Mutuality

Note: There has to be clear pervasiveness of absence of mutual behaviours elicited by the dyad as defined above. Specific examples are shown below:

- a) No child initiated activity with parental involvement.
- b) There is no interactive-reciprocal dialogue/turn-taking. Example: The parent and child do not co-ordinate their efforts in order to move the task along.
- c) No shared attention. There is no eye contact and/or there is a lack of attentiveness to each other’s comments and actions regarding the task.
- d) No reciprocated positive affect. e.g. if child looks at the parent smiling, the parent does not reciprocate with the same behaviour or complimentary behaviour.
- e) No mirroring/ matching. Parent and child do not match/imitate each other’s behaviours and/or verbalisations during the task.
- f) No fluid conversation. The interaction is infused with “dead air”.
- g) No coordinated/shared body orientation

2- Minimal Mutuality

Note: There is pervasive non-mutuality, but slight evidence of mutuality. A '2' differs from a '1' in showing at least one clear but modest example of mutual behaviours amidst a general pattern of non-mutual behaviours. However, the degree of pervasiveness and degree of intensity indicates predominantly non-mutuality.

3- Some Mutuality

Note: Generally, this dyad is more non-mutual than mutual.

4- Moderate Mutuality

Note: The intensity/frequency in which mutual behaviours are displayed is balanced by the intensity/frequency by which non-mutual behaviours are displayed. Thus, several examples of mutual behaviours will be balanced with several examples of non-mutual behaviours. The overall impression would be that this is a dyad that is partly behaving mutually and partly non-mutually; neither style dominates.

5- Good Mutuality

Note: There is an overall pattern in which more mutual behaviours are displayed than non-mutual behaviours. Thus, the general style is mutual. These examples of mutual behaviours provide strong evidence of mutuality. However, there are also modest signs of non-mutual behaviours.

6- Very Good Mutuality

Note: There is a consistent pattern where episodes of mutual behaviour are displayed. This is a dyad that consistently shows signs of mutuality as defined above. However, although consistently exhibiting signs of mutuality, there may be at least one example where mutual behaviour is expected but not seen; or despite pervasive and clear evidence of mutuality, there is a slight indication of non-mutuality.

7- Extreme Mutuality

Note: This dyad must either display all the above criteria or those mutual behaviours that are displayed must be extreme manifestations of mutuality. The

various types of mutual behaviours are pervasive and unambiguous to the observer.

Appendix 11: Openness Scale (developed for study)

Openness

Rate: Parent and child separately

Openness refers to the quality of the interaction from the parent to the child and vice versa. It describes the degree to which a genuine, open and comfortable interaction is demonstrated in the dyad.

Operationalisation

Examples

a) Ease

Interactions are characterised by a sense of ease and comfort from the parent/child. The parent/child appears to be open with the other's presence and does not seem an unwilling participant in the conversation. Despite potentially negative statements or exchanges there is an overall sense of ease. Playfulness and humour may also be apparent; designed to lighten the mood or indicate a 'good will' towards the other.

b) Openness/transparency

Openness is used to facilitate the discussion of difficult topics. The parent/child is willing to honestly discuss their viewpoint in order to express their difficulties and needs. They do not acquiesce to the other and stymie their opinion simply to avoid conflict or conversation.

Scores

1- No openness

Note: There is a complete absence of ease and comfort or openness: the parent/child is uncomfortable in the other's company and may appear tense or uneasy. They are withdrawn from the conversation and do not appear to be a willing participant in the conversation.

2- Minimal openness

Note: There may be one or two examples of openness, e.g. one or two instances of playfulness. However, the degree of pervasiveness and degree of intensity indicate that predominantly there is no openness with the other.

3- Slight openness

Note: To score a 3, the parent/child will show some scattered evidence of openness, but this will not constitute a strong/ obvious sign of openness on their part.

4- Somewhat open

Note: The intensity/frequency in which openness is displayed is balanced by the intensity/frequency by which a lack of openness is displayed. Thus, several examples of ease and goodwill towards the other will be balanced with several examples of lack of openness and withdrawing from the conversation. The overall effect will be that the parent/child will partly display openness and partly display a lack of ease with the other.

5- Good openness

Note: There is an overall pattern in which open behaviours are greater/more prominent than a lack of ease. Thus the general sense is of ease or openness with the other. This is offset by modest and infrequent examples of unease and a lack of openness with the other.

6- Very good openness

Note: There is a consistent pattern where openness is displayed toward the other. They consistently show signs of openness; and mild evidence of unease and a lack of openness.

7- Extreme openness

Note: The parent/child either displays all the above criteria or those that are displayed must be extreme manifestations of openness. The various types of open behaviours are pervasive and unambiguous to the observer.

Appendix 12: Underlying Tension Scale (developed for study)

Underlying Tension

Rate: Parent and child DYADICALLY

Underlying tension refers to situations where the discussion between parent and child seems strained and both sides appear reluctant to change their own ideas or demands. There is a sense that both parent and child seem equally determined to get what they want, with little room for compromise, i.e. there is a *battle of wills*. This scale codes for more subtle interactions and tension rather than overt conflicts.

Operationalisation

Examples

c) Underlying tension

This relates to there being a strained relationship between the parent and the child. There is uneasiness between the two which suggests that not only do they have different views on the topic of discussion but that neither person is very open to compromise and the result is a 'battle of wills'. There is a lack of flexibility from both sides and they seem uncomfortable with each other. Examples might be half-heartedly agreeing to a solution, interrupting each other or responding in brief, terse words.

d) Resistance

There is frequent opposition to the others requests, suggestions or ideas. There is a lack of enthusiasm for the other's view point and a refusal to accept an alternative position. There is an underlying struggle between the pair, which may lead to displays of irritation. In the case of parents, there might be resistance to the child's quest to become autonomous and independent. In the case of children, they may ignore what the parent is saying rather than choose to debate an issue. There is the sense that one is hoping that the other will simply back down, rather than negotiate.

e) Dismissing/ disengaged

This refers to minimising or dismissing the others ideas, opinions or expressions of emotions. One may view the others views as unimportant or trivial and shows little interest in them or may ridicule or make light of their opinions. Emotions are seen as demanding and difficult to manage. The dyad does not find concrete solutions to the problem as they believe that the problem is irrelevant or will go as time pass by.

f) Falseness

When expressing opinions or attempting to reach a solution there is a lack of conviction in what is being said. What is expressed appears disingenuous or lacks sincerity. There seems to be a falseness or a “front” that is being put on during discussions, which makes the interaction appear forced or awkward.

Scores

1- No underlying tension

Note: There is an absence of tension, strain, resistance, disengagement and falseness.

2- Minimal underlying tension

Note: The degree of pervasiveness and degree of intensity (e.g. one or two examples of minor resistance) indicate that predominantly there is no underlying tension between members of the dyad.

3- Slight underlying tension

Note: To score a 3, the parent and child will show some scattered evidence of underlying tension, but this won't constitute a strong/ obvious sign of a struggle between the two.

4- Moderate underlying tension

Note: The intensity/frequency in which underlying tension is displayed is balanced by the frequency by which these behaviours are not displayed. Thus, several examples of underlying tension will be balanced with several examples of comfortable, flexible and accepting behaviour. The overall will be that the dyad is a pair that partly engage in a battle of wills and partly engage in accommodating and tolerant behaviour.

5- Definite underlying tension

Note: There is an overall pattern in which underlying tension behaviours are greater/ more prominent than comfortable and accommodating behaviours. Thus, the general style is tense, resistant, disengaged or false. This is offset by modest and infrequent examples of comfortable and accepting behaviours.

6- Significant underlying tension

Note: There is a consistent pattern where episodes of underlying tension behaviours are displayed. The parent and child consistently show signs of tension, strain, dismissing and disingenuous behaviour, and mild evidence of comfortable and accepting behaviours.

7- Extreme underlying tension

Note: The parent and child either display all of the above criteria or those that are displayed are extreme manifestations of underlying tension behaviours. The various types of underlying tension behaviours are pervasive and unambiguous to the observer.

Appendix 13: Principal Components Analysis SPSS Output

Factor Extraction (twin 1)

Table 1. Eigenvalues

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.649 | 61.781 | 61.781 | 8.649 | 61.781 | 61.781 |
| 2 | 1.478 | 10.558 | 72.339 | 1.478 | 10.558 | 72.339 |
| 3 | .869 | 6.210 | 78.549 | | | |
| 4 | .731 | 5.219 | 83.768 | | | |
| 5 | .531 | 3.794 | 87.562 | | | |
| 6 | .378 | 2.701 | 90.263 | | | |
| 7 | .302 | 2.156 | 92.419 | | | |
| 8 | .270 | 1.931 | 94.350 | | | |
| 9 | .219 | 1.564 | 95.914 | | | |
| 10 | .163 | 1.166 | 97.080 | | | |
| 11 | .139 | .995 | 98.076 | | | |
| 12 | .120 | .858 | 98.933 | | | |
| 13 | .094 | .673 | 99.607 | | | |
| 14 | .055 | .393 | 100.000 | | | |

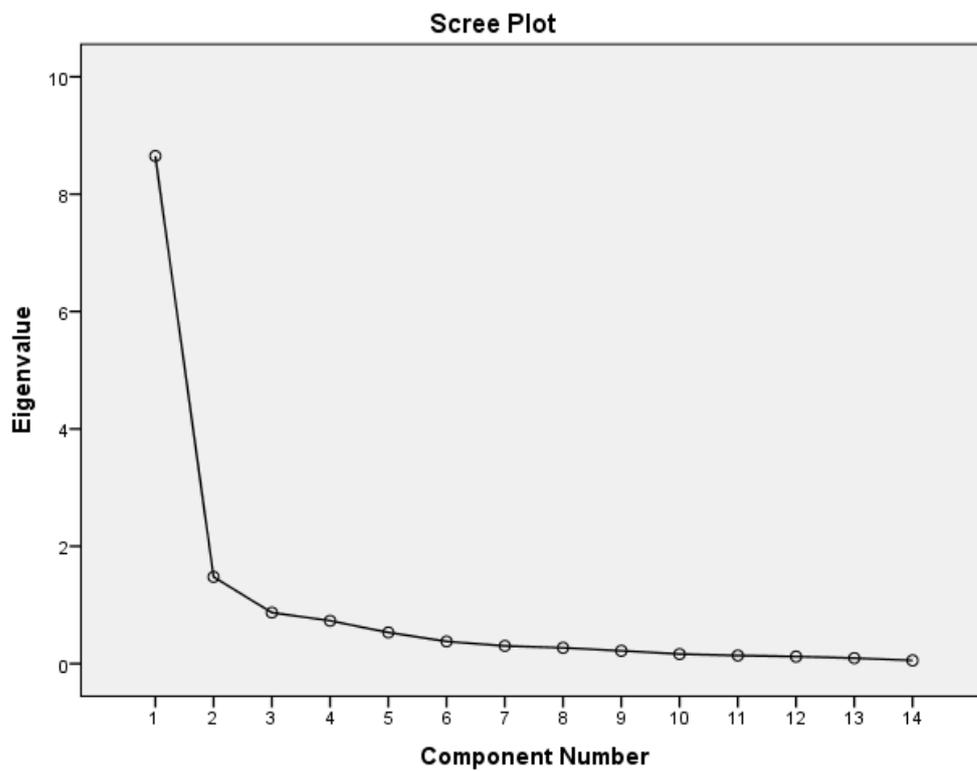


Figure 1. Scree plot

Oblimin rotation (non-orthogonal) 2 factor solution specified (twin 1)

Table 2. Component matrix (2 components extracted)

| | Component | |
|---------------|-----------|-------|
| | 1 | 2 |
| POpen1 | .932 | |
| PSensitivity1 | .921 | |
| PSupport1 | .910 | |
| PAssert1 | .884 | |
| Mutuality1 | .853 | |
| PWarmth1 | .853 | |
| PAnger1 | -.849 | |
| Tension1 | -.827 | |
| PPositive1 | .805 | |
| PCoercion1 | -.795 | |
| PProbsolve1 | .705 | |
| Conflict1 | -.685 | .456 |
| PInvolve1 | | .715 |
| PDepress1 | | -.664 |

Table 3. Pattern matrix (rotation method: oblimin with Kaiser normalisation)

| | Component | |
|---------------|-----------|-------|
| | 1 | 2 |
| PAnger1 | -.915 | |
| PCoercion1 | -.881 | |
| PSensitivity1 | .880 | |
| PSupport1 | .877 | |
| POpen1 | .875 | |
| PAssert1 | .866 | |
| Tension1 | -.856 | |
| Conflict1 | -.812 | |
| PWarmth1 | .799 | |
| Mutuality1 | .787 | |
| PPositive1 | .700 | |
| PProbsolve1 | .681 | |
| PInvolve1 | | .771 |
| PDepress1 | | -.702 |

Table 4. Structure matrix (rotation method: oblimin with Kaiser normalisation)

| | Component | |
|---------------|-----------|-------|
| | 1 | 2 |
| POpen1 | .917 | |
| PSensitivity1 | .911 | |
| PSupport1 | .902 | |
| PAssert1 | .882 | |
| PAnger1 | -.875 | |
| Tension1 | -.840 | |
| PWarmth1 | .838 | |
| Mutuality1 | .834 | |
| PCoercion1 | -.827 | |
| PPositive1 | .773 | .495 |
| Conflict1 | -.730 | |
| PProbsolve1 | .700 | |
| PInvolve1 | | .803 |
| PDepress1 | | -.707 |

Factor extraction (twin 2)

Table 5. Eigenvalues

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.307 | 59.335 | 59.335 | 8.307 | 59.335 | 59.335 |
| 2 | 1.221 | 8.722 | 68.057 | 1.221 | 8.722 | 68.057 |
| 3 | .972 | 6.944 | 75.000 | | | |
| 4 | .869 | 6.211 | 81.211 | | | |
| 5 | .661 | 4.723 | 85.933 | | | |
| 6 | .407 | 2.908 | 88.842 | | | |
| 7 | .352 | 2.516 | 91.357 | | | |
| 8 | .290 | 2.073 | 93.430 | | | |
| 9 | .213 | 1.520 | 94.950 | | | |
| 10 | .182 | 1.297 | 96.247 | | | |
| 11 | .170 | 1.217 | 97.463 | | | |
| 12 | .149 | 1.065 | 98.529 | | | |
| 13 | .124 | .884 | 99.412 | | | |
| 14 | .082 | .588 | 100.000 | | | |



Figure 2. Scree plot

Oblimin rotation (non-orthogonal) 2 factor solution specified (twin 2)

Table 6. Component matrix (2 components extracted)

| | Component | |
|---------------|-----------|------|
| | 1 | 2 |
| POpen2 | .906 | |
| PSensitivity2 | .896 | |
| PSupport2 | .887 | |
| Mutuality2 | .864 | |
| PAnger2 | -.839 | |
| Tension2 | -.812 | |
| PWarmth2 | .784 | |
| PCoercion2 | -.780 | |
| PAssert2 | .777 | |
| PPositive2 | .729 | |
| Conflict2 | -.716 | .547 |
| PProbsolve2 | .672 | |
| PDepress2 | -.409 | |
| PInvolve2 | .548 | .587 |

Table 7. Pattern matrix (rotation method: oblimin with Kaiser normalisation)

| | Component | |
|---------------|-----------|-------|
| | 1 | 2 |
| Conflict2 | -1.011 | |
| PCoercion2 | -.876 | |
| PAnger2 | -.836 | |
| Tension2 | -.788 | |
| PAssert2 | .666 | |
| PSupport2 | .575 | .439 |
| PSensitivity2 | .564 | .463 |
| POpen2 | .549 | .493 |
| PInvolve2 | | .883 |
| PWarmth2 | | .644 |
| PPositive2 | | .620 |
| PDepress2 | | -.536 |
| Mutuality2 | .481 | .518 |
| PProbsolve2 | | .461 |

Table 8. Structure matrix (rotation method: oblimin with Kaiser normalisation)

| | Component | |
|---------------|-----------|-------|
| | 1 | 2 |
| PAnger2 | -.880 | -.520 |
| Conflict2 | -.871 | |
| PCoercion2 | -.858 | -.421 |
| Tension2 | -.843 | -.515 |
| PSensitivity2 | .806 | .757 |
| POpen2 | .806 | .779 |
| PSupport2 | .804 | .739 |
| PAssert2 | .771 | .548 |
| PWarmth2 | .620 | .792 |
| PInvolve2 | | .788 |
| Mutuality2 | .752 | .769 |
| PPositive2 | .569 | .748 |
| PProbsolve2 | .564 | .629 |
| PDepress2 | | -.522 |