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Children Conceived by Gamete Donation: Psychological Adjustment and Mother-child Relationships at Age 7

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Abstract

An increasing number of babies are being born using donated sperm, where the child lacks a genetic link to the father, or donated eggs, where the child lacks a genetic link to the mother. This study examined the impact of telling children about their donor conception on mother-child relationships and children's psychological adjustment. Assessments of maternal positivity, maternal negativity, mother-child interaction and child adjustment were administered to 32 egg donation, 36 donor insemination and 54 natural conception families with a 7-year-old child. Although no differences were found for maternal negativity or child adjustment, mothers in non-disclosing gamete donation families showed less positive interaction than mothers in natural conception families suggesting families may benefit from openness about the child's genetic origins.

Keywords

gamete donation; egg donation; donor insemination; mother-child relationship; psychological adjustment

Advances in reproductive medicine since the birth of the first baby through *in vitro* fertilization (IVF) in 1978 have resulted in more than 3 million children worldwide (International Committee for Monitoring Assisted Reproductive Technology, 2009). Many of these children are conceived using donated gametes (sperm or eggs), either through donor insemination or egg donation. Donor insemination refers to the insemination of a woman with the sperm of a man who is not her husband or partner. The resulting child is genetically related to the mother but not to the father who raises the child. Egg donation is like donor insemination in that the child is genetically related to only one parent, but in this case it is the mother with whom the child lacks a genetic link. With embryo donation, the child lacks a genetic link to both parents. In the case of intra-family donation, whereby gamete donation takes place between family members, the parent will have a partial genetic link to the child.

Those who become parents through assisted reproductive procedures involving gamete donation tend not to tell their children about their donor conception and thus the majority of

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children conceived in this way remain unaware that the person they know as their father (in the case of sperm donation) or their mother (in the case of egg donation) is not their genetic parent. In the European Study of Assisted Reproduction Families (Golombok, Brewaeys, Cook, Giavazzi, Guerra, Mantovani, et al., 1996; Golombok, Brewaeys, Giavazzi, Guerra, MacCallum, & Rust, 2002), an investigation of a representative sample of more than 100 donor insemination families in Spain, Italy, The Netherlands and the United Kingdom, not one set of parents had disclosed the donor conception to their child by early school age, and only 8.6% of parents had done so by early adolescence. A follow up of the United Kingdom sample at age 18 showed that no further children had been told about their genetic origins between early adolescence and early adulthood (Owen & Golombok, 2009). Even in Sweden, where legislation gives individuals the right to obtain information about the donor's identity, only 11% of parents were found to have informed their child about the donor insemination (Gottlieb, Lalos, & Lindblad, 2000). Investigations in the United States have produced similar findings (Nachtigall, Becker, Quiroga, & Tschann, 1997) although there is evidence that a growing number of parents are being open with their children (Freeman, Jadv, Kramer, & Golombok, 2009). Fewer studies have been carried out of egg donation families than of donor insemination families. However, a comparable situation appears to exist. In an investigation in Finland, none of the parents had told their child about the egg donation (Soderstrom-Antilla, Sajaniemi, Tiitinen, & Hovatta, 1998), and in a study in the United Kingdom, only 5% of parents had told their child (Golombok, Murray, Brinsden, & Abdalla, 1999).

There has been considerable concern about the secrecy that surrounds families created through gamete donation (Baran & Pannor, 1993; Daniels & Taylor, 1993; McGee, Brakman & Gurmankin, 2001). It has been argued that secrecy will have an adverse effect on family relationships and, consequently, on the child. Findings suggestive of an association between secrecy and negative outcomes for donor conceived children have come from research on adoption which has shown that adopted children who are not given information about their biological parents may become confused about their identity and at risk for psychological problems (Brodzinsky, Smith, & Brodzinsky, 1998; Grotevant & McRoy, 1998). It is now generally accepted that adopted children benefit from open communication with their parents about their adoption and information about their biological parents (Brodzinsky, 2006; Grotevant, 2007; Palacios & Brodzinsky, 2010). Family therapists have also argued that secrecy may jeopardize communication between family members, and result in a distancing of some members of the family from others (Papp, 1993; Imber-Black, 1998). In relation to donor insemination, Clamar (1989) has suggested that keeping the circumstances of conception secret will separate those who know the secret (the parents) from those who do not (the child). Although gamete donation is similar to adoption in that the child lacks a genetic link with one or other parent, they differ in that the child does have a genetic link with one parent. It is conceivable that the imbalance between parents in genetic relatedness to the child may influence family dynamics, as suggested by parents' decision not to disclose the donor conception due to the fear that this would disrupt the child's relationship with the non-genetic parent (Cook, Golombok, Bish, & Murray, 1995).

Little is known about the consequences of openness about gamete donation for family relationships and child development, largely because so few individuals have been told about their genetic origins. From studies of the small numbers of people who are aware of their donor conception, the age of the child when told and the manner of disclosure appear to have an impact on their reaction. Young children tend to show curiosity about their unknown donor and a desire to discover more about him (Rumball & Adair, 1999; Vanfraussen, Ponjaert-Kristoffersen, & Brewaeys, 2001). Similarly, adolescents who have known about their donor conception since childhood wish to find out more about their

donor, with many believing that this would help them learn more about themselves (Jadva, Freeman, Kramer & Golombok, 2009; Scheib, Riordan, & Rubin, 2005). This is in line with studies of adopted individuals who search for their birth parents, the majority of whom report that curiosity and a desire to acquire a more complete sense of identity are their primary motivations for initiating a search (Howe & Feast, 2000; Wrobel & Dillon, 2009). In contrast, those who discover their donor conception later in life, particularly those who find out by accident or under adverse circumstances such as parental divorce, appear to show more negative responses including anger towards their social parents and feelings of betrayal and distrust (Jadva et. al., 2009; Turner & Coyle, 2000).

The aim of the present study was to examine the impact of telling children about their donor conception in the preschool years on psychological adjustment and the mother-child relationship. Findings relating to the father-child relationship will be presented elsewhere. Two-parent families with a child conceived by donor insemination or egg donation and a comparison group of families with a naturally conceived child were recruited to the study in the United Kingdom when the child was 1 year old. As approximately half of the parents (56% of egg donation parents and 46% of donor insemination parents) intended to be open with their child about the method of their conception, reflecting a recent change in parental attitudes toward disclosure, this enabled the consequences of secrecy versus disclosure about donor conception on family relationships to be examined prospectively and systematically for the first time. Phase 1 conducted at age 1 (Golombok et al., 2004), Phase 2 conducted at age 2 (Golombok, Jadva, Lycett, Murray, & MacCallum, 2005) and Phase 3 conducted at age 3 (Golombok et al., 2006) found the donor insemination and egg donation families to be functioning well. However, the children were too young to examine the consequences of openness versus secrecy about the child's genetic origins. Research on adoption has shown that it is not until at least 5 years of age that children begin to clearly differentiate between birth and adoption as alternative ways of entering a family and begin to understand meaning and implications of being adopted (Brodzinsky & Pinderhughes, 2002). The only other investigation of parenting and child adjustment in assisted reproduction families examined predominantly lesbian and single mother families with 7-year-old children conceived by donor insemination and found the children to be functioning well (Chan, Raboy, & Patterson, 1998).

The present paper focuses on Phase 4 of the study when the children were 7 years old. As theoretical approaches to the understanding of adoption stress the importance of openness about the adoption for positive family relationships and children's psychological wellbeing (Brodzinsky, 2006; Grotevant, 2007; Palacios & Brodzinsky, 2010), less positive mother-child relationships and greater difficulties in child adjustment were hypothesized for donor conception families in which children had not been told about their genetic origins in comparison with donor conception families in which children had been told, and natural conception families. The study adopted a multi-informant, multi-method approach to include data from different perspectives and maximize the validity of the measures. The quality of mother-child relationships was assessed both by standardized interview to assess positive and negative aspects of parenting that are associated with children's psychological adjustment, such as warmth and conflict respectively, and by the observation of mother-child interaction in the home. Children's psychological adjustment was assessed both by standardized questionnaire administered to mothers and teachers, and by standardized interview.

Methods

Participants

The study has adopted a mixed-method approach (interviews, observation and questionnaires), with data obtained from mothers, fathers, children and teachers (see Golombok et al., 2004 for details of the initial recruitment of families to the study). The original study included 50 donor insemination families, 51 egg donation families and 80 natural conception families. At Phase 2, the participation rates were 92%, 94% and 85% respectively. At Phase 3, 89%, 85% and 99% respectively of the Phase 2 participants took part. The present phase of the study involved 36 families with a child conceived by donor insemination, 32 families with a child conceived by egg donation and a comparison group of 54 families with a naturally conceived child, representing 88%, 78% and 81% respectively of those who participated in Phase 3, with no significant difference in participation rate between family types. The overall retention rates between Phase 1 when the children were 1 year old and Phase 4 when the children were 7 years old were 72% for donor insemination families, 63% for egg donation families and 68% for natural conception families. Rather than actively withdrawing from the study, the majority of those lost to follow-up had moved abroad or had moved house and could not be traced.

Systematic information was obtained from all mothers of children conceived by gamete donation about whether or not they had told their child about their donor conception, coded as 'told', 'plans to tell', 'uncertain' or 'plans not to tell' with complete agreement between raters (Readings, Blake, Casey, Jadv & Golombok, in press). Of the 68 mothers, 23 (34%) had told their child (10 donor insemination and 13 egg donation) and 45 (66%) had not told (26 donor insemination and 19 egg donation). All of the children who were aware of their donor conception had been informed by age 5.

As shown in Table 1, there were similar proportions of boys and girls in each family type. A one-way ANOVA showed that the age of the child differed significantly between groups, $F(2, 119) = 11.15, p < .001$, reflecting the slightly older age of the natural conception children (mean = 91.57 months) than the donor insemination (mean = 88.36 months) and egg donation (mean = 88.91 months) children. A significant difference was also found for mother's age, $F(2, 119) = 18.61, p < .001$, such that egg donation mothers were older (mean = 47.13 years) than donor insemination (mean = 41.61 years) and natural conception (42.09 years) mothers.

Social class was assessed by the occupation of the parent with the highest ranking position according to a modified version of the United Kingdom Registrar General's classification (OPCS and Employment Department Group, 1991). Occupational classifications ranged from 1 (professional) through 2 (managerial/technical) to 3 (skilled/non-manual). The family types differed with respect to social class, $\chi^2(4) = 17.51, p < .01$, with a lower proportion of donor insemination and egg donation families than natural conception families in higher ranking occupations. There was also a significant difference between family types for number of siblings, $\chi^2(4) = 23.17, p < .001$, reflecting a lower proportion of donor insemination and egg donation families than natural conception families with siblings. Ninety-three percent of parents ($n=113$) were still married or cohabiting at the time of the study.

Procedure

One of four psychologists trained in the study techniques visited the families at home. Written informed consent to participate in the investigation was obtained from the mother and verbal assent was obtained from the child. Ethical approval for the study was granted by the University's Psychology Research Ethics Committee. The mother was administered a

standardized interview that lasted approximately 1 hour and was digitally recorded. As data were obtained by interview on issues relating to the child's conception, it was not possible for interviewers to be "blind" to family type. However, the section of the interview on the child's psychological adjustment was rated by a clinical child psychologist who was unaware of the method of the child's conception. Mother-child dyads ($n=108$) also participated in a video recorded observational task that lasted 5–10 minutes. In addition, 117 (96%) of the mothers and 92 (75%) of the children's teachers completed a questionnaire assessment of children's psychological adjustment. Written informed consent was obtained from the teachers.

Measures

Mother-child relationship

Interview with mother: The mothers were interviewed using an adaptation of a standardized interview designed to assess quality of parenting (Quinton & Rutter, 1988). This interview has been validated against observational ratings of mother-child relationships in the home, demonstrating a high level of agreement between ratings of the quality of parenting by interviewers and observers ($r = 0.63$). Detailed accounts were obtained of the child's behavior and the mother's response to it, with reference to the child's progress at school, peer adjustment, and relationships within the family unit. Particular attention was paid to mother-child interactions relating to issues of warmth and control. Information obtained by interview was rated according to a standardized coding scheme, and regular meetings were held to minimize rater discrepancy.

The following variables relating to the quality of the mother-child relationship were coded: (1) *warmth* was rated on a 3-point scale ranging from 0 (low) through 1 (moderate) to 2 (high) taking account of the mother's tone of voice and facial expressions when talking about the child in addition to her verbal report of her relationship with her child (2) *interaction* was rated on a 3-point scale ranging from 0 (low) through 1 (moderate) to 2 (high) and assessed the extent to which the mother and child spent time together, engaged in joint activities and enjoyed each other's company (3) *sensitivity* was rated on a 3-point scale ranging from 0 (low) through 1 (moderate) to 2 (high) and represented the mother's ability to recognize and respond appropriately to her child's needs (4) *aggression* was rated on a 3-point scale from 0 (none) through 1 (mild) to 2 (moderate) and measured how the mother reacted to the child in a situation of conflict (5) *criticism* assessed the degree of maternal criticism of the child on a 3-point scale from 0 (none) through 1 (minor) to 2 (moderate) (6) *level of battle* assessed the level of mother-child conflict on a 3-point scale ranging from 0 (none) through 1 (minor) to 2 (moderate/major), and (7) *frequency of battle* assessed the frequency of mother-child conflict from 0 (never/rarely) through 1 (occasional) to 2 (frequent). These variables were examined as they represent aspects of parenting that have been shown in previous studies to be associated with children's psychological adjustment and to have good inter-rater reliability. To establish inter-rater reliability in the present study, 47 randomly selected interviews were coded by a second interviewer and intra-class correlation coefficients for these variables were found to range from 0.50 to 0.80.

Parent-child observation: The Etch-A-Sketch task (Stevenson-Hinde & Shouldice, 1995) was used to obtain an observational assessment of mother-child interaction. This measure was chosen because it was age-appropriate, could be rated "blind" to family type, and could be taken into the family home. The Etch-A-Sketch is a drawing tool with two dials that allow one person to draw vertically and the other to draw horizontally. The mother and child were asked to copy a picture of a house, each using one dial only, with clear instructions not to use the other dial. The session was video recorded and coded using the Parent-Child Interaction System [PARCHISY] (Deater-Deckard & O'Connor, 2000; Deater-Deckard &

Petrill, 2004) to assess the construct of mutuality, i.e. the extent to which the mother and child engaged in positive dyadic interaction characterized by warmth, mutual responsiveness and cooperation. The PARCHISY has been shown to discriminate between mothers of 'hard to manage' and control children and to predict individual differences in children's social adjustment (Deater-Deckard & Petrill, 2004; Ensor & Hughes, 2009) thus demonstrating its validity as a measure of parent-child interaction. The following variables were rated on a 7-point scale ranging from 1 (no instances) to 7 (constant, throughout interaction): (1) *Mother's responsiveness to child* assessed the extent to which the mother responded immediately and contingently to the child's comments, questions or behaviors (2) *Child's responsiveness to mother* assessed the extent to which the child responded immediately and contingently to the mother's comments, questions or behaviors (3) *Dyadic reciprocity* assessed the degree to which the dyad showed shared positive affect, eye contact and a "turn-taking" (conversation like) quality of interaction, and (4) *Dyadic cooperation* assessed the degree of agreement about whether and how to proceed with the task. In order to assess inter-rater reliability, 47 randomly selected interviews were coded by a second interviewer. Intra-class correlation coefficients for these variables were found to range from 0.64 to 0.85.

Child psychological adjustment

Interview with mother: The child's psychological adjustment was assessed during the interview with the mother using a standardized procedure with a high level of reliability ($r = .85$) between ratings made by social scientists and those made "blindly" by a child psychiatrist Rutter, Cox, Tupling, Berger and Yule (1975). Validity was demonstrated by a high level of agreement between interview ratings of children's psychological problems and mothers' assessments of whether or not their children had emotional or behavioral difficulties. Detailed descriptions were obtained of any emotional or behavioral problems shown by the child. These descriptions of actual behavior, which included information about where the behavior was shown, severity of the behavior, frequency, precipitants and course of the behavior over the past year were transcribed and rated by a clinical child psychologist who was unaware of the nature of the study. Psychological problems, when identified, were rated according to severity on a 4-point scale ranging from 0 (no disorder) to 3 (definite or marked disorder) and type (emotional, conduct, mixed, developmental, hyperactive, psychotic or other).

Strengths and Difficulties Questionnaire: The presence of child psychological problems was also assessed with the Strengths and Difficulties Questionnaire [SDQ] (Goodman, 1994 & 1997) administered to the mother. The SDQ produces an overall score of the child's adjustment with scores of 13 or below classified as within the normal range, scores of 14–16 classified as borderline and scores of 17 or above classified as abnormal, i.e. indicating psychological disorder.

An independent assessment of children's psychological adjustment was obtained by administering the SDQ to teachers. This questionnaire has been designed for completion by teachers as well as parents. Following permission from the mother, the questionnaire was mailed to the child's teacher with an enclosed stamped addressed envelope for return to the researcher. Teachers were informed that their responses would not be reported back to the child's family or school. No mention was made of the child's donor conception. Although no systematic information was obtained on whether the teachers were aware of the nature of the child's conception, interviews with mothers about disclosure generally suggested that few teachers, if any, would have known. For teachers' questionnaires, scores of 11 or below are classified as within the normal range, scores of 12–15 are classified as borderline and scores of 16 or above are classified as abnormal.

The SDQ has been shown to have good inter-rater reliability, with correlations between parent and teacher total scores reported to be 0.62. Evidence for validity comes from the high correlations between the total score of the SDQ and the total score of the Rutter Parent Questionnaire and the Rutter Teacher Questionnaire, designed to assess child psychiatric disorder. In addition, the SDQ discriminates well between psychiatric and non-psychiatric samples (Goodman, 1994 & 1997).

Analytic strategy

The interview and observational data relating to the quality of the mother-child relationship were analyzed using confirmatory factor analysis (CFA) to establish the underlying structure of the variables. The sample size was relatively small for this analytical approach. For models with 100 degrees of freedom or more (as is the case in this study) and good model fit ($RMSEA \geq .08$), 132 cases are necessary for a probability of .8 of rejecting the hypothesis of good fit (MacCallum, Browne & Sugawara, 1996). However, although the sample is 10 participants short of the required number, the strength of this approach is that it accounts for measurement error in the observed variables thus increasing power and decreasing sample size requirements (Duncan, Duncan & Strycker, 2006).

In the first instance, multiple groups CFA was used to establish a model of observational ratings of mother-child mutuality and interview ratings of maternal positivity and maternal negativity in the three groups simultaneously (natural conception, gamete donation not informed, gamete donation informed). This model was extended to address two hypotheses. First, that families with children conceived by gamete donation who had not been told of their genetic origins would experience lower levels of mutuality and maternal positivity, and higher levels of maternal negativity, than families with children who had been told and families with naturally conceived children. Second, that these group differences would be independent of group differences in child's age, mothers' age, occupational status, and number of siblings. The data on child psychological adjustment was analyzed using non-parametric χ^2 tests as the proportion of children obtaining scores indicative of psychological problems was very small.

Results

Mother-child relationship

Multiple-groups CFA was used to specify a model in which observed indicators of mother's and child's responsiveness, dyadic reciprocity and dyadic cooperation loaded onto a latent variable of mother-child mutuality; mothers' interview ratings of interaction, warmth and sensitivity loaded onto a latent variable of maternal positivity; and mothers' interview ratings of frequency of battle, level of battle, criticism and aggression loaded onto a latent variable of maternal negativity. Item-total correlations for mutuality, maternal positivity and maternal negativity respectively ranged from .29–.40, .39–.46 and .36–.45. Using Mplus 5 (Muthén & Muthén, 2007) with the guidelines proposed by Brown (2006), good model fit was evaluated using the following criteria: chi-square non-significant, root mean square error of approximation ($RMSEA \leq .06$), and comparative fit index (CFI) and Tucker-Lewis index (TLI) $\geq .95$. In addition, CFI and TLI values in the range .90–.95 indicated adequate model fit. The model was over-identified with 151 *df* and fitted the data well: $\chi^2 = 158.78$, $p = .32$, $RMSEA = .04$, $CFI = .94$, $TLI = .94$. Table 2 shows descriptive statistics for the indicators; Figure 1 shows completely standardized parameter estimates, including factor covariances. All factor loadings were statistically significant: $p < .05$. These results suggested that the factor loadings and indicator intercepts of the indicators of mother-child mutuality, maternal positivity and maternal negativity were equivalent across all three

groups, i.e. that the latent variables appeared to measure the same construct in the same way in each group, making subsequent comparisons of means meaningful and interpretable.

To test the first hypothesis, the within-group dispersion of the latent variables of mother-child mutuality, maternal positivity and maternal negativity was constrained to be equivalent across groups, to ensure latent means had a comparable scale across groups. Second, the means of each latent variable in the natural conception group were fixed to zero. This identified the natural conception group as the reference group, with the latent means in both gamete donation groups representing their deviation from the reference group's means. This model was over-identified with 157 *df* and fitted the data well: $\chi^2 = 164.32$, $p = .33$, RMSEA = .03, CFI = .95, TLI = .94. The mean comparisons revealed that, compared with the natural conception group, the gamete donation not informed group had a significantly lower completely standardized mean for both mother-child mutuality: *estimate* = $-.70$, $z = 2.26$, $p < .05$; and for maternal positivity: *estimate* = $-.69$, $z = 2.27$, $p < .05$; but not for maternal negativity: *estimate* = $.05$, $z = .17$, $p = .86$. The gamete donation informed group had a marginally lower completely standardized mean for mother-child mutuality than the natural conception group: *estimate* = $-.71$, $z = 1.96$, $p = .05$; but not for maternal positivity or maternal negativity: *estimate* $\leq .50$, $z \leq 1.53$, $p \geq .13$. The model was run again to compare the gamete donation informed and not informed groups. There were no significant differences between the informed and not informed groups' completely standardized means for all three latent variables: *estimate* $\leq .13$, $z \leq 1.00$, $p \geq .32$.

To address the second hypothesis, this multiple-groups CFA was run with occupational status covaried as only the association between maternal negativity and occupational status was significant. This model was over-identified with 187 *df*, and model fit was adequate to good: $\chi^2 = 201.01$, $p = .23$, RMSEA = .04, CFI = .91, TLI = .90. With this effect controlled, the gamete donation not informed group still had a significantly lower completely standardized mean than the natural conception group for both mother-child mutuality: *estimate* = $-.67$, $z = 2.17$, $p < .05$; and for maternal positivity: *estimate* = $-.62$, $z = 2.00$, $p < .05$; but not for maternal negativity: *estimate* = $.05$, $z = .16$, $p = .87$. The gamete donation informed group still had a marginally lower completely standardized mean for mother-child mutuality than the natural conception group: *estimate* = $-.71$, $z = 1.96$, $p = .05$; but not for maternal positivity or negativity: *estimate* $\leq .50$, $z \leq 1.61$, $p \geq .11$. The model was re-run to compare the gamete donation informed and not informed groups. There were no significant differences on the completely standardized means for all three latent variables: *estimate* $\leq .35$, $z \leq 1.04$, $p \geq .30$.

Child psychological adjustment

As shown in Table 3, there were no differences in either mothers' or teachers' SDQ scores between family types. The large majority of children obtained SDQ scores within the normal range. Of the 117 children whose mother completed the questionnaire, only 2 obtained a score within the borderline range (1 gamete donation informed, 1 gamete donation not informed) and 2 obtained a score within the abnormal range (both natural conception). Of the 92 children whose teacher completed the questionnaire, 6 obtained a borderline score (1 gamete donation informed, 3 gamete donation not informed, 2 natural conception) and 3 obtained an abnormal score (1 gamete donation not informed, 2 natural conception). There was no significant group difference in the proportion of children classified as borderline or abnormal for mothers': $\chi^2(4) = 4.59$, $p = .33$, or teachers': $\chi^2(4) = 1.71$, $p = .79$, SDQ scores.

With respect to the assessment of psychiatric disorder by the child psychologist, only 3 of the 122 children were rated as having a definite or marked disorder, all of whom had been conceived by gamete donation. Two of these children had been told about their donor

conception (1 donor insemination child with emotional problems and 1 egg donation child with enuresis) and one had not been told (an egg donation child with speech and language difficulties). There was no significant difference according to family type in the proportion of children classified as having a definite or marked disorder.

Discussion

No differences between family types were found for maternal negativity showing that conflict and hostility between mothers and children is no higher in non-disclosing than disclosing gamete donation families or natural conception families. In addition, the children were found to be functioning well. Only 2 (1.7%) children obtained a mother's SDQ score in the abnormal range, neither of whom was donor conceived, and 3 (2.2%) children obtained a teacher's SDQ score in the abnormal range, only 1 of whom was donor conceived. Three children (2.5%) were rated by a clinical child psychologist as having a marked psychiatric disorder. Although all three had been conceived by gamete donation, one was diagnosed as having a developmental disorder which is unlikely to be associated with the quality of relationship between the parents and the child.

These findings are in line with our initial studies of donor insemination (Golombok et al., 1996, 2002) and egg donation (Golombok et al., 1999) families conducted when assisted reproduction was less widespread, and with the previous phases of the present investigation (Golombok et al., 2004; Golombok et al., 2005; Golombok et al., 2006), and add weight to the earlier conclusion that the absence of a genetic link between the mother and the child in gamete donation families does not have an adverse effect on mother-child relationships or children's psychological wellbeing.

Although mother-child relationships were not found to be more negative in gamete donation than in natural conception families, these relationships were found to be less positive. The gamete donation families differed from the natural conception families in both the observational rating of mother-child mutuality and the interview rating of maternal positivity, with less positive interaction shown by the gamete donation families. These differences appear to be largely accounted for by the gamete donation families who had not disclosed the donor conception to the child as the non-disclosing families obtained significantly lower scores than the natural conception families for both mother-child mutuality and maternal positivity whereas the disclosing families obtained only marginally lower scores than the natural conception families for mother-child mutuality and did not differ from the natural conception families for maternal positivity.

It seems, therefore, that lack of communication about the child's genetic origins may interfere with positive interaction between mothers and their children. The significantly lower levels of mother-child mutuality and maternal positivity between non-disclosing gamete donation families and the natural conception families, but only marginally lower levels of mutuality and similar levels of maternal positivity between disclosing gamete donation families and the natural conception families, suggest that the secrecy surrounding the child's donor conception is associated with less positive mother-child interaction in gamete donation families.

Although the present study was not designed to examine the mechanisms involved in the less positive mother-child interaction in non-disclosing than disclosing gamete donation families, it may be relevant that children can sense when they are not being told something because a taboo surrounds the discussion of certain topics (De Paulo, 1992). In the case of gamete donation, parents may change their tone of voice, facial expression or body posture, or change the topic of conversation, whenever the subject of whom the child looks like

comes up. From a psychoanalytic perspective, Ehrensaft (2008) claimed that children acquire unconscious knowledge about their origins through inadvertent transmissions or “slips” on the part of parents or others who are aware of the child’s donor conception, a situation that is not unlikely given that more than 50% of parents who do not disclose the donor conception to their child have confided in a friend or family member (Cook, et al., 1995; Golombok et al., 2004). There is evidence from qualitative data to suggest that some donor conceived individuals suspected in childhood that something was amiss (Jadva, et al., 2009; Turner & Coyle, 2000) and a study of donor conceived adults found that greater parental avoidance of the topic of donor insemination was associated with poorer family functioning (Paul & Berger, 2007). It is important to point out that parents who do not disclose may differ from those who do in other ways that may influence parenting and child outcomes. They may, for example, be less communicative generally or have greater discomfort with negative emotion, both of which may lead to less positive mother-child interaction as well as a reticence to disclose potentially conflict-producing information about the child’s genetic origins.

The less positive interaction between mothers and children in non-disclosing families was not associated with emotional or behavioral problems in the children as no differences were found between the non-disclosing families and the other family types for any of the measures of child psychiatric disorder. Moreover, none of the children in non-disclosing families obtained a mothers’ SDQ score in the abnormal range, and only 3.7% of children obtained a teachers’ SDQ score in the abnormal range, a lower proportion than the 8% expected from UK general population norms for children of this age (Meltzer, Gatward, Goodman, & Ford, 2000).

A particular advantage of the present study is that it allowed the consequences of secrecy versus openness about the child’s genetic origins for the quality of mother-child relationships and children’s psychological wellbeing to be examined for the first time, and at an age when children have begun to understand the full implications what it means to be donor conceived. The only other study to have compared the psychological adjustment of children who had been told about their donor conception with those who had not included only 6 children who were aware of their conception by donor insemination (Lycett, Daniels, Curson, & Golombok, 2004). Interestingly, however, the differences that were identified similarly indicated less positive parent-child relationships in the non-disclosing than in the disclosing families.

Although gamete donation and adoption are similar in that the child lacks a genetic link with a parent, it has been argued that gamete donation differs from adoption in ways that may protect children who are not told about their genetic origins against psychological harm. Firstly, unlike adopted children, donor insemination and egg donation children do have a genetic link with one parent. Secondly, parents of donor insemination and egg donation children have experienced the pregnancy and birth of the child which increases the opportunity for prenatal bonding and may ease the transition to parenthood. Thirdly, the children were not relinquished by their genetic parents following their birth and were born to parents who went to great lengths to conceive them. Nevertheless, it seems from the findings of the present study that the similarities between gamete donation families and adoptive families may also be important. Like adoptive families, gamete donation families may benefit from open communication about the child’s genetic origins.

It might be expected that the presence of psychological problems in the children may have been played down by gamete donation mothers who may wish to present their child in a favorable light either as a reaction to the stigma that is associated with assisted reproduction involving donated gametes, or because they feel they must live up to high expectations of

themselves as mothers given the difficulties they had to overcome in order to have a child. However, the teacher questionnaire, and the assessment by the child psychologist who was unaware of the types of family in the study, provided independent ratings of the presence of emotional or behavioral problems in the children that confirmed the mothers' reports. Moreover, the interview procedure, which involved lengthy and detailed questioning as well as the assessment of non-verbal aspects of the mothers' responses, and the observational measure, were designed to minimize socially desirable responding. The fact that the difference between the non-disclosing gamete donation families and the natural conception families was identified both by interview and by observational assessment adds weight to the conclusion that non-disclosing families show less positive mother-child relationships.

The study adopted a latent variable approach to examine differences in mother-child relationship quality between family types. Thus it was possible to establish that the latent variables of mother-child mutuality, maternal positivity and maternal negativity were measured equivalently in each group, and to demonstrate that the differences identified appear to reflect genuine differences in the underlying construct rather than variation in construct measurement across the three groups. A further advantage of this approach is that it is particularly suited to the dichotomous and interval variables that formed the basis of the study.

This investigation is among the first worldwide to provide empirical data on the outcomes for children of assisted reproduction procedures involving the separation of genetic from social parenting, and it should be emphasized that the children conceived by gamete donation did not show significant problems. The study of donor insemination families by Chan et al. (1998) reported similarly positive child outcomes in predominantly lesbian and single mother families. Our study is one of the first to have adopted a longitudinal approach and thus sheds light on the role of genetic ties in mother-child relationships and children's psychological adjustment as children grow up.

The findings of the study have implications both for policy-making and clinical practice. The President's Council on Bioethics (2004) concluded that the incompleteness of basic information on the uses and impact of new reproductive technologies makes any conclusive policy judgments very difficult to formulate, and recommended that studies of the impact of assisted reproductive technologies for women and children should be undertaken. A major policy issue at the present time is whether or not children conceived by gamete donation should have access to identifying information about their donor. The Ethics Committee of the American Society for Reproductive Medicine (2004) has come out in support of disclosure to offspring about the use of donor gametes, and in Sweden, Norway, the Netherlands, Austria, Switzerland, the Australian States of Victoria and Western Australia, New Zealand and the United Kingdom, children conceived by gamete donation have access to identifying information about their donor on reaching adulthood.

An important clinical question relates to the impact on children's psychological adjustment of the age at which they are told about the circumstances of their birth. Studies of adoptive families show that the earlier children are informed about their adoption, the better the outcome in terms of their emotional and identity development, and it is now recommended that children are told about their adoption in the preschool years (Brodzinsky et al., 1998). The findings of the present study similarly suggest that assisted reproduction families may benefit from disclosure to children about the nature of their conception before they enter school.

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Figure 1. Multiple-group confirmatory factor analyses of mother-child mutuality, maternal positivity, and maternal negativity

Table 1

Sociodemographic information by family type

	Natural conception		Donor insemination		Egg donation		F	df	p
	Mean	SD	Mean	SD	Mean	SD			
Age of child (months)	91.57	3.85	88.36	2.97	88.91	3.29	11.15	2,119	< .001
Age of mother (years)	42.09	3.06	41.61	3.63	47.13	6.01	18.61	2,119	< .001
Child's sex	n	%	n	%	n	%	χ^2		p
Boy	26	48	19	53	20	63	1.67	2	.43
Girl	28	52	17	47	12	37			
Social class									
Professional	28	52	11	31	14	44	17.51	4	< .01
Managerial / technical	25	46	13	36	10	31			
Skilled / non-manual	1	2	12	33	8	25			
Number of siblings									
None	3	6	14	39	14	44	23.17	4	< .001
One	45	83	17	47	13	41			
Two	6	11	5	14	5	15			

Table 2
Descriptive statistics for indicators of mother-child mutuality, maternal positivity and maternal negativity, by family type

	Natural conception				Gamete donation not informed				Gamete donation informed			
	Mean	SD	Range		Mean	SD	Range		Mean	SD	Range	
Mother-child mutuality	M responsiveness	5.32	.68	3–6	5.03	.68	3–6		5.00	.86	3–6	
	C responsiveness	4.82	.92	2–6	4.58	.98	1–6		4.35	.99	2–6	
	D reciprocity	1.80	1.01	0–5	1.53	.80	0–3		1.75	1.33	0–5	
	D cooperation	1.58	1.14	0–5	1.05	.80	0–3		1.35	.99	0–4	
Maternal Positivity	Interaction	1.46	.57	0–2	1.24	.61	0–2		1.17	.65	0–2	
	Warmth	1.06	.79	0–2	.84	.80	0–2		1.17	.72	0–2	
	Sensitivity	1.52	.64	0–2	1.10	.58	0–2		1.24	.62	0–2	
Maternal negativity	Frequency of battle	1.26	.76	0–2	1.31	.73	0–2		1.52	.67	0–2	
	Level of battle	1.15	.53	0–2	1.24	.43	1–2		1.26	.54	0–2	
	Criticism	1.11	.66	0–2	1.11	.61	0–2		1.09	.60	0–2	
	Aggression	1.11	.60	0–2	1.16	.64	0–2		1.30	.47	1–2	

Table 3

Means, standard deviations and number of children in the clinical range for mother- and teacher-rated SDQ, and diagnosis of psychiatric disorder, by family type

	NC		DC not told		DC told		F	df	p
	Mean	SD	Mean	SD	Mean	SD			
Mother SDQ	5.31	3.88	5.64	3.36	5.86	3.83	0.19	2,114	.82
Teacher SDQ	4.83	4.69	7.03	4.03	5.11	4.10	2.43	2,89	.09
	n	%	n	%	n	%	χ^2		p
Mother SDQ	49	96	43	98	21	95	4.59	4	.33
Normal									
Borderline	0	0	1	2	1	5			
Abnormal	2	4	0	0	0	0			
Teacher SDQ	38	90	27	87	18	95	1.71	4	.79
Normal									
Borderline	2	5	3	10	1	5			
Abnormal	2	5	1	3	0	0			
Psychiatric rating	54	100	44	98	21	91	5.75	2	.06
Normal									
Disorder	0	0	1	2	2	9			

Note. SDQ = Strengths and Difficulties Questionnaire