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# Families created by assisted reproduction: Parent–child relationships in late adolescence

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**Abstract**

This paper presents the findings of the third phase of a longitudinal study of families created by assisted reproduction. The quality of parent–child relationships was examined close to the adolescent's 18th birthday in 26 *in vitro* fertilization (IVF) families and 26 donor insemination (DI) families in comparison with 38 adoptive families and 63 natural conception families matched for demographic characteristics. A significantly higher level of mother–adolescent warmth was found between the assisted reproduction and the adoptive families, between the DI and natural conception families and between the DI and IVF families. IVF mothers showed significantly greater disciplinary indulgence than natural conception mothers, and significantly lower disciplinary aggression than DI mothers. No differences were identified between fathers for warmth or conflict. Only 2 DI children were aware of their donor conception.


*Keywords:* In vitro fertilization; Donor insemination; Adoption; Parenting

## Introduction

In the years since the birth of the first "test-tube" baby, Louise Brown, in 1978, *in vitro* fertilization (IVF) has moved from the realms of science fiction to become a commonly accepted

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treatment for infertility. IVF involves the fertilization of an egg with sperm in the laboratory and the transfer of the resulting embryo to the mother's womb (Steptoe & Edwards, 1978). When the mother's egg and the father's sperm are used, both parents are genetically related to the child. Donor insemination (DI) is a much simpler procedure than IVF, involving the insemination of a woman with sperm of a man who is not her husband or partner, which results in a child who is genetically unrelated to the father. Although DI has been practiced for more than a century to enable couples with an infertile male partner to have children (Achilles, 1992), it was only after the introduction of IVF, and the resultant increase in the availability of fertility treatment, that DI became widely used.

It may seem that the only difference between IVF and natural conception is the conception itself. However, there are a number of reasons why having a child by IVF may result in a rather different experience for parents. It has been suggested that the stress of infertility and its treatment may lead to parenting difficulties when a long-awaited baby is eventually born. Burns (1990) argued that parents who had difficulty in conceiving might become emotionally over-invested in their long-awaited child, and other authors have suggested that those who become parents following infertility may be overprotective of their children, or may have unrealistic expectations of them, or of themselves as parents (Hahn & DiPietro, 2001; McMahon, Ungerer, Beaurepaire, Tennant, & Saunders, 1995; Mushin, Spensley, & Barreda-Hanson, 1985; Van Balen, 1998). Additionally, it has been predicted that infertility may lead to psychological problems and marital difficulties for those who become parents following IVF (McMahon et al., 1995).

DI has become a focus of greater concern than IVF in recent years due to the secrecy that surrounds this procedure; the majority of children conceived in this way remain unaware that the person they know of as their father is not their genetic parent (van Berkel, van der Veen, Kimmel, & te Velde, 1999; Brewaeys, 1996). Drawing from research on adoption (Baran & Pannor, 1993; Daniels & Taylor, 1993; Snowden, 1990; Snowden, Mitchell, & Snowden, 1983), and family therapy (Baran & Pannor, 1993; Clamar, 1989), it has been argued that secrecy about DI will have a damaging effect on the quality of the relationship between the parents and the child.

Empirical studies of parenting and parent–child relationships in assisted reproduction families have mainly concentrated on the pre-school and early school years, with the large majority of investigations focusing on IVF rather than DI families. Studies of IVF families with infants and toddlers have been conducted in Australia (Gibson, Ungerer, & Leslie, 1999; Gibson, Ungerer, McMahon, Leslie, & Saunders, 2000; McMahon et al., 1997, 2003), the Netherlands (Colpin, Demyttenaere, & Vandemuelebroecke, 1995; Van Balen, 1996), France (Raoul-Duval, Bertrand-Servais, & Letur-Konirsch, Frydman, 1994) and the United Kingdom (Weaver, Clifford, Gordon, Hay, & Robonson, 1993). These have generally found no evidence of psychological problems among IVF parents. With respect to parent–child relationships, the few differences that have been identified between IVF and natural conception families reflect more positive feelings toward the baby but also a tendency to view the baby as more vulnerable (Gibson, Ungerer, McMahon, et al., 2000; Van Balen, 1996; Weaver et al, 1993). In an investigation of the security of infant-mother attachment using the Strange Situation procedure, IVF infants aged 12 months were found to show predominantly secure attachment relationships (Gibson, Ungerer, Tennant, & Saunders, 2000). In a study of toddlers, no differences in the behavior of 24–30-month-old IVF and naturally conceived children, as rated during an interaction task with the mother, were found by Colpin et al. (1995). The first investigation to be conducted in a non-Western culture examined

IVF families with pre-school and early school age children in Taiwan (Hahn & DiPietro, 2001). The quality of parenting was generally found to be good, although IVF mothers showed greater protectiveness of their children.

The only study to have compared samples of IVF and DI families, and thus to provide information about the relative consequences for parent–child relationships of a ''high-tech''-assisted reproductive technique and a procedure that results in the absence of a genetic link between the father and the child, is the Longitudinal Study of Assisted Reproduction Families. The first phase was conducted when the children were aged between 4 and 8 years (Golombok, Cook, Bish, & Murray, 1995). Contrary to expectations, it was found that the IVF and DI parents showed greater warmth to their children, were more emotionally involved with them, interacted with them more, and reported less stress associated with parenting than the comparison group of natural conception parents. The other comparison group of adoptive parents fell between the assisted reproduction and natural conception parents with respect to these variables. These results suggested that genetic ties are less important for family functioning than a strong desire for parenthood. The most striking finding to emerge from the study was that not one set of DI parents had told their child about their genetic origins (Cook, Golombok, Bish, & Murray, 1995). A replication of this study in Spain, Italy and the Netherlands confirmed the findings of the original investigation (Golombok et al., 1996).

Phase two was carried out as the children entered adolescence at around 12 years of age. The findings pointed to high levels of psychological well-being and marital satisfaction among the assisted reproduction parents, and a high level of warmth between parents and their children accompanied by an appropriate level of discipline and control (Golombok, MacCallum, & Goodman, 2001; Golombok, MacCallum, Goodman, & Rutter, 2002). No differences were identified between the DI and the IVF families for any of the variables relating to the quality of relationship between the parents and the child. However, the more positive findings for the assisted reproduction families in comparison with the natural conception families, identified when the children were aged 4–8 years, were no longer apparent when the children were aged 12. Again, the findings were replicated in the wider European sample (Golombok, Brewaeys, & Giavazzi, 2002). Only 8.6% of the total sample of 100 sets of DI parents were found to have disclosed the donor conception to their adolescent child.

The aim of this third phase of the study was to follow up the UK families during the children's late adolescence at age 18, the time at which many young people are entering the workforce or higher education, leaving home, and becoming involved in intimate relationships. By this age, adolescents have developed distinct relationships with each parent, for example, they may be close to their mother and distant from their father (Harter, 1999). This is also the age at which adoptees in the UK are permitted to seek information about their birth parents. The present paper focuses on the quality of parent–child relationships in the four family types (IVF, DI, adoptive and naturally conceived). Aspects of parenting that are generally considered to be important for adolescent well-being are parental warmth in combination with appropriate control, and the facilitation of autonomy (Baumrind, 1991; Collins, 1990; Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Steinberg, 1990). Factors that are likely to have a detrimental effect include parental psychiatric disorder such as depression (Downey & Coyne, 1990) and marital conflict (Cummings & Davies, 1994; Grych & Fincham, 1990; Harold & Conger, 1997). With respect to adoption, a warm and accepting attitude toward the child, coupled with realistic parenting

expectations and satisfaction with adoptive parenthood, is associated with more positive adjustment among adoptees (Brodzinsky, Smith, & Brodzinsky, 1998). In so far as adolescents conceived by assisted reproduction experience good quality parenting, i.e. parenting that fosters autonomy in the context of parental acceptance and appropriate control, they would not be expected to show negative psychological consequences arising from the method of their conception. However, specific aspects of assisted reproduction, such as parental overprotection, unrealistically high expectations of the child and secrecy about the child's genetic origins, may have an adverse effect on the quality of the relationship between these parents and their adolescent child.

## Method

### *Participants*

At the time of the second phase of the study, parents were asked for permission to contact them again for follow-up (see Golombok et al., 1995; Golombok, MacCallum, Goodman, & Rutter, 2002 for details of recruitment of families to first and second phases of the study, respectively). Those who agreed (93%) were approached by telephone or letter as close as possible to their adolescent's 18th birthday.

Twenty-six families with an adolescent conceived by IVF, 26 families with an adolescent conceived by donor insemination, 38 adoptive families (where the child had been adopted in infancy) and 63 families with a naturally conceived adolescent (where the parents had been diagnosed as having an infertility problem but had not used IVF or gamete donation to conceive their child) agreed to participate in the third phase of this longitudinal study. This latter group was chosen to control for infertility. The cooperation rates for families with IVF, DI, adoptive, and naturally conceived adolescents, respectively, were 83%, 79%, 81% and 81%. Excluding those families who could not be traced, the corresponding rates were 96%, 87%, 93% and 93%.

There were similar proportions of boys and girls in each family type. However, the age of the target adolescent differed between groups, $F(3, 149) = 3.39$, $p < 0.05$. The DI adolescents were the youngest (mean age, 17 years 4 months) and the adopted adolescents were the oldest (mean age, 19 years 6 months). A significant difference was found for mother's age, $F(3, 149) = 9.80$, $p < 0.001$, with the mothers in the DI families being the youngest (mean age, 49 years) and the mothers in the adoptive group being the oldest (mean age, 54 years). A significant difference was also found for father's age, $F(3, 120) = 4.63$, $p < 0.01$. Fathers in the natural conception families were the youngest (mean age, 51 years) and the fathers in the adoptive group were the oldest (mean age, 55 years).

Eighty-eight percent of parents were still married or co-habiting at the time of the study (excluding 3 couples where the father had died). Eighteen couples had separated or divorced (2 IVF, 6 DI, 1 adoptive and 9 natural conception). Although the proportion of parents who had separated or divorced did not differ significantly between family types, there was a non-significant trend ($\chi^2 = 7.82$, $p = 0.05$) toward a higher proportion of divorced or separated parents in the DI (25%) and natural conception families (14%) than in the IVF (8%) and adoptive (3%) families. No significant difference was found between family types with respect to social class as measured

by the occupation of the parent with the highest-ranking position according to a modified version of the Registrar General's classification. Occupational classifications ranged from 1 (professional/managerial) to 4 (partly skilled or unskilled). A significant difference was found for the presence of siblings, $F(3, 149) = 6.64$, $p < 0.001$, with fewer of the IVF and DI adolescents having siblings than the adoptive and naturally conceived adolescents. There were no differences between family types in relation to the proportion of adolescents who had left school or had left home. As significant differences were found between groups for the child's age, the mother's age, the father's age and the presence of siblings, these demographic variables were entered into all further analyses as covariates, with mother's age and father's age used for the mothers' and fathers' data, respectively.

All of the adopted adolescents knew of their adoption and all but one of the IVF adolescents knew that they have been conceived by IVF. In contrast, only two sets of DI parents (8%) had told their child about their donor conception. Three (11%) were undecided about whether or not to disclose this information in the future, and 21 (81%) planned definitely not to tell.

### *Procedure*

The families were visited at home by a researcher trained in the study techniques. Information was collected separately from the mother and the father by means of a tape-recorded standardized semi-structured interview and standardized questionnaires. The mother's interview lasted 1–2 h, followed by the father's interview of approximately 45 min. Ninety-seven percent of mothers and 50% of fathers were interviewed. Fewer fathers than mothers were available for interview due to work commitments and because some were no longer living in the family home due to separation or divorce and 3 had died. The participation rate for fathers in the IVF, DI, adoptive and natural conception groups was 54%, 23%, 61% and 56%, respectively. Questionnaire data were obtained from 90% of mothers and 58% of fathers (some of the fathers who were unavailable for interview completed the questionnaires).

### *Measures*

#### *Parents' marital and psychological state*

For married or co-habiting couples, both parents completed the Golombok Rust Inventory of Marital State [GRIMS] (Rust, Bennun, & Golombok, 1990), a questionnaire measure of the quality of the marital relationship. All parents completed the Trait Anxiety Inventory [STAI] (Spielberger, 1983) and the Beck Depression Inventory [BDI] (Beck & Steer, 1987) to assess anxiety and depression, respectively. All of these questionnaires have good reliability and discriminate well between clinical and non-clinical groups. For each instrument, a higher score indicates greater difficulties.

#### *Parent–adolescent relationships*

*Interviews with parents*. The mothers were interviewed using an adaptation of a standardized interview designed to assess quality of parenting (Quinton & Rutter, 1988). Detailed accounts of the adolescent's behavior and the mother's response to it were obtained, with reference to the

adolescent's personality, progress at school and family relationships. A shortened version of this interview that focused on the father–child relationship was administered to fathers. Information obtained by interview was rated according to a standardized coding scheme by raters trained in the use of the coding scheme by one of the authors of the interview (DQ). Regular meetings were held to minimize rater discrepancy. This interview has been validated against observational ratings of mother–child relationships in the home, demonstrating a high level of agreement between global ratings of the quality of parenting by interviewers and observers, concurrent validity: $r = 0.63$. In the previous phase of this study conducted earlier in adolescence, 57 randomly selected interviews were coded by a second interviewer who was "blind" to family type (Golombok, MacCallum, et al., 2002). Agreement between raters ranged from 95% to 100% for all the variables used, with nonagreement defined as a >1-point difference on any scale. Pearson product–moment correlation coefficients between raters for individual variables are presented in Golombok, MacCallum, et al. (2002) and Golombok, Brewaeys, et al. (2002).

The following variables relating to parent–adolescent warmth were rated for mothers and fathers separately: (1) *parent to child warmth* was rated on a 4-point scale from 1 (little or none) to 4 (marked) and represented the level of demonstrative affection from the parent to the adolescent, (2) *child to parent warmth* was also rated on this 4-point scale representing the level of demonstrative affection from the adolescent to each parent, (3) *interaction with parent* measured the number of joint activities that the parent and adolescent had engaged in during the previous 3 months, (4) *conversation with parent* measured the number of days in the week that each parent and the adolescent had spoken for at least 10 min, and (5) *child confiding in parent* was rated on a 5-point scale from 1 (none) to 5 (some intimate disclosure) to assess the use of each parent as a confidant by the adolescent. In addition, two overall ratings were made for mothers and fathers separately from information gathered from the entire interview. (6) *Expressed warmth* was rated on a 6-point scale from 1 (none) to 6 (high) and took account of the parent's tone of voice and facial expressions in addition to their verbal report of their relationship with their adolescent child, and (7) *Emotional involvement* was rated on a 5-point scale from 1 (little or none) to 5 (enmeshed) and took into account the extent to which the parent was over-concerned or overprotective toward the child, and the extent to which the parent had interests apart from those relating to the child.

The following variables were rated for mothers and fathers separately in relation to conflict and control between themselves and their offspring: (1) *disciplinary aggression* was rated on a 6-point scale from 1 (none) to 6 (abusive) and measured how the parent reacted to the adolescent child in a situation of conflict (2) *disciplinary indulgence* was rated on a 6-point scale from 1 (none) to 6 (indulgent) and measured the degree of negotiation between the parent and the child with regard to control issues (3) *criticism* measured the degree of parental criticism of the child on a 5-point scale and ranging from 1 (no criticism) to 5 (criticism through much of the interview), and (4) *control* assessed the degree of parental control of the child on a 5-point scale ranging from 1 (little or no control, parent dominated by child) to 5 (over-controlling, restrictive parenting).

In addition, information was obtained by interview with the mother on the level of support with child-rearing that she received from her partner. Three ratings were made: (1) *father's help in control* was rated on a 7-point scale from 1 (exacerbates issues) to 7 (takes the load) and measured how much the father helped the mother when she was engaged in control issues with the

adolescent, (2) *parental coordination over control* was measured on a 5-point scale from 1 (active un-coordination) to 5 (coordinated action) and assessed the extent to which the mother and father acted in a joint and consistent way with respect to control issues, and (3) *reliability of father* was rated on a 5-point scale from 1 (no support) to 5 (very reliable) and measured the extent to which the father could be called upon and trusted to take some parenting responsibility.

*Questionnaires administered to parents.* Mothers and fathers completed the Parents of Adolescents Separation Anxiety Scale [PASAS] (Hock et al., 2001) to assess parental emotions associated with separation. The scale produces two subscale scores (i) *Anxiety about adolescent distancing*, a measure of the extent to which the parent feels worried about the adolescent's developing autonomy, and (ii) *Comfort with secure base role*, a measure of how secure the parent feels with respect to his or her relationship with the adolescent.

Each parent also completed the Conflict Behavior Questionnaire [CBQ] (Prinz, Foster, Kent, & O'Leary, 1979), an assessment of conflict between the parent and adolescent. The CBQ produces two subscale scores (i) *dissatisfaction with the adolescent's behavior* and (ii) *parent–adolescent conflict interaction*.

## Results

### *Parents' marital and psychological state*

#### *Mothers*

Using one-way analyses of covariance (ANCOVAs), a significant difference between family types was found for scores on the Trait Anxiety Inventory, $F(3, 137) = 2.90$, $p < 0.05$, reflecting lower anxiety among the DI mothers than both the natural conception ($p < 0.05$) and the adoptive ($p < 0.01$) mothers. No group differences were found for depression as assessed by the Beck Depression Inventory. Neither was there a difference between groups for degree of marital satisfaction as measured by the Golombok Rust Inventory of Marital State.

#### *Fathers*

One-way analyses of covariance (ANCOVAs) did not find a significant difference between family types for either the Trait Anxiety Inventory, the Beck Depression Inventory or the Golombok Rust Inventory of Marital State.

### *Parent–adolescent relationships*

The parent–adolescent relationship variables from the interviews and questionnaires were separated into two categories, warmth and conflict. The data were analyzed according to these two constructs separately for mothers and fathers using multivariate analyses of covariance (MANCOVAs). Where a significant group difference was found, the following contrast analyses were carried out to determine whether IVF and DI parents differed from the adoptive (AD) and natural conception (NC) parents, and whether the IVF and DI parents differed from each other: (1) IVF vs. AD (2) IVF vs. NC (3) DI vs. AD (4) DI vs. NC, and (5) IVF vs. DI.

*Mothers*

*Warmth*. The following warmth variables (expressed warmth, mother to child warmth, child to mother warmth, interaction with mother, conversation with mother, confiding in mother, emotional involvement, anxiety about distancing and comfort with secure base) were entered into a MANCOVA. Wilks's $\lambda$ was significant, $F(27, 301) = 1.57$, $p < 0.05$, showing an overall difference between the groups. Contrast analyses showed that the IVF and adoptive families differed in mother to child warmth ($p < 0.05$) and in child to mother warmth ($p < 0.05$), reflecting higher levels of warmth in the IVF than adoptive families for both variables. The DI families also showed a higher level of child to mother warmth ($p < 0.05$), a higher level of expressed warmth ($p < 0.05$) and a greater level of comfort with their secure base role than the adoptive families ($p < 0.05$). There were no differences for any of the warmth variables between the IVF and natural conception families. However, the DI mothers showed significantly higher levels of expressed warmth ($p < 0.05$) and emotional involvement ($p < 0.05$) than the natural conception mothers. In addition, in comparison to the natural conception mothers, the DI mothers showed greater comfort with their secure base role ($p < 0.01$). Regarding the comparisons between IVF and DI mothers, significant differences were found for expressed warmth ($p < 0.05$) and comfort with the secure base role ($p < 0.05$), with DI mothers showing higher levels in both instances. No differences were identified between any of the family types for interaction with the mother, conversation with the mother, confiding in the mother, or anxiety about adolescent distancing (see Table 1).

*Conflict*. The following conflict variables (disciplinary aggression, disciplinary indulgence, criticism, control, dissatisfaction with adolescent's behavior and conflict interaction) were entered into a MANCOVA. Wilks's $\lambda$ was significant, $F(18, 328) = 1.85$, $p < 0.05$, showing an overall difference between the groups. Contrast analyses showed the IVF mothers to differ from the natural conception mothers in disciplinary indulgence ($p < 0.05$), with IVF mothers showing greater disciplinary indulgence than the natural conception mothers. The IVF and DI mothers also differed significantly from each other in disciplinary aggression ($p < 0.05$) with IVF mothers

Table 1
Means, standard deviations (SDs) and *p*-values for mother–adolescent warmth by family type.

| | IVF | | DI | | Adoptive | | Naturally Conceived | | *p*-Value |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD | |
| Expressed warmth | 5.04 | 0.80 | 5.35 | 0.79 | 4.95 | 0.74 | 4.93 | 0.88 | $<0.05^{3,4,5}$ |
| Mother to child warmth | 3.60 | 0.70 | 3.42 | 0.90 | 3.19 | 0.96 | 3.52 | 0.59 | $<0.05^{1}$ |
| Child to mother warmth | 3.56 | 0.76 | 3.42 | 0.90 | 3.03 | 1.01 | 3.42 | 0.67 | $<0.05^{1,3}$ |
| Interaction with mother | 39.6 | 38.1 | 27.2 | 25.8 | 19.7 | 24.8 | 32.3 | 33.7 | ns |
| Conversation with mother | 6.13 | 1.89 | 5.73 | 2.32 | 5.11 | 2.66 | 5.62 | 2.30 | ns |
| Child confiding in mother | 4.04 | 1.09 | 4.19 | 1.09 | 3.68 | 1.33 | 4.17 | 0.99 | ns |
| Emotional involvement | 2.79 | 0.72 | 2.77 | 0.99 | 2.92 | 0.68 | 2.44 | 1.00 | $<0.05^{4}$ |
| Anxiety about distancing | 51.6 | 13.6 | 55.3 | 14.7 | 55.4 | 10.8 | 52.7 | 13.9 | ns |
| Comfort with secure base | 59.0 | 6.98 | 63.7 | 5.96 | 58.5 | 6.56 | 58.7 | 7.01 | $<0.05^{3,5}$ $<0.01^{4}$ |

*Note*: 1 = IVF vs. AD; 2 = IVF vs. NC; 3 = DI vs. AD; 4 = DI vs. NC; 5 = IVF vs. DI.

showing lower levels than DI mothers. There were no differences between family types for criticism, control or the two subscales of the Conflict Behavior Questionnaire (see Table 2).

*Father's contribution to parenting*. The following variables relating to the father's involvement in parenting according to mothers' reports (father's help in control, parental coordination over control and reliability of father) were entered into a MANCOVA. Wilks's $\lambda$ was not significant. Thus, no differences were identified between fathers in the different family types with respect to parenting support.

*Fathers*

*Warmth*. The following warmth variables (expressed warmth, father to child warmth, child to father warmth, interaction with father, conversation with father, confiding in father, emotional involvement, anxiety about distancing and comfort with secure base) were entered into a MANCOVA. Wilks's $\lambda$ was not significant, showing no overall difference between family types.

*Conflict*. The following conflict variables (disciplinary aggression, disciplinary indulgence, criticism, control, dissatisfaction with adolescent's behavior and conflict interaction) were entered into a MANCOVA. Wilks's $\lambda$ was not significant, showing no overall difference between family types.

## Discussion

The psychological well-being and marital quality of the mothers and fathers in the study was generally good, and did not differ according to family type apart from the lower levels of anxiety among the mothers of children conceived by donor insemination. However, a number of differences in parent–child relationships were identified between the assisted reproduction families and the families with adopted or naturally conceived children. The degree of warmth between mothers and their 18-year-old children was higher in both the IVF and DI families than in the adoptive families. Mother–adolescent warmth was also greater in the DI families than in the natural conception families, but no difference in warmth was found between the IVF and natural

Table 2
Means, standard deviations (SDs) and *p*-values for mother–adolescent conflict by family type.

| | IVF | | DI | | Adoptive | | Naturally conceived | | *p*-Value |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD | |
| Disciplinary aggression | 1.71 | 0.80 | 2.35 | 0.74 | 1.84 | 0.92 | 1.98 | 0.68 | $<0.05^{5}$ |
| Disciplinary indulgence | 3.46 | 0.58 | 3.35 | 0.56 | 3.30 | 0.57 | 3.22 | 0.46 | $<0.05^{2}$ |
| Criticism | 1.96 | 0.80 | 1.85 | 0.88 | 2.24 | 0.72 | 1.81 | 0.91 | ns |
| Control | 3.87 | 0.34 | 3.58 | 0.64 | 3.89 | 0.65 | 3.63 | 0.52 | ns |
| Dissatisfaction with adolescent's behavior | 3.79 | 4.56 | 3.62 | 4.53 | 4.88 | 5.25 | 4.91 | 13.1 | ns |
| Conflict interaction | 2.08 | 1.95 | 1.91 | 2.58 | 2.52 | 2.94 | 1.79 | 1.58 | ns |

*Note*: 1 = IVF vs. AD; 2 = IVF vs. NC; 3 = DI vs. AD; 4 = DI vs. NC; 5 = IVF vs. DI.

conception families. Regarding the comparison between the two types of assisted reproduction family themselves, higher levels of warmth were found among mother–adolescent dyads in the DI than in the IVF families. These findings are in line with both the first phase of the study when the children were of early school age and with the second phase conducted at age 12. Thus it appears that the positive relationships between mothers and their children remain a feature of assisted reproduction families throughout childhood. It is important to point out that the adoptive and natural conception families in this investigation did not show low levels of warmth. Instead, the findings indicated that mother–adolescent warmth in assisted reproduction families was particularly high.

With respect to conflict between mothers and their adolescent children, the differences that were identified for disciplinary indulgence related to the IVF and natural conception mothers, with IVF mothers showing more disciplinary indulgence than their counterparts with naturally conceived children. For disciplinary aggression, there was a difference between the IVF and DI mothers, with IVF mothers showing less disciplinary aggression than DI mothers. No differences in conflict were identified between the DI and the natural conception mothers, or between mothers from either type of assisted reproduction family and the adoptive mothers. Again, these findings are broadly similar to those found at earlier phases of the study. However, the greater disciplinary indulgence shown by IVF mothers at age 18 was not apparent at age 12, and it was the DI rather than the IVF mothers who showed lower levels of disciplinary aggression when the child was aged 12. In general, the differences in the present phase of the investigation between the assisted reproduction mothers and the natural conception mothers reflect a difference in disciplinary style rather than a difference in actual conflict, a finding that was also apparent at age 12.

Regarding the fathers, no differences were identified between fathers from the various family types for either warmth or conflict. Whereas the lack of difference for warmth matches the findings from age 12, the fathers of 12 year olds were found to differ with respect to conflict. DI fathers were less involved with the discipline of their 12-year-old children than were fathers from the other family types, especially in comparison with the natural conception fathers. However, the low cooperation rate for fathers in the present phase of the study means that it is unclear whether the lack of difference in conflict between DI fathers and the other groups of fathers at age 18 reflects a similar level of conflict between fathers and their adolescents in the different family types, or results from the reduced sample size and potential bias toward fathers who were least involved in the discipline of their children at age 12 being less likely to participate at age 18. In terms of mothers' reports of fathers' involvement in parenting, no group differences were found. This was also the case when the children were aged 12.

Thus the findings of this third phase of the study conducted when the children were at the transition from adolescence to early adulthood show that conception by assisted reproduction is not associated with difficulties in parent–child relationships through the adolescent years, the time at which difficulties in parent–child relationships in these families are expected to arise. Of particular interest is the positive relationship between DI mothers and their children, indicating that the involvement of a sperm donor in the child's conception does not have an adverse effect on the mother's relationship with her adolescent child. The clinical literature on this topic suggests that it is the relationship between the non-genetic parent, i.e. the father, and the child that is likely to be most at risk. Although there was no evidence in support of this prediction it is important to emphasize that many DI fathers did not participate in this phase of the study, and those who

declined to take part may have been those who were less involved with their child. The finding that a high proportion of DI parents had separated or divorced may also reflect more difficult or distant relationships between DI fathers and their children. Furthermore, the high levels of warmth between DI mothers and their adolescent children may stem from the higher proportion of single mothers in the DI families. It cannot be concluded whether the few differences in parent–child relationships that were identified in the study resulted from the nature of the child's conception or from the characteristics of those who opted for IVF, DI or adoption. The former explanation is more likely given that the decision by infertile couples to have IVF or DI is dependent on medical rather than psychological factors. The adoptive parents were similar to the IVF and DI parents in that they had undergone unsuccessful fertility treatment in the past. The IVF parents may have been more reluctant than the DI or adoptive parents to raise a non-genetic child but this cannot be established as they were not required to make this decision.

Due to ethical considerations, it was not possible to obtain data from the DI adolescents directly. The large majority was unaware of the donor conception and thus would not have been able to give fully informed consent to participate in the study. The adolescents from the other family types were interviewed and the findings reported elsewhere (Golombok, Owen, Blake, Murray, & Jadva, in press). Only two children conceived by donor insemination had been told about their genetic origins. Although secrecy about the donor conception does not appear to have resulted in difficulties in mother–child relationships in families where this information had not been disclosed to the child, no conclusions can be drawn about the impact of secrecy on father–child relationships due to the low participation rate of fathers. The two young people who were aware of their donor conception had been told in middle childhood. Although both found the disclosure upsetting at the time, neither was distressed about this by age 18. One wished to meet the donor and the other did not but wished to have some information about him. Neither felt that their relationship with their father or their mother had been affected by the discovery of their donor conception. Although studies of larger numbers of young people who are aware of their donor conception are required to understand the consequences of disclosure for donor conceived offspring it is noteworthy that the two young people who were aware of the nature of their conception were accepting of this information. The children in the present study were conceived at a time when secrecy was recommended. Recently there has been a trend toward greater openness and thus more will be learned in the years to come about the feelings and experiences of donor conceived children who are aware of their genetic origins.

A limitation of the study is that it focused on singleton children to avoid the confounding effects of multiple births. However, one-quarter to one-third of IVF pregnancies involve twins, triplets or more. Parents of IVF twins and triplets have been found to show higher levels of parenting stress and depression, and greater difficulties in parenting, than mothers of IVF singletons (Golombok, Olivennes, Ramogida, Freeman, & Rust, 2007; Olivennes, Golombok, Ramogida, & Rust, 2005). Thus the findings of the present investigation cannot be generalized to IVF families with multiple births. A further difficulty with a study of this kind is that the parents may have tended to present their relationship with their child in the best possible light due to the challenges they faced in achieving parenthood. The in-depth interview approach adopted in the investigation was designed to minimize this potential bias in responding. It is important to note that the sample sizes of the various family types meant that the statistical power to detect significant differences was quite low, particularly for fathers. Although non-significant, the

proportion of divorced and separated parents ranged from 25% in the DI group to 3% in the adoptive group, and the proportion of fathers who participated in the study ranged from 61% of adoptive fathers to 23% of DI fathers, suggesting that these differences may have reached statistical significance with larger samples.

The present study is the first to follow up children conceived by assisted reproduction at late adolescence. It appears from the findings that the quality of relationships between parents and their assisted reproduction adolescents is generally good, even in the absence of a genetic link between the father and the child. However, it is necessary to be circumspect regarding the relationship between DI fathers and their children due to the low cooperation rate of DI fathers. Moreover, it should be remembered that the large majority of DI children in the study were unaware that the person they knew of as their father was not their genetic parent.

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