

The European study of assisted reproduction families: the transition to adolescence

S.Golombok^{1,6}, A.Brewaeys², M.T.Giavazzi³, D.Guerra⁴, F.MacCallum¹ and J.Rust⁵

¹Family and Child Psychology Research Centre, City University, London, UK, ²Department of Gynaecology, Leiden University Hospital, The Netherlands, ³University of Milan, Italy, ⁴Institut Dexeus, Barcelona, Spain and ⁵Goldsmiths College, University of London, UK

⁶To whom correspondence should be addressed. E-mail: s.e.golombok@city.ac.uk

BACKGROUND: Findings are presented of the second phase of a European longitudinal study of families created by assisted reproduction. The present investigation reports on data obtained during the child's transition to adolescence. **METHODS:** A total of 102 IVF families, 94 donor insemination (DI) families, 102 adoptive families, and 102 families with a naturally conceived child were compared on standardized interview and questionnaire measures of parenting and children's psychological well-being. **RESULTS:** The assisted reproduction families were similar to the adoptive and natural conception families for many of the measures of the quality of parent-child relationships. To the extent that differences were found between the assisted reproduction families and the other family types, these reflected mainly more positive functioning among the assisted reproduction families, with the possible exception of the overinvolvement with their children of a small proportion of assisted reproduction mothers and fathers. The assisted reproduction children were functioning well and did not differ from the adoptive or naturally conceived children on any of the measures of psychological adjustment. However, only 8.6% had been told about their genetic origins. **CONCLUSIONS:** IVF and DI families with an early adolescent child appear to be functioning well.

Key words: adolescence/child development/donor insemination/IVF/parenting

Introduction

The introduction of IVF in 1978 (Steptoe and Edwards, 1978) gave rise to much concern that babies born through this procedure would show abnormalities. Although these fears proved to be unfounded in relation to physical development (e.g. Australian In Vitro Fertilization Collaborative Group, 1985; Lancaster, 1987; Beral *et al.*, 1990; Tan *et al.*, 1992; Rufat *et al.*, 1994; Wang *et al.*, 1994; Tanbo *et al.*, 1995; Society for Assisted Reproductive Technology Registry, 1999; Westergard *et al.*, 1999), there remained a number of concerns about the potentially adverse consequences of assisted reproduction for children's psychological development and for parenting. It has been argued, for example, that dysfunctional patterns of parenting may be a feature of these families due to the difficulties experienced by the mothers and fathers in their quest for a child. According to one study (Burns, 1990), parents who had difficulty in conceiving may emotionally overinvest in their much longed-for child. Other authors have also suggested that those who become parents after a period of infertility may be overprotective of their children, or may have unrealistic expectations of them, or of themselves as parents, due to the difficulties they experienced in their attempt to conceive (Mushin *et al.*, 1985; McMahon *et al.*, 1995; van Balen, 1998; Hahn and DiPietro, 2001). Psychological disorder

and marital problems have also been predicted for those who become parents following infertility treatment (McMahon *et al.*, 1995).

There are additional concerns in relation to families where donated sperm have been used in the child's conception. For example, parents may feel or behave less positively towards a non-genetic than a genetic child, and may not fully accept the child as their own. This may have an undermining effect on the child's sense of identity and psychological well-being. Fathers, in particular, might be expected to be more distant from their child (Baran and Pannor, 1993; Snowden and Snowden, 1998). A further issue is that the majority of adults and children conceived in this way remain unaware that the person they believe to be their father is not their genetic parent. In recent years there has been growing unease about the secrecy that surrounds families created by donor insemination (DI). It has been argued that secrecy will have an insidious and damaging effect on family relationships and, consequently, on the child (Snowden *et al.*, 1983; Clamar, 1989; Snowden, 1990; Baran and Pannor, 1993; Daniels and Taylor, 1993; Landau, 1998; McWhinnie, 2001).

It seems, from the evidence available so far, that such concerns are unfounded. Studies of IVF families where the mother and the father are the genetic parents of the child have

generally found the parents to be well adjusted and to have good relationships with their children (Weaver *et al.*, 1993; Raoul-Duval *et al.*, 1994; Colpin *et al.*, 1995; van Balen, 1996; McMahon *et al.*, 1997; Gibson *et al.*, 2000). The few differences that have been found between IVF and natural conception parents have tended to reflect higher levels of anxiety about parenting by mothers of IVF babies (Weaver *et al.*, 1993; Colpin *et al.*, 1995; McMahon *et al.*, 1997; Gibson *et al.*, 2000; Hahn and DiPietro, 2001). More positive results have also been reported for IVF mothers with respect to warmth and emotional involvement with their child (Weaver *et al.*, 1993; van Balen, 1996; Hahn and DiPietro, 2001).

Rather fewer studies have been carried out on parenting in families created by DI than on parenting in IVF families where the child is genetically related to both parents. In a review of the 12 studies of parents' disclosure of DI published between 1980 and 1995 (Brewaeys, 1996) it was found that few parents (between 1 and 20%) intended to tell their child about her or his genetic origins, and in eight of the 12 studies fewer than 10% of parents intended to tell. Even in Sweden, where legislation gives individuals the right to obtain information about the donor and his identity, a recent survey found that only 11% of parents had informed their child about the DI (Lindblad *et al.*, 2000). In spite of their decision to opt for secrecy, almost half of the parents included in Brewaeys' (1996) review had told at least one other person that they had conceived as a result of DI, thus creating a risk that the child would find out through someone else. Some parents come to regret their earlier openness once the child has been born (Back and Snowden, 1988; Amuzu *et al.*, 1990; Klock and Maier, 1991).

Brewaeys also examined studies of the characteristics of DI parents (Brewaeys, 1996, 2001). She found that in the large majority of cases, DI was felt by parents to be a positive choice and, with few exceptions, fathers reported that DI did not influence their relationship with their child and felt themselves to be 'real' fathers. However, these investigations were based on questionnaire data of variable quality and no control groups had been employed. Regarding psychological adjustment and marital satisfaction, there was little indication of problems in couples who opted for DI (Reading *et al.*, 1982; Klock and Maier, 1991; Schover *et al.*, 1992; Owens *et al.*, 1993; Klock *et al.*, 1994).

With respect to the children themselves, there is no evidence from any of the studies conducted to date to suggest that singleton IVF children born at full term are at risk for cognitive impairment (Mushin *et al.*, 1985, 1986; Yovich *et al.*, 1986; Morin *et al.*, 1989; Brandes *et al.*, 1992; Raoul-Duval *et al.*, 1993; Ron-El *et al.*, 1994; Cederblad *et al.*, 1996; Olivennes *et al.*, 1997; Gibson *et al.*, 1998; Levy-Shiff *et al.*, 1998). The social and emotional development of IVF children also appears to be within the normal range as assessed by maternal ratings and observational measures (Colpin *et al.*, 1995; Cederblad *et al.*, 1996; van Balen, 1996; McMahon *et al.*, 1997; Gibson *et al.*, 1998; Montgomery *et al.*, 1999; Gibson *et al.*, 2000) with only one study reporting a higher incidence of psychological problems among IVF children (Levy-Shiff *et al.*, 1998).

Studies of the cognitive development of children conceived

by DI point to superior cognitive functioning (Izuka *et al.*, 1968; Clayton and Kovacs, 1982; Leeton and Blackwell, 1982; Milson and Bergman, 1982; Amazu *et al.*, 1990; Manuel *et al.*, 1990). These findings have not been supported by large-scale controlled investigations but could conceivably result from the use of high ability donors. The first uncontrolled studies of the socio-emotional development of children conceived by DI found no evidence of raised levels of emotional or behavioural problems (Clayton and Kovacs, 1982; Leeton and Blackwell, 1982). Although a higher incidence of psychological problems among DI than naturally conceived children as assessed by an interview with parents has been reported (Manuel *et al.*, 1990), a controlled study that used standardized measures showed no evidence of psychological disorder in children conceived by DI (Kovacs *et al.*, 1993).

The European Study of Assisted Reproduction Families examined the quality of parenting and socio-emotional development of children in families created as a result of both IVF and DI, in comparison with naturally conceived and adoptive families, in Italy, Spain, The Netherlands and the UK (Golombok *et al.*, 1996). In the first phase of the study, conducted when the children were aged between 4 and 8 years, representative samples of 116 families with a child conceived by IVF (where the child was genetically related to both parents) and 111 families with a child conceived by DI were compared with 120 families with a naturally conceived child and 115 families with a child adopted in infancy. The families were matched as closely as possible with respect to demographic characteristics. Mothers of children conceived by assisted reproduction were found to express greater warmth toward their child, to be more emotionally involved with their child, to interact more with their child and to report less stress associated with parenting than the natural conception comparison group. In addition, assisted reproduction fathers reported less parenting stress, and were reported by mothers to interact with their child more, than fathers with a naturally conceived child. The adoptive parents' ratings on these variables were closely comparable with those of the assisted reproduction parents. Thus the findings of this study indicated that the quality of parenting in families with a 4–8 year old child conceived by assisted reproduction was superior to that shown by families with a naturally conceived child. No differences in parenting were identified between IVF and DI families, suggesting that genetic ties are less important for family functioning than a strong desire for parenthood. Where parents in the different family types differed with respect to anxiety, depression, or marital satisfaction, this reflected greater difficulties among the natural conception parents.

In addition to these measures, mothers of children conceived by DI were interviewed about their openness regarding their child's genetic origins. It was striking that not one set of DI parents in any of the four participating countries had told their child that she or he had been conceived using the sperm of an anonymous donor. Nevertheless, more than half of the DI mothers (56%) had told a friend or family member, so there would always be a risk of disclosure to the child.

Regarding the psychological well-being of the children, standardized questionnaires of behavioural and emotional prob-

lems were completed by mothers and teachers, and the children were administered tests of self-esteem and of their feelings towards their parents. The assisted reproduction children did not differ with respect to the presence of psychological disorder or in their perception of their relationship with their parents in any of the four countries studied. In the UK, an assessment was also made of the children's security of attachment to their parents using the Separation Anxiety Test. In addition, interview transcripts relating to children's psychological functioning were rated by a child psychiatrist who was 'blind' to the child's family type. No group differences were found for either security of attachment relationships or for the incidence of psychological disorder (Golombok *et al.*, 1995). However, a further investigation that included families from an Eastern European country (Bulgaria), found higher levels of behavioural and emotional problems in Eastern European IVF and DI children than among their Western European counterparts (Cook *et al.*, 1997). This suggests that the consequences of assisted reproduction for child development are related to the social context in which these techniques are carried out.

The present study is the first investigation of assisted reproduction children during the transition to adolescence, and follows up the Western European families originally examined (Golombok *et al.*, 1996). It is at adolescence that issues of identity become salient, and that parent-child conflict is most likely to occur (Coleman and Hendry, 1990). Thus it is primarily at adolescence that difficulties for these families would be expected to arise. To the extent that the experience of adopted children is relevant to children conceived by assisted reproduction, it is important to point out that an increase in emotional and behavioural problems in adopted children, compared with their non-adopted counterparts, emerges at around 11 years of age (Maughan and Pickles, 1990; Miller *et al.*, 2000), the age at which adopted children also show an increased interest in their biological origins (Hoopes, 1990). Thus it is predicted that children conceived by assisted reproduction, and particularly those conceived by DI, will show raised levels of psychological problems and difficulties in their relationships with parents in comparison with their naturally conceived counterparts.

Materials and methods

Subjects

The families from the initial study were asked to take part in the follow-up when the child was aged 11–12 years. Four hundred families participated in the follow-up study. These included 102 families with a child conceived by IVF, 94 families with a child conceived by DI, 102 adoptive families, and 102 families with a naturally conceived child. The response rates for families with IVF, DI, adoptive and naturally conceived children respectively, were 88, 85, 89 and 85%. Excluding those families who could not be traced, the rates were 92, 89, 91 and 93% respectively.

In each country, there were similar proportions of boys and girls in each family type. In addition, there was no difference in children's age between family types. However, children's age differed significantly between countries [$F(3,396) = 64.4, P < 0.001$]. The children from the UK were the oldest with a mean age of 11.9 years and the children from The Netherlands were the youngest with a mean age

of 11.1 years. A significant difference in the age of the mothers was found between family types [$F(3,396) = 8.1; P < 0.001$] reflecting older IVF mothers with a mean age of 45 years and younger DI mothers with a mean age of 43 years, and between countries [$F(3,396) = 5.4; P < 0.01$] reflecting older mothers in the UK with a mean age of 45 years and younger mothers in Spain with a mean age of 43 years. The proportion of children with siblings differed significantly between family types ($\chi^2 = 52.1, P < 0.001$) and between countries ($\chi^2 = 9.9, P < 0.05$). There was a higher proportion of singleton children in IVF and DI families than in adoptive and natural conception families, and a higher proportion of singleton children in Spain than in the other countries. Social class also differed significantly by family type ($\chi^2 = 38.4; P < 0.001$) reflecting higher social class among the adoptive and natural conception families than among the assisted reproduction families, and by country ($\chi^2 = 46.8; P < 0.001$) reflecting the higher social class of families in Spain and Italy than in The Netherlands and UK. At the time of interview, 93% of parents were married, 6% had separated or divorced, and 1% of fathers had died. There was no difference between family types with respect to the proportion of parents who had separated or divorced. Divorced or separated fathers were asked to participate in the study if they had at least weekly contact with the child. Although the differences in demographic characteristics were not large in real terms, the variables that differed significantly between family types and/or between countries (mother's age, child's age, the presence of siblings and social class) were entered into the statistical analyses as co-variables.

The families were visited at home by researchers trained in the study techniques. Data were collected from the mother, the father and the target child by interview and by questionnaire. In most cases, the family was seen by the same interviewer as in the first phase of the study to maximize cooperation, and interviewers saw similar proportions of each family type to minimize interviewer bias. Information obtained by interview was rated according to a standardized coding scheme. Interviews were conducted with 99% of the mothers, 92% of the children and 80% of the fathers. Questionnaire data were obtained from 91% of mothers, 83% of children and 80% of fathers.

Measures

Parents' marital and psychological state

Both the mother and the father completed the Golombok Rust Inventory of Marital State (GRIMS) (Rust *et al.*, 1988, 1990), a questionnaire measure of the quality of the marital relationship. The State-Trait Anxiety Inventory (Spielberger, 1983) and the Beck Depression Inventory (BDI) (Beck and Steer, 1987) were also completed by both parents to assess anxiety and depression respectively. For each of these questionnaires, a high score represents a problem. All three of these instruments have been shown to have good reliability and to discriminate well between clinical and non-clinical groups.

Parent-child relationships

Interviews with parents. The mothers were interviewed using an adaptation of a standardized interview designed to assess the quality of parenting (Quinton and Rutter, 1988). The interview lasted 1 to 1½ h and was tape-recorded. This procedure 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: $r = 0.63$. Detailed accounts were obtained of the child's behaviour and the mother's response to it, with reference to the child's progress at school, use of spare time, peer adjustment, and relationships within the family unit. In order to calculate inter-rater

reliabilities, 57 randomly selected family interviews in the UK were coded by a second interviewer who was 'blind' to family type (Golombok *et al.*, 2002). Agreement between raters ranged from 95 to 100% for all the variables used, with non-agreement defined as a difference of >1 point on any scale.

Overall ratings of the quality of parenting were made according to strict coding criteria taking into account information obtained from the entire interview, as follows: (i) expressed warmth was rated on a 6-point scale from 0 ('none') to 5 ('high'), and was based on the mother's tone of voice and facial expression when talking about the child, spontaneous expressions of warmth, sympathy and concern about any difficulties experienced by the child, and enthusiasm and interest in the child as a person; (ii) emotional involvement was rated on a 5-point scale from 0 ('little or none') to 3 ('high') and 4 ('enmeshed'), and measured the extent to which family life and the emotional functioning of the mother were centred on the child, and the extent to which the mother was overconcerned or overprotective towards the child; (iii) sensitive responding was rated on a 5-point scale from 0 ('none') to 4 ('very sensitive responding'), and represented the mother's ability to recognize and respond appropriately to her child's fears and anxieties; (iv) supervision was rated on a 5-point scale from 0 ('very inadequate') to 4 ('over supervised'), and took account of the mother's age-appropriate monitoring of the child's activities; and (v) disciplinary indulgence was rated on a 6-point scale from 0 ('none') to 5 ('indulgent'), and measured the degree of negotiation between mother and child with regard to control issues.

In addition to these overall ratings, the following individual variables were rated from the interview material: (i) enjoyment of motherhood was rated on a 4-point scale from 0 ('none') to 3 ('a great deal'), and took account of expressed enjoyment as well as reservations about motherhood; (ii) frequency of disputes measured the number of disputes that had occurred in the previous 3 months between the mother and the child; and (iii) severity of disputes was rated on a 4-point scale from 0 ('no confrontations') to 3 ('major battles'), and assessed the intensity of disputes during conflict with the child.

One section of the mother's interview concerned the extent to which the mother perceived the father to be a help or a hindrance in parenting. Four ratings were made: (i) 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 child; (ii) parental coordination over control was rated on a 5-point scale from 1 ('active uncoordination') 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; (iii) reliability of father in parenting support was rated on a 5-point scale from 0 ('no support') to 4 ('very reliable'), and represented the extent to which the father could be called upon and trusted to take some parenting responsibility; and (iv) load taking of father was rated on a 5-point scale from 0 ('none') to 4 ('major parenting load'), and was specifically concerned with the father taking care of the child to provide the mother with time to do other activities. In addition, the mothers of children conceived by DI were asked whether or not they had told, or planned to tell, their child about his or her origins, and about their reasons for or against telling.

Fathers were separately administered a shortened form of the interview that focused on the father's relationship with the child. Ratings were made of expressed warmth, emotional involvement, enjoyment of fatherhood, frequency of disputes and severity of disputes.

Interview with the child. The children were interviewed using the

Child and Adolescent Functioning and Environment Schedule (CAFÉ) (John and Quinton, 1991), a semi-structured interview designed to obtain information on children's functioning at school, and their relationships with peers, and parents. For the present investigation, the following ratings of children's perceptions of their relationships with parents were made for mothers and fathers separately: (i) warmth from mother and warmth from father were each rated on a 4-point scale from 0 ('none/very little') to 3 ('a great deal'), and measured the parents' overt affectionate and caring behaviour; (ii) enjoyment of time spent with mother and enjoyment of time spent with father were rated on a 4-point scale from 0 ('none/very little') to 3 ('a great deal'), and reflected the extent of pleasure experienced whilst in the presence of parents; (iii) dependability of mother and dependability of father were rated on a 4-point scale from 0 ('completely undependable') to 3 ('very dependable'), and represented the parents' reliability and trustworthiness; (iv) quality of mother's discipline and quality of father's discipline were rated on a 4-point scale from 0 ('very lenient/lax') to 3 ('very strict/harsh'), and measured the parents' level of disciplinary control; (v) criticism by mother and criticism by father were rated on a 4-point scale from 0 ('none/very little') to 3 ('a great deal'), and assessed the extent to which the child was openly criticized or rejected by the parents; and (vi) monitoring was rated on a 4-point scale from 0 ('rarely monitored/supervised') to 3 ('always monitored/supervised'), and measured the extent to which the parents enforced rules about the child's activities outside the home.

Questionnaire measures. The Expression of Affection Inventory (EAI) (Hetherington and Clingempeel, 1992) was completed by mothers (regarding the child), fathers (regarding the child), and children (once for each parent) to provide a standardized assessment of the total occurrences of affectionate behaviour between them. A high score represented greater affection. The Conflict Tactics Scale (CTS) (Straus, 1979) was also administered to mothers (regarding the child), fathers (regarding the child), and children (once for each parent) to assess how parents and children act during conflict. The CTS yields three subscales: reasoning (e.g. discussing issues), symbolic aggression (e.g. sulking) and physical aggression (e.g. hitting). A high score represented a high level of the behaviour being measured.

Children's socio-emotional functioning

The child's adjustment at school and with peers was assessed using the following ratings from the CAFÉ: (i) interest/effort in schoolwork was rated on a 5-point scale from 0 ('no interest/effort') to 4 ('above average interest'), and assessed the extent to which the child maintained effort and interest in school subjects; (ii) confidence in school performance was rated on a 4-point scale from 0 ('none in any subject') to 3 ('very confident in most subjects'), and measured the extent to which the child was successful and confident about his or her abilities at school; (iii) time spent with peers measured the number of days per week on which the child spent time with peers outside school; (iv) confidence with peers was rated on a 4-point scale from 0 ('not at all confident') to 3 ('very confident'), and represented the extent to which the child felt confident in making and sustaining relationships with peers; (v) verbal aggression towards peers was rated on a 4-point scale from 0 ('none') to 3 ('at least weekly'), and measured the frequency with which the child shouted at or was abusive or threatening towards other children; and (vi) physical aggression towards peers was rated on a 4-point scale from 0 ('none') to 3 ('chronic/serious'), and measured the extent to which the child pushed, hit or punched other children with malicious intent.

The presence of behavioural or emotional problems in the children was assessed using the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1994, 1997) administered to mothers and to the children's teachers. Sixty-eight per cent of the teachers completed the question-

naire. The SDQ produces an overall score of the child's adjustment (total deviance) and a score of the child's prosocial behaviour. The questionnaire has been shown to have good inter-rater reliability, and discriminates well between psychiatric and non-psychiatric samples.

Results

Two-way analyses of co-variance (with country and group as between-subjects factors) were carried out for each variable. Where a significant group difference was found, the following two-tailed contrast analyses were performed to address specific questions: (i) assisted reproduction versus naturally conceived (AR versus NC) to examine whether families with a child conceived by assisted reproduction (IVF and DI) were different from families with a naturally conceived child; (ii) assisted reproduction versus adoptive (AR versus A) to examine whether families with a child conceived by assisted reproduction (IVF and DI) were different from families with an adopted child; and (iii) IVF versus DI to examine whether IVF and DI families were different from each other and thus to examine the consequences of one parent being genetically unrelated to the child. For variables where a significant group \times country interaction was found in addition to a significant group difference, the contrast analyses were repeated for each country individually and were reported only if the effect was present in at least two countries in order to minimize the reporting of chance effects given the large number of variables involved in the study.

Parents' marital and psychological state

No differences were found between groups for degree of marital satisfaction as measured by the GRIMS for either mothers or fathers. Neither was there a significant difference for mothers or fathers for anxiety or depression as assessed by the STAI and the BDI.

Parent-child relationships

The parent-child relationship variables were separated into two categories, those relating to warmth and those relating to control. The results are reported according to these two constructs.

Warmth

With respect to mothers' warmth towards the child, there was no difference between groups for either expressed warmth, the total affection score of the EAI, or sensitive responding (see Table I). However, the assisted reproduction mothers reported significantly greater enjoyment of motherhood than the natural conception mothers (AR versus NC; $F = 6.80$, $P < 0.01$). In addition, the assisted reproduction mothers obtained significantly higher ratings for emotional involvement than both the natural conception mothers (AR versus NC; $F = 7.27$, $P < 0.01$) and the adoptive mothers (AR versus A; $F = 7.32$, $P < 0.01$). Further analysis of this variable excluding those mothers who obtained a rating of 4 ('enmeshed') showed that a significantly greater proportion of assisted reproduction mothers than natural conception and adoptive mothers exhibited a high level of emotional involvement with their children ($\chi^2 = 7.49$, $P < 0.01$). However, a comparison between those

who obtained a rating of ≥ 3 with those who obtained a rating of 4 also demonstrated that a higher proportion of assisted reproduction mothers ($n = 19$) than adoptive mothers ($n = 4$) and natural conception mothers ($n = 2$) were classified as enmeshed (Fisher's exact; $P = 0.006$) suggesting that assisted reproduction mothers were more likely to be overconcerned or overprotective of their child. An exploratory comparison between the children of assisted reproduction mothers who obtained a rating of 'enmeshed' and the other children from assisted reproduction families for the children's data found the children of enmeshed mothers to report less criticism from both their mother ($t = 2.64$; $P < 0.01$) and their father ($t = 2.73$; $P < 0.01$), and less time spent with peers ($t = 2.43$; $P < 0.05$). Regarding children's warmth towards the mother, no significant difference between groups was found for either warmth from mother, enjoyment of time spent with mother, dependability of mother or total mother affection score of the EAI. There were no differences between IVF and DI families for any of the variables relating to mother-child warmth.

For fathers' warmth towards the child, assisted reproduction fathers obtained significantly higher scores for expressed warmth than both natural conception (AR versus NC; $F = 17.00$, $P < 0.001$) and adoptive fathers (AR versus A; $F = 23.47$, $P < 0.001$). They also showed greater enjoyment of fatherhood than natural conception fathers (AR versus NC; $F = 6.55$, $P < 0.05$). This was reflected in the children's ratings, with assisted reproduction children reporting significantly higher levels of warmth from father than adopted children (AR versus A; $F = 7.20$, $P < 0.01$), although there was no difference between assisted reproduction children and naturally conceived children for this variable. In addition, the assisted reproduction fathers obtained significantly higher ratings for emotional involvement than both the natural conception fathers (AR versus NC; $F = 7.34$, $P < 0.01$) and the adoptive fathers (AR versus A; $F = 9.05$, $P < 0.01$). Further analysis of this variable excluding those fathers who obtained a rating of 4 ('enmeshed') found no difference in emotional involvement between the assisted reproduction fathers and the natural conception and adoptive fathers. However, a comparison between those who obtained a rating of ≤ 3 with those who obtained a rating of 4 showed that a higher proportion of assisted reproduction fathers ($n = 17$) than natural conception ($n = 2$) and adoptive ($n = 0$) fathers were classified as enmeshed (Fisher's exact; $P < 0.001$) indicating that assisted reproduction fathers were more likely to be overconcerned or overprotective of their child. The children did not differ with respect to enjoyment of time spent with father, dependability of father or total father affection score of the EAI. There were no differences between IVF and DI families for any of the variables relating to father-child warmth.

Control

For mothers, there were no significant differences between groups regarding the level of supervision of their children or disciplinary indulgence (see Table II). Neither were there differences between mothers' reports of the frequency or severity of disputes. However, children conceived by assisted

Table I. Comparisons of warmth between family types

	IVF		DI		Adoptive		Naturally conceived		<i>F</i>	<i>P</i>	User contrasts (<i>P</i> -values)		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			AR versus NC	AR versus A	IVF versus DI
Mother's interview													
Mother's expressed warmth	3.85	0.97	3.86	1.01	3.83	0.90	3.66	0.88	2.42	NS	–	–	–
Emotional involvement of mother	2.64	0.72	2.75	0.67	2.41	0.65	2.43	0.75	3.35	< 0.05	< 0.01	< 0.01	–
Sensitive responding of mother	2.46	0.79	2.42	0.80	2.42	0.63	2.49	0.75	0.17	NS	–	–	–
Enjoyment of motherhood	2.60	0.60	2.59	0.57	2.58	0.58	2.38	0.63	3.02	< 0.05	< 0.01	–	–
Father's interview													
Father's expressed warmth	3.59	0.96	3.72	0.93	3.36	1.06	3.28	0.98	9.39	< 0.001	< 0.001	< 0.001	–
Emotional involvement of father	2.43	0.84	2.42	0.91	2.11	0.65	2.15	0.71	4.36	< 0.01	< 0.01	< 0.01	–
Enjoyment of fatherhood	2.47	0.57	2.58	0.61	2.51	0.61	2.31	0.61	3.46	< 0.05	< 0.05	–	–
Child's interview													
Warmth from mother	2.51	0.67	2.61	0.52	2.26	0.79	2.44	0.64	2.60	NS	–	–	–
Enjoyment of time with mother	2.31	0.67	2.46	0.65	2.36	0.71	2.40	0.59	0.24	NS	–	–	–
Dependability of mother	2.22	0.65	2.23	0.64	2.21	0.63	2.13	0.66	0.30	NS	–	–	–
Warmth from father	2.24	0.79	2.37	0.73	2.08	0.77	2.24	0.64	2.75	< 0.05	–	< 0.01	–
Enjoyment of time with father	2.36	0.67	2.44	0.63	2.37	0.69	2.37	0.60	0.26	NS	–	–	–
Dependability of father	2.13	0.69	2.15	0.68	2.19	0.69	2.04	0.73	0.35	NS	–	–	–
EAI questionnaire measures													
Mother's total affection score	53.73	15.88	52.39	19.01	51.88	13.77	52.53	12.67	0.11	NS	–	–	–
Father's total affection score	44.82	16.11	46.73	15.80	40.02	14.18	40.22	17.79	2.20	NS	–	–	–
Child's total affection score about mother	50.81	18.84	48.87	16.37	46.41	18.36	48.15	17.02	0.55	NS	–	–	–
Child's total affection score about father	50.80	18.85	48.79	16.35	46.41	18.36	48.15	17.02	0.56	NS	–	–	–

DI = donor insemination; AR = assisted reproduction; NC = naturally conceived; A = adoptive; NS = not significant; EAI = Expression of Affection Inventory.

Table II. Comparisons of control between family types

	IVF		DI		Adoptive		Naturally conceived		<i>F</i>	<i>P</i>	User contrasts (<i>P</i> -values)		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			AR versus NC	AR versus A	IVF versus DI
Mother's interview													
Frequency of disputes with mother	30.55	33.99	28.23	31.84	27.62	35.42	31.61	36.59	1.45	NS	–	–	–
Severity of disputes with mother	0.97	0.66	1.09	0.74	0.95	0.69	1.06	0.69	1.16	NS	–	–	–
Supervision	2.77	0.70	2.70	0.60	2.76	0.47	2.80	0.62	0.47	NS	–	–	–
Disciplinary indulgence	1.98	0.78	2.16	0.82	1.89	0.67	1.91	0.74	1.55	NS	–	–	–
Father's interview													
Frequency of disputes with father	14.90	18.96	18.55	25.93	17.24	26.06	19.46	29.34	0.60	NS	–	–	–
Severity of disputes with father	0.89	0.73	0.82	0.69	0.88	0.75	0.94	0.70	1.12	NS	–	–	–
Child's interview													
Quality of mother's discipline	1.73	0.55	1.69	0.55	1.66	0.58	1.70	0.56	0.96	NS	–	–	–
Criticism by mother	0.58	0.63	0.41	0.60	0.67	0.76	0.71	0.72	3.51	< 0.05	< 0.01	< 0.05	–
Quality of father's discipline	1.68	0.55	1.50	0.56	1.80	0.56	1.80	0.55	2.80	< 0.05	< 0.05	< 0.05	–
Criticism by father	0.51	0.62	0.38	0.52	0.70	0.74	0.68	0.65	9.51	< 0.001	< 0.001	< 0.001	–
Monitoring	2.05	0.65	2.11	0.60	1.95	0.75	2.03	0.72	3.29	< 0.05	–	–	–
CTS questionnaire measures													
Mother's reasoning	10.89	3.50	10.77	3.39	10.30	3.82	10.24	3.63	3.21	< 0.05	–	–	–
Father's reasoning	10.22	4.00	10.92	3.49	9.94	3.83	9.34	4.28	3.51	< 0.05	< 0.05	–	–
Child's reasoning about mother	9.26	4.19	9.56	4.05	8.10	4.05	9.43	4.00	1.05	NS	–	–	–
Child's reasoning about father	8.29	4.45	8.66	4.41	7.17	4.21	9.12	4.30	1.32	NS	–	–	–
Mother's symbolic	7.65	5.92	8.02	5.54	7.53	5.11	8.22	5.92	1.28	NS	–	–	–
Father's symbolic	6.21	5.41	6.06	4.30	6.34	5.21	6.14	5.02	0.04	NS	–	–	–
Child's symbolic about mother	8.42	5.58	9.90	7.37	8.50	5.84	9.07	6.58	0.82	NS	–	–	–
Child's symbolic about father	6.82	5.84	9.55	6.93	7.52	5.88	7.52	6.40	2.27	NS	–	–	–
Mother's physical	2.23	3.57	2.21	2.82	2.45	2.84	2.23	2.77	0.08	NS	–	–	–
Father's physical	1.78	2.63	1.78	2.77	1.84	2.66	1.43	2.62	0.38	NS	–	–	–
Child's physical about mother	0.35	1.25	1.01	3.65	0.60	1.90	0.73	3.61	3.44	< 0.05	–	–	–
Child's physical about father	0.16	0.93	0.67	3.26	0.45	1.58	0.49	2.73	1.72	NS	–	–	–

DI = donor insemination; AR = assisted reproduction; NC = naturally conceived; A = adoptive; NS = not significant; CTS = Conflict Tactics Scale.

Table III. Comparisons of children’s socio-emotional functioning between family types

	IVF		DI		Adoptive		Naturally conceived		<i>F</i>	<i>P</i>	User contrasts (<i>P</i> -values)		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			AR versus NC	AR versus A	IVF versus DI
Child’s interview													
Interest/effort in schoolwork	2.69	0.86	2.85	0.86	2.68	0.79	2.82	0.72	1.03	NS	–	–	–
Confidence in school performance	1.94	0.70	1.94	0.75	1.78	0.65	1.90	0.63	1.98	NS	–	–	–
Time spent with peers	3.98	2.11	3.04	2.10	4.23	1.97	3.22	1.96	4.37	< 0.01	–	< 0.05	–
Confidence with peers	2.11	0.63	2.13	0.54	2.15	0.65	2.09	0.53	0.17	NS	–	–	–
Verbal aggression towards peers	0.30	0.65	0.48	0.69	0.41	0.73	0.51	0.83	1.57	NS	–	–	–
Physical aggression towards peers	0.11	0.32	0.17	0.41	0.11	0.41	0.27	0.53	3.10	< 0.05	< 0.05	–	–
SDQ measures													
Total deviance score for mother	7.68	5.46	7.66	4.89	7.03	4.43	7.77	5.22	0.22	NS	–	–	–
Total deviance score for teacher	6.26	6.31	6.70	6.27	5.98	4.67	6.23	3.84	0.29	NS	–	–	–
Prosocial behaviour score for mother	7.77	1.87	7.66	2.17	7.33	2.03	7.60	1.96	1.13	NS	–	–	–
Prosocial behaviour score for teacher	7.37	2.12	7.04	2.33	7.14	1.89	6.94	2.06	1.25	NS	–	–	–

DI = donor insemination; AR = assisted reproduction; NC = naturally conceived; A = adoptive; NS = not significant; SDQ = Strengths and Difficulties Questionnaire.

reproduction reported less criticism by mother than naturally conceived (AR versus NC; $F = 9.12, P < 0.01$) and adopted (AR versus A; $F = 6.26, P < 0.05$) children. Children’s perception of the quality of mother’s discipline and of monitoring did not differ between groups. Neither were there group differences for either mothers or children for the reasoning, symbolic aggression or physical aggression scores of the CTS. The IVF and DI families did not differ from each other for any of the mother–child control variables.

Fathers did not differ with respect to their reports of frequency or severity of disputes with their children. However, assisted reproduction children perceived less criticism by father than both natural conception (AR versus NC; $F = 14.39, P < 0.001$) and adoptive (AR versus A; $F = 27.19, P < 0.001$). In addition, they obtained lower scores for quality of father’s discipline than both natural conception (AR versus NC; $F = 5.20, P < 0.05$) and adoptive children (AR versus A; $F = 4.24, P < 0.05$) reflecting more lenient discipline by assisted reproduction fathers. With respect to reasoning as assessed by the CTS, assisted reproduction fathers reported greater reasoning than natural conception fathers (AR versus NC; $F = 4.29, P < 0.05$), although this finding was not reflected in the children’s reports. There were no group differences for either fathers or children for the symbolic aggression or physical aggression scores on the CTS. IVF and DI families did not differ with respect to any of the father–child control variables.

Fathers’ contribution to parenting

No group differences were identified for father’s help in control, parental coordination over control, reliability of father in parenting support and load-taking of father.

Children’s socio-emotional functioning

As shown in Table III, there were no differences between children from the different family types in relation to interest/effort in schoolwork or confidence in school performance.

With respect to peer relationships, the time spent with peers was less among assisted reproduction children than among adopted children (AR versus A, $F = 6.25, P < 0.05$) but did not differ between assisted reproduction children and natural conception children. The groups did not differ in confidence with peers. Although a similar level of verbal aggression towards peers was shown by children in all family types, the assisted reproduction children were less likely to engage in physical aggression towards peers than the naturally conceived children (AR versus NC; $F = 5.96, P < 0.05$). Regarding the total deviance score and the prosocial score of the SDQ, no significant differences were found between groups for either mothers’ or teachers’ ratings. There were no differences between IVF and DI families for any of the variables relating to children’s socio-emotional functioning.

Telling children about DI

Only eight sets of parents (8.6%) had told their child that he or she had been conceived by DI; five in The Netherlands (22.7% of Dutch DI parents), two in the UK (5.4% of British DI parents), one in Spain (4.3% of Spanish DI parents) and none in Italy. A total of nine sets of parents (9.7%) planned to tell in the future, eleven (11.8%) were undecided, and 65 (69.9%) had decided against telling the child. Those who had decided against telling represented 100% of the Italian DI parents, 78.4% of the British DI parents, 68.2% of the Dutch DI parents and 43.5% of the Spanish DI parents. In contrast, 50% of IVF parents and 95% of adoptive parents had told their child about the circumstances of their birth.

DI parents who had not told their child were asked for their reasons. The most common reason was to protect the child, with 65.9% of parents reporting concern that disclosure would be distressing to the child. More than one-third of parents (35.8%) were worried about the impact of telling on family relationships, particularly on the child’s relationship with the father, and gave this as a reason for their decision not to tell. Furthermore, 44.6% of parents wished to protect the father

whereas protection of the mother was given as a reason against telling by only 14.6% of parents. Another reason, given by 14.8% of parents, was to maintain relationships outside the family. It was feared, for example, that the child would tell other people who would behave negatively as a result. Two-thirds of parents (66.7%) believed that there was no need to tell the child about the DI.

Of the eight sets of parents who had told the child, seven believed that the child had a right to know. In addition, four sets of parents wished to avoid the possibility of the child finding out through someone else, and two were concerned about the risk of marriage to a person conceived from the sperm of the same donor. Comparisons between the children who had been told and those who had not were carried out for all of the variables relating to the quality of parent-child relationships and children's socio-emotional functioning. No differences were found for any of the warmth or children's outcome variables. However, a significant difference was shown for three of the control variables; frequency of disputes ($t = 2.76$, $P < 0.05$), severity of disputes ($t = 2.43$, $P < 0.05$) and quality of mother's discipline ($t = 2.06$, $P < 0.05$). An examination of the means for these variables showed that children who had been told about DI had less frequent and less severe disputes with their mothers, and perceived their mothers as less strict, than those who had not been told.

Discussion

At the time of the child's transition to adolescence at 11–12 years of age, >90% of the assisted reproduction parents were still married to each other. There was no evidence of raised levels of emotional or marital problems among the assisted reproduction mothers or fathers as assessed by self-report measures of anxiety, depression or marital state. As low levels of marital conflict and parental psychiatric disorder are conducive to children's healthy psychological development (Golombok, 2000), it appeared that the parents provided a positive family environment in which to raise their child. There was no difference between fathers in the various family types regarding the extent of their contribution to childcare.

With respect to warmth between mothers and children, the assisted reproduction mothers did not differ from the adoptive or natural conception mothers in expressed warmth, sensitivity towards the child or affection as assessed by the EAI. From the perspective of the child, no differences were found in warmth towards the mother, enjoyment of time spent with her, view of her dependability or affection as assessed by the EAI. The assisted reproduction mothers showed greater emotional involvement with their child. Although, for the majority, this simply meant that family life and the emotional functioning of the mother were more centred on the child, a higher proportion of assisted reproduction mothers than adoptive and natural conception mothers also appeared to be overconcerned or overprotective of their child. In addition, the assisted reproduction mothers enjoyed motherhood more than the natural conception mothers.

In relation to warmth between fathers and children, the

assisted reproduction fathers showed greater expressed warmth and emotional involvement than both the adoptive and natural conception fathers, and enjoyed fatherhood more than the natural conception fathers. This was reflected in the greater warmth towards their father shown by assisted reproduction than adopted children, although no difference in warmth towards the father was found between assisted reproduction and natural conception children. The assisted reproduction children did not enjoy the time spent with their father more, or consider him to be more dependable, than their adoptive or naturally conceived counterparts. No differences in father-child affection as assessed by the EAI were identified between family types.

Regarding the parents' control of the child, the frequency and severity of disputes between mothers and children, and fathers and children, were similar in all family types. In addition, the assisted reproduction mothers were no more likely than the other mothers to show disciplinary indulgence with their children. Interestingly, however, there were some differences in control from the point of view of the child. The assisted reproduction children reported less criticism or rejection from both their mother and their father than the natural conception and adopted children. They also perceived their father, but not their mother, as more lenient in terms of discipline. No other differences between assisted reproduction and either adoptive or natural conception children were identified for the CTS, although assisted reproduction fathers reported greater reasoning with their child during disputes. With respect to the amount of independence that parents granted their children, the assisted reproduction mothers reported a similar degree of supervision of their children as the other mothers, and the assisted reproduction children reported a similar level of monitoring by parents as the other children.

The children in assisted reproduction families were found to show positive psychological adjustment. There was no evidence of emotional or behavioural problems as assessed by mothers or teachers on the SDQ. In addition, the children reported a similar interest and confidence in schoolwork. They also appeared to have good relationships with their peers. The assisted reproduction children spent a similar amount of time with peers as the naturally conceived children, although less time than the adopted children, and were just as confident with peers as both the adopted and natural conception children. Whereas the assisted reproduction children were as verbally aggressive towards their peers as the other children, they were less likely to be physically aggressive than the natural conception children.

No differences were identified between the IVF and DI families for any of the variables relating to parenting or the psychological well-being of the child. This suggests that the absence of a genetic link between the father and the child does not interfere with the development of a positive relationship between them. DI fathers were just as warm and just as involved in the control of their children as IVF fathers, and the level of psychological functioning shown by DI children was no different from that of their IVF counterparts.

It is important to point out that <10% of DI parents had told their child about his or her genetic origins. In spite of the

majority of parents' decision not to tell, it appears that the children aged 12 years do not seem to experience negative consequences arising from the secrecy surrounding the circumstances of their birth. This does not mean that it is preferable for children not to be told about DI. Many parents have told other people (Golombok *et al.*, 1996) which creates a risk that the child will find out from someone else. In addition, research has shown that adopted children benefit from openness about their genetic parents (Brodzinsky *et al.*, 1998; Grotevant and McRoy, 1998) which may be relevant to the situation of DI children. Furthermore, the increasing use of genetic testing in medicine could result in children conceived by DI discovering the truth about their genetic origins from medical practitioners rather than their parents. Finally, the consequences of non-disclosure for later adolescence and adult life are still unknown. Anecdotal evidence suggests that some people who find out about their conception by DI in adulthood feel hostile towards their parents and mistrustful of them (Donor Conception Support Group of Australia, 1997; Cordray, 1999, personal communication; Turner and Coyle, 2000). Systematic studies of representative samples are necessary to fully understand the long-term consequences of DI for the individuals concerned.

In the present study, comparisons between those DI children who had been told about their genetic origins and those who had not, pointed to less frequent and less severe disputes between mothers and their children, and less strict discipline by mothers, in families where the parents had been open with their child. Conflict was no higher in DI families that had opted for secrecy than in the other family types. Instead, it was the families where the parents had disclosed the circumstances of the child's birth that showed less conflict. It must be stressed that these analyses were exploratory in nature. The number of children who had been told was very small, and the large number of variables examined may have resulted in chance effects. Nevertheless, it is worth noting that the finding of lower conflict between mothers and children in families where the parents had been open was shown in independent reports from both the mother and the child. Contrary to the fears expressed by DI parents, this suggests that telling does not have an adverse effect, and may even have a beneficial effect, on the quality of parent-child relationships. Further research that compares larger numbers of children who have been told with those who have not are necessary to establish the effects of openness about DI. One important factor in a person's response to this information may be the age at which he or she is told. The consequences of disclosure by parents in the pre-school years are likely to be rather different from those of discovering in adulthood about conception by DI.

An advantage of the present investigation was that information about family relationships and the well-being of the child was collected from mothers, fathers and the children themselves to give a rounded view of family functioning and minimize the effects of reporting bias. In addition, data were obtained from teachers to provide an independent account of the children's psychological adjustment using the SDQ, a highly reliable and valid measure of children's emotional and behavioural problems. As assisted reproduction parents may tend to present their child in a favourable light, the teachers' reports

provided important confirmation of the information obtained from parents about their child. The high response rates attained in this follow-up study show that the low level of psychological problems among assisted reproduction children cannot be explained by families who are experiencing difficulties dropping out of the investigation. It is important to point out, however, that the participation rate in the first phase of the study was lower, and thus families with problems may have been lost at the initial stage. A limitation of the study was that due to the nature of the questioning required, it was not possible for interviewers to remain 'blind' to family type. However, there is no existing information about assisted reproduction families with an adolescent child and thus the interviewers had no clear expectation of what they might find, although they may have been influenced by theoretical considerations in the literature or by findings of studies on younger children.

The present study focused on singleton children in order to examine the impact of assisted reproduction independently of the potentially confounding effect of a multiple birth. It is important to remember, however, that more than one-quarter of IVF births involve twins, triplets or more. Parents who have multiple births not only have to cope with two or more infants born at once but also with infants who may have greater needs as a result of prematurity and low birthweight (Botting *et al.*, 1990). The impact of these factors on parenting and child development to adolescence and beyond should be a priority for future research.

Theoretical predictions that difficulties in parent-child relationships would arise in assisted reproduction families as children enter adolescence were not supported by the findings of the present study. In general, assisted reproduction families with an early adolescent child appeared to be characterized by stable and satisfying marriages, psychologically healthy parents, a high level of warmth between parents and their children accompanied by an appropriate level of discipline and control, and well-adjusted children. To the extent that differences were found between the assisted reproduction families and either the natural conception or adoptive families, these reflected mainly more positive functioning among the assisted reproduction families, with the possible exception of the overinvolvement with their children of a small proportion of assisted reproduction parents. Assisted reproduction fathers, in particular, seemed to have warmer and less authoritarian relationships with their child. There was no evidence for the expectation that DI fathers would be more distant or hostile towards their adolescent children, or that DI children would be at risk for psychological problems. These findings are broadly comparable with those of the first phase of the study that highlighted good quality parenting by mothers and fathers in assisted reproduction families and healthy psychological adjustment of the children. Thus it seems from this follow-up investigation that conceiving a child by IVF or DI does not have a deleterious effect on parenting or child development during the transition from childhood to the adolescent years.

Acknowledgements

We would like to thank the European Commission Biomed II Research Programme and the Wellcome Trust for funding this study. Thanks are also due to Marion Gil, Emma Goodman, Alba Llobera, Alberta Mantovani, Sander Muntz, Elvi Myland and Albert Royo for their assistance with data collection.

References

- Amuzu, B., Laxova, R. and Shapiro, S. (1990) Pregnancy outcome, health of children and family adjustment of children after DI. *Obstet. Gynecol.*, **75**, 899–905.
- Australian In Vitro Fertilisation Collaborative Group (1985) High incidence of preterm births and early losses in pregnancy after in vitro fertilisation. *Br. Med. J.*, **291**, 1160–1163.
- Back, K. and Snowden, R. (1988) The anonymity of the gamete donor. *J. Psychosom. Obstet. Gynaecol.*, **9**, 191–198.
- Baran, A. and Pannor, R. (1993) *Lethal Secrets*. Amistad, New York.
- Beck, A. and Steer, R. (1987) *The Beck Depression Inventory Manual*. Psychological Corporation, San Antonio, CA.
- Beral, V., Doyle, P., Tan, S.L., Mason, B.A. and Campbell, S. (1990) Outcome of pregnancies resulting from assisted conception. *Br. Med. Bull.*, **46**, 753–768.
- Botting, B., MacFarlane, A. and Price, F. (1990) *Three, Four and More: A Study of Triplet and Higher Order Births*. HMSO, London.
- Brandes, J.M., Scher, A., Itzkovits, J., Thaler, I., Sarid, M. and Gershoni-Baruch, R. (1992) Growth and development of children conceived by in vitro fertilization. *Pediatrics*, **90**, 424–429.
- Brewaeyts, A. (1996) Donor insemination, the impact on family and child development. *J. Psychosom. Obstet. Gynecol.*, **17**, 1–13.
- Brewaeyts, A. (2001) Review: Parent–child relationships and child development in donor insemination families. *Hum. Reprod. Update*, **7**, 38–46.
- Brodzinsky, D.M., Smith, D.W. and Brodzinsky, A.B. (1998) *Children's Adjustment to Adoption. Developmental and Clinical Issues*. Sage Publications, London.
- Burns, L.H. (1990) An exploratory study of perceptions of parenting after infertility. *Fam. Systems Med.*, **8**, 177–189.
- Cederblad, M., Friberg, B., Ploman, F., Sjöberg, N.O., Stjernqvist, K. and Zackrisson, E. (1996) Intelligence and behaviour in children born after in vitro fertilization treatment. *Hum. Reprod.*, **11**, 2052–2057.
- Clamar, A. (1989) Psychological implications of the anonymous pregnancy. In Offerman-Zuckerberg, J. (ed.), *Gender in Transition: A New Frontier*. Plenum Press, New York.
- Clayton, C. and Kovacs, G. (1982) AID offspring: initial follow up study of 50 couples. *Med. J. Aust.*, **1**, 338–339.
- Coleman, J.C. and Hendry, L. (1990) *The Nature of Adolescence*. Routledge, London.
- Colpin, H., Demyttenaere, K. and Vandemeulebroecke, L. (1995) New reproductive technology and the family: the Parent–Child relationship following in vitro fertilization. *J. Child Psychol. Psychiat.*, **36**, 1429–1441.
- Cook, R., Vatev, I., Michova, Z. and Golombok, S. (1997) The European Study of Assisted Reproduction Families: A comparison of family functioning and child development between Eastern and Western Europe. *J. Psychosom. Obstet. Gynecol.*, **18**, 203–212.
- Daniels, K. and Taylor, K. (1993) Secrecy and openness in donor insemination. *Politics Life Sci.*, **12**, 155–170.
- Donor Conception Support Group of Australia (1997) *Let the Offspring Speak: Discussions on Donor Conception*. Donor Conception Support Group of Australia, Georges Hall, New South Wales.
- Gibson, F.L., Ungerer, J.A., Leslie, G.I., Saunders, D.M. and Tennant, C.C. (1998) Development, behaviour and temperament: a prospective study of infants conceived through in vitro fertilization. *Hum. Reprod.*, **13**, 1727–1732.
- Gibson, F.L., Ungerer, J.A., McMahon, C.A., Leslie, G.I. and Saunders, D.M. (2000) The mother–child relationship following in vitro fertilisation (IVF): infant attachment, responsiveness, and maternal sensitivity. *J. Child Psychol. Psychiat.*, **41**, 1015–1023.
- Golombok, S. (2000) *Parenting: What Really Counts?* London, Routledge.
- Golombok, S., Cook, R., Bish, A. and Murray, C. (1995) Families created by the New Reproductive Technologies: Quality of parenting and social and emotional development of the children. *Child Dev.*, **66**, 285–298.
- Golombok, S., Brewaeyts, A., Cook, R., Giavazzi, M.T., Guerra, D., Mantovani, A., Van Hall, E., Crosignani, P.G. and Dexeus, S. (1996) The European Study of Assisted Reproduction Families. *Hum. Reprod.*, **11**, 2324–2331.
- Golombok, S., MacCallum, F., Goodman, E. and Rutter, M. (2002) Families with children conceived by donor insemination: a follow-up at age 12. *Child Dev.*, in press.
- Goodman, R. (1994) A modified version of the Rutter Parent Questionnaire including extra items on children's strengths: a research note. *J. Child Psychol. Psychiat.*, **35**, 1483–1494.
- Goodman, R. (1997) The Strengths and Difficulties Questionnaire: a research note. *J. Child Psychol. Psychiat.*, **38**, 581–586.
- Grotevant, M.D. and McRoy, R.G. (1998) *Openness in Adoption: Exploring Family Connections*. Sage, New York.
- Hahn, C. and DiPietro, J.A. (2001) In vitro fertilization and the family: Quality of parenting, family functioning, and child psychosocial adjustment. *Dev. Psychol.*, **37**, 37–48.
- Hetherington, E.M. and Clingempeel, W.G. (1992) Coping with marital transitions: a family systems perspective. *Monogr. Soc. Res. Child Dev.*, **57**, 242.
- Hoopes, J.L. (1990) Adoption and identity formation. In Brodzinsky, D.M.S. (ed.), *The Psychology of Adoption*. Oxford University Press, Oxford.
- Izuka, R., Yoshiaki, S., Nobuhiro, N. and Michie, O. (1968) The physical and mental development of children born following artificial insemination. *Int. J. Fertil.*, **13**, 24–32.
- John, K. and Quinton, D. (1991) *Child and Adolescent Functioning and Environment Schedule (Revised)*. MRC Child Psychiatry Unit, London.
- Klock, S. and Maier, D. (1991) Psychological factors related to donor insemination. *Fertil. Steril.*, **56**, 549–559.
- Klock, S.C., Jacob, M.C. and Maier, D. (1994) A prospective study of donor insemination recipients: secrecy, privacy, and disclosure. *Fertil. Steril.*, **62**, 477–484.
- Kovacs, G.T., Mushin, D., Kane, H. and Baker, H.W.G. (1993) A controlled study of the psycho-social development of children conceived following insemination with donor semen. *Hum. Reprod.*, **8**, 788–790.
- Lancaster, P.A.L. (1987) Congenital malformations after in-vitro fertilization. *Lancet*, **ii**, 1392–1393.
- Landau, R. (1998) Secrecy, anonymity, and deception in donor insemination: a genetic, psycho-social and ethical critique. *Social Work Health Care*, **28**, 75–89.
- Leeton, J. and Backwell, J. (1982) A preliminary psychosocial follow-up of parents and their children conceived by artificial insemination by donor (AID). *Clin. Reprod. Fertil.*, **1**, 307–310.
- Levy-Shiff, R., Vakil, E., Dimitrovsusky, L., Abramovitz, M., Shahar, N., Har-Even, D., Gross, S., Lerman, M., Levy, I., Sirota, L. and Fish, B. (1998) Medical, cognitive, emotional, and behavioral outcomes in school-age children conceived by in-vitro fertilization. *J. Clin. Child Psychol.*, **27**, 320–329.
- Lindblad, F., Gottlieb, C. and Lalos, O. (2000) To tell or not to tell what parents think about telling their children that they were born following donor insemination. *J. Psychosom. Obstet. Gynecol.*, **21**, 193–203.
- Manuel, C., Facy, F., Choquet, M., Grandjean, H. and Czyba, J.C. (1990) Les risques psychologiques de la conception par IAD pour l'enfant. *Neuropsychiatrie de l'enfance*, **38**, 642–58.
- Maughan, B. and Pickles, A. (1990) Adopted and illegitimate children growing up. In Robins, L.N. and Rutter, M. (eds), *Straight and Devious Pathways from Childhood to Adulthood*. Cambridge University Press, Cambridge, pp. 36–61.
- McMahon, C., Ungerer, J., Beaurepaire, J., Tennant, C. and Saunders, D. (1995) Psychosocial outcomes for parents and children after in vitro fertilization: a review. *J. Reprod. Infant Psychol.*, **13**, 1–16.
- McMahon, C.A., Ungerer, J.A., Tennant, C. and Saunders, D. (1997) Psychosocial adjustment and the quality of the mother–child relationship at four months postpartum after conception by in vitro fertilization. *Fertil. Steril.*, **68**, 492–500.
- McWhinnie, A. (2001) Gamete donation and anonymity. Should offspring from donated gametes continue to be denied knowledge of their origins and antecedents? *Hum. Reprod.*, **16**, 807–817.
- Miller, B.C., Fan, X., Christensen, M., Grotevant, H.D. and van Dulmen, M. (2000) Comparisons of adopted and nonadopted adolescents in a large, nationally representative sample. *Child Dev.*, **71**, 1458–1473.
- Milson, I. and Bergman, P. (1982) A study of parental attitudes after donor insemination. *Acta Obstet. Gynecol. Scand.*, **61**, 125–128.
- Montgomery, T.R., Aiello, F., Adelman, R.D., Wasylshyn, N., Andrews, M.C., Brazelton, T.B., Jones, G.S. and Jones, H.W. (1999) The psychological

- status at school age of children conceived by in-vitro fertilization. *Hum. Reprod.*, **14**, 2162–2165.
- Morin, N.C., Wirth, F.H., Johnson, D.H., Frank, L.M., Presburg, H.J., Van de Water, V.L., Chee, E.M. and Mills, J.L. (1989) Congenital malformations and psychosocial development in children conceived by *in vitro* fertilization. *J. Pediatr.*, **115**, 222–227.
- Mushin, D., Spensley, J. and Barrada-Hanson, M. (1985) Children of IVF. *Clin. Obstet. Gynecol.*, **12**, 865–875.
- Mushin, D.N., Barrada-Hanson, M.C. and Spensley, J.C. (1986) *In vitro* fertilization children: early psychosocial development. *J. In Vitro Fertil. Embryo Transfer*, **3**, 247–252.
- Olivennes, F., Kerbrat, V., Rufat, P., Blanchet, V., Franchin, R. and Frydman, R. (1997) Follow-up of a cohort of 422 children aged 6–13 years conceived by *in vitro* fertilization. *Fertil. Steril.*, **67**, 284–289.
- Owens, D., Edelman, R. and Humphrey, M. (1993) Male infertility and donor insemination: couples' decisions, reactions, and counselling needs. *Hum. Reprod.*, **8**, 880–885.
- Quinton, D. and Rutter, M. (1988) *Parenting Breakdown: The Making and Breaking of Intergenerational Links*. Avebury Gower, Aldershot, UK.
- Raoul-Duval, A., Bertrand-Servais, M. and Frydman, R. (1993) Comparative prospective study of the psychological development of children born by *in vitro* fertilization and their mothers. *J. Psychosom. Obstet. Gynecol.*, **14**, 117–126.
- Raoul-Duval, A., Bertrand-Servais, M., Letur-Konirsch, H. and Frydman, R. (1994) Psychological follow-up of children born after *in-vitro* fertilization. *Hum. Reprod.*, **9**, 1097–1101.
- Reading, A., Sledmere, C. and Cox, D. (1982) A survey of patient attitudes towards artificial insemination by donor. *J. Psychosom. Res.*, **26**, 429–433.
- Ron-El, R., Lahat, E., Golan, A., Lerman, M., Bukoversusky, I. and Herman, A. (1994) Development of children born after ovarian superovulation induced by long-acting gonadotrophin-releasing hormone antagonists and menotrophins, and by *in vitro* fertilization. *J. Pediatr.*, **125**, 734–737.
- Rufat, P., Olivennes, F., de Mouzon, J., Dehan, M. and Frydman, R. (1994) Task force report on the outcome of pregnancies and children conceived by *in vitro* fertilization (France: 1987–1989). *Fertil. Steril.*, **61**, 324–330.
- Rust, J., Bennun, I., Crowe, M. and Golombok, S. (1988) The Golombok Rust Inventory of Marital State (GRIMS). In Milne, D. (ed.), *Assessment: A Mental Health Portfolio*. NFER–Nelson.
- Rust, J., Bennun, I. and Golombok, S. (1990) The GRIMS: a psychometric instrument for the assessment of marital discord. *J. Fam. Therapy*, **12**, 45–57.
- Society for Assisted Reproductive Technology Registry (1999) Assisted reproductive technology in the United States: 1996 results generated from the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology Registry. *Fertil. Steril.*, **71**, 798–807.
- Schover, L.R., Collins, R.L. and Richards, S. (1992) Psychological aspects of donor insemination: evaluation and follow up of recipient couples. *Fertil. Steril.*, **57**, 583–590.
- Snowden, R. (1990) The family and artificial reproduction. In Bromham, E.A. (ed.), *Philosophical Ethics in Reproductive Medicine*. Manchester University Press, Manchester.
- Snowden, R. and Snowden, E. (1998) Families created through donor insemination. In Daniels, K. and Haimes, E. (eds), *Donor Insemination: International Social Science Perspectives*. Cambridge University Press, Cambridge, pp. 33–52.
- Snowden, R., Mitchell, G.D. and Snowden, E.M. (1983) *Artificial Reproduction: A Social Investigation*. George Allen and Unwin, London.
- Spielberger, C. (1983) *The Handbook of the State–Trait Anxiety Inventory*. Consulting Psychologists Press, Palo Alto, CA.
- Steptoe, P. and Edwards, R.G. (1978) Birth after replacement of a human embryo. *Lancet*, **ii**, 366.
- Straus, M. (1979) Measuring intrafamily conflict and violence: The Conflict Tactics (CT) Scales. *J. Marriage Fam.*, **41**, 75–88.
- Tan, S.-L., Doyle, P., Campbell, S., Beral, V., Rizk, B., Brinsden, P., Mason, B. and Edwards, R.G. (1992) Obstetric outcome of *in vitro* fertilization pregnancies compared with normally conceived pregnancies. *Am. J. Obstet. Gynecol.*, **14** (special issue), s50–s60.
- Tanbo, T., Dale, P.O., Lunde, O., Moe, N. and Abyholm, T. (1995) Obstetric outcome in singleton pregnancies after assisted reproduction. *Obstet. Gynecol.*, **86**, 188–192.
- Turner, A.J. and Coyle, A. (2000) What does it mean to be a donor offspring? The identity experiences of adults conceived by donor insemination and the implications for counselling and therapy. *Hum. Reprod.*, **15**, 2041–2051.
- van Balen, F. (1996) Child-rearing following *in vitro* fertilization. *J. Child Psychol. Psychiat.*, **37**, 687–693.
- van Balen, F. (1998) Development of IVF children. *Dev. Rev.*, **18**, 30–46.
- Wang, J.X., Clark, A.M., Kirby, A., Philipson, G., Petrucco, O., Anderson, A. and Mathews, C.D. (1994) The obstetric outcome of singleton pregnancies following *in-vitro* fertilization/gamete intra-Fallopian transfer. *Hum. Reprod.*, **9**, 141–146.
- Weaver, S.M., Clifford, E., Gordon, A.G., Hay, D.M. and Robinson, J. (1993) A follow-up study of 'successful' IVF/GIFT couples: social–emotional well-being and adjustment to parenthood. *J. Psychosom. Obstet. Gynecol.*, **14**, 5–16.
- Westergaard, H.B., Johansen, A.M.T., Erb, K. and Andersen, A.N. (1999) Danish national *in-vitro* fertilization registry 1994 and 1995: a controlled study of births, malformations and cytogenetic findings. *Hum. Reprod.*, **14**, 1896–1902.
- Yovich, J., Parry, T., French, N. and Grauaug, A. (1986) Developmental assessment of 20 *in vitro* fertilization (I.V.F.) infants at their first birthday. *J. In Vitro Fertil. Embryo Transfer*, **3**, 225–237.

Submitted on July 9, 2001; accepted on November 5, 2001