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Donor insemination: a follow-up study of disclosure decisions, family relationships and child adjustment at adolescence


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Abstract The call for greater openness about gamete donation highlights the need to assess the long-term implications of telling donor-conceived children about their origins. This longitudinal study examined the consequences of secrecy versus openness about donor insemination (DI) for family relationships and child adjustment at adolescence. Thirty heterosexual families with an adolescent (aged 10–14 years) conceived by anonymous DI were assessed using standardized measures of parent–child and marital relationships, and parents' and adolescents' psychological wellbeing. Ten (33%) adolescents had been told about their donor conception. The only differences found between disclosed and non-disclosed families concerned parent–child relationships. In particular, whilst disclosure was associated with lower levels of conflict between mothers and sons, adolescents who were aware of their donor origins reported less warm father–child relationships than those who had not been told. This is of interest given that identity issues and a fuller understanding of donor conception are likely to arise at adolescence. However, differences between disclosing and non-disclosing families cannot be directly attributed to parents' disclosure decisions. Overall, these findings suggest that openness about DI does not create significant difficulties for family functioning or child adjustment and that a child's age and sex may be important in assessing the impact of secrecy and disclosure. 

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Introduction

A longstanding concern about the use of donor insemination (DI) has been whether to inform the resulting children about the nature of their conception. For many years, the large

majority of heterosexual parents have chosen not to tell their children how they were conceived (Brewaeyns, 1996; van Berkel et al., 1999; Golombok et al., 1996, 2002a). This reflected the predominant professional advice not to disclose this information on the assumption that awareness

of one's donor origins may be damaging for a child's psychological wellbeing and family relationships. Over the past decade, however, there has been a shift towards the positive endorsement of openness as being in the best interests of the child, exemplified by the removal of donor anonymity from the regulatory frameworks governing assisted conception in many countries around the world. Whilst there is some evidence that policy and cultural attitudes favouring openness and the introduction of identifiable donors have increased disclosure rates among parents (Daniels and Lewis, 1996; Golombok et al., 2004; Scheib et al., 2003), disclosure rates are variable and parents are not necessarily opting to disclose (Appleby et al., 2012). Furthermore, it remains the case that most DI parents underwent fertility treatment at a time when secrecy was the norm. Heterosexual couples with children conceived by anonymous sperm donors typically have the lowest disclosure rates of all. In the UK, where the removal of donor anonymity only applies to children conceived after 1 April 2005, this group of parents still accounts for the majority of the population of donor-conception families.

Whether parents choose to disclose or not, there is very limited information about the long-term outcomes of these decisions. The fear that openness about donor conception may threaten a child's wellbeing and family relationships has been countered by the concern that secrecy may have a similarly damaging effect. There is, however, little empirical evidence to substantiate either of these claims. In logistical terms, the low rate of disclosure in DI families has limited the extent to which the consequences of openness versus secrecy have been evaluated and compared. However, the few available studies have not found parental disclosure decisions to have a detrimental impact on children's behavioural adjustment or parent-child relationships, either reporting no differences between disclosing and non-disclosing families (Nachtigall et al., 1997, 1998; Chan et al., 1998) or more positive parent-child relationships in families where parents intend to, or have, disclosed (Lycett et al., 2004; Golombok et al., 2002a, 2011).

In addition to small sample sizes, a further limitation of these comparative investigations is the young age of the children involved. As yet, there are no longitudinal studies assessing the psychosocial impact of disclosure versus non-disclosure beyond early school age, with the exception of the European Study of Assisted Reproduction Families (Golombok et al., 1996). In the second phase of this study when the children were aged 11–12 years, no differences were found concerning child adjustment between disclosing and non-disclosing families. However, some differences did arise with regards to parent-child relationships, with mothers in DI families where children had been told about their origins being found to be less strict and to have less frequent and less severe arguments with their children than those who had not disclosed (Golombok et al., 2002a). Although these findings were tentative because less than 10% of the DI parents had disclosed, the association between disclosure and lower levels of maternal conflict was replicated in relation to primary school age children in the study by Lycett et al. (2004). In addition, Lycett et al. (2004) found that mothers who were inclined towards disclosure reported their child as being less of a strain and having fewer conduct problems, with disclosing couples also

regarding themselves as more competent as parents. Golombok et al. (2011) likewise reported more positive mother-child relationships in disclosing than non-disclosing gamete donation families at age 7. No comparable differences have been established regarding father-child relationships, although exploratory comparisons by Lycett et al. (2004) of families who had made a definite decision for or against disclosure revealed differences in fathers' supervision, with those who had decided not to tell their child adopting higher levels of supervision than those who had told.

Whilst the available research thus suggests that disclosure may be associated with more positive outcomes for some aspects of parent-child interaction, it is important to recognize that DI families have been found to be functioning well overall. For example, Golombok et al. (2002a) found more positive parent-child relationships in assisted conception families when compared with natural conception and adoptive families. Furthermore, mediating factors such as quality of parenting and parent-child relationships are likely to be influential when comparing disclosed and non-disclosed families. Indeed, it is likely that disclosing families may differ from non-disclosing families in other respects beyond the parents' disclosure decision; for example, parents in disclosing families may be more open and emotionally available generally. It is also important to consider how the individual, familial and cultural context in which the disclosure process takes place may impact on outcomes (Daniels et al., 2009; Shehab et al., 2008). For example, a child's age at first disclosure and the manner in which they are told have been found to be of significance, with individuals who discover their donor origins later in life or under adverse circumstances, such as parental divorce, reporting more negative responses (Jadva et al., 2009; Turner and Cole, 2000).

Whilst little is known about the consequences of secrecy versus openness about donor conception at adolescence, it is reasonable to anticipate that differences may come to the fore at this stage. Young children are unlikely to comprehend the full implications of sperm donation with regards to their lack of genetic relationship with their father, with the abstract thinking required for such an understanding first developing at adolescence (Steinberg and Silk, 2002). Issues of identity also become salient during early adolescence (Erikson, 1968; Harter, 1998), and conflict in parent-child relationships is likely to increase (Smetana, 1995). In addition, adolescence is a time when sex differences in children's socioemotional development and parental relationships become more evident (Steinberg, 1981). Again, the circumstances of disclosure may influence adolescents' feelings about being donor conceived, with those who grow up in families where there has been openness around donor conception being found to be positively accepting of this knowledge, as reported in the study by Scheib et al. (2005) of adolescents with open-identity donors.

In the case of adoption, a growing awareness of the meaning and implications of being adopted may develop at adolescence and curiosity about origins and genetic parents may be expressed (Brodzinsky and Pinderhughes, 2002). Whilst negative and ambivalent feelings about being adopted may arise as children grow older (Smith and

Brodzinsky, 1994), studies of adoption also demonstrate the importance of openness about adoption for positive family relationships and children's psychological wellbeing (Brodzinsky, 2006; Grotevant et al., 2005; Palacios and Brodzinsky, 2010). Research on adoption further suggests that adopted boys may be more vulnerable to problems in psychological adjustment than adopted girls (Brodzinsky, 1993; Grotevant and Cooper, 1985; Smith and Brodzinsky, 1994).

The aim of this study is to examine the consequences at adolescence of parental secrecy versus openness about DI for parent-child relationships and child adjustment. This is the second phase of a longitudinal study looking at outcomes for a UK sample of heterosexual couple families with a child conceived by anonymous DI (i.e. prior to the removal of donor anonymity in 2005), with a relatively high rate of disclosure given the prevailing cultural norms favouring secrecy at the time of their fertility treatment. The families were first assessed in early childhood (age 4–8 years) (Lycett et al., 2004, 2005) and the present study follows up the families as the child is entering adolescence (age 10–14 years). As such, this is the first prospective study to compare systematically the consequences at early adolescence of disclosure and non-disclosure. In the previous phase, families were found to be functioning well, with more positive outcomes found in disclosing families for some aspects of parent-child relationships and child adjustment. In particular, lower levels of mother-child conflict were reported in families where parents were inclined towards openness about DI, whilst there were no conclusive differences regarding father-child relationships. The current study explores whether the positive outcomes associated with disclosure in early childhood persist during the adolescent years; a developmental stage when identity issues, behavioural problems and conflict with parents are more likely to arise. In addition, this study is the first to investigate whether a child's sex influences the impact of disclosure on psychological adjustment and mother- and father-child relationships and to collect data from adolescents themselves about the quality of their relationships with their parents.

Materials and methods

Participants

The sample comprised 30 heterosexual parent families with an adolescent conceived by anonymous donor insemination. Thirty mothers, 21 fathers and 30 children took part, of whom 14 were boys and 16 were girls. Eighteen (60%) children had no siblings, 11 (37%) had one sibling and one (3%) had two siblings. All of the children were singletons. The children were aged 10–14 years (mean 12.53 years), with the mean age of boys and girls being 12.5 years and 12.6 years, respectively. Thirteen (93%) boys and 12 (75%) girls were at secondary school. The mothers' mean age was 47 years and the fathers' mean age was 53 years. Twenty-three (77%) couples were married and the remaining seven (23%) had divorced: in one instance, the child was no longer in contact with the father; in two (6%) cases, contact with the father was irregular and minimal (i.e. the child saw father less than once every fortnight); and in two (6%) cases, the mother had

remarried. The length of marriage for the sample as a whole ranged from 7 to 28 years, with the duration being (mean \pm SD) 20 ± 5.4 years. There was a range in social class background as rated by the current (or most recent) occupation of the parent with the highest ranking using a modified version of the Standard Occupational Classification 2000 (ONS, 2000). Ten (33%) parents were professional/managerial, nine (30%) were associate professional/technical, nine (30%) were skilled/non-manual and two (7%) were unskilled. Three (10%) mothers and six (20%) fathers were currently unemployed. In terms of ethnicity, the majority (91%) of parents were white British, one (2%) were white other European and four (8%) were Middle Eastern.

The families had been assessed 6 years previously (Phase 1) when the children were aged 4–8 years (Lycett et al., 2004, 2005). They were originally recruited from King's College Hospital Assisted Conception Unit, London. This clinic was selected to maximize disclosure rates among the sample owing to its policy of encouraging parental openness about donor conception. Forty-six families took part at Phase 1, of whom four did not wish to be contacted about future research and six were untraceable due to change of address. The remaining 36 families were contacted about the current study by telephone, first by the original researcher (EL) and, if they agreed, with a follow-up call from the current researcher (TF). Thirty-one families agreed to take part, giving a participation rate of 86%; one of these families was not included in the analysis because they were unable to complete all of the measures. All five families who did not wish to take part in the current study had not informed their child about their donor conception at Phase 1. In cases ($n = 4$) where couples had divorced and the father maintained regular contact with the child, mothers were asked for permission for the father to be contacted about the study. In accordance with the mothers' wishes, only one of the seven divorced fathers was contacted and he agreed to take part. Of the remaining six divorced fathers, the father either had no or minimal contact with the child ($n = 3$) or the mother declined to give their ex-husbands' contact details ($n = 3$) because relations between the mother and father were strained or the mother was concerned that the father would be upset by, or disinterested in, the study. This contributed to the lower participation rates amongst fathers than mothers: in addition to the six (67%) non-participating fathers who had divorced, one (11%) had work commitments and two (22%) declined to take part. In Phase 1, 18 (39%) parents reported being inclined towards disclosure, including six (13%) who had told their child about their donor conception. In the current phase, a further four parents reported having told their child about their origins, giving a total of 10 (33%) children who had been told about their donor conception. There were five (50%) boys and five (50%) girls in the disclosed group.

Informed consent was obtained from all families who took part in the study. Ethical approval was granted by the University of Cambridge Psychology Research Ethics Committee.

Procedure

A research psychologist (TF) trained in the study techniques visited the families at home or, if preferred, a parent's

workplace. Semi-structured interviews were conducted with the mother and father separately, lasting between 1 and 2.5 h each. Individual rather than joint interviews were employed because the viewpoints of mothers and fathers may differ and were of equal interest in the present study. With the parents' permission, the child was also interviewed: all of the parents agreed to their child taking part. Additional data were collected from parents with standardized questionnaires and, with the parents' permission, one of the child's current teachers also completed a postal questionnaire. Ninety percent of parents gave permission for their child's teacher to be contacted, with 74% ($n = 20$) of these teachers completing the questionnaire.

Measures

Parents' marital and psychological state

Using interviews, mothers and fathers were asked about their psychiatric history and information was obtained about any psychiatric contacts made, or medication prescribed, since the previous phase of the study.

For intact couples, both mothers and fathers completed the Golombok Rust Inventory of Marital State (GRIMS; Rust et al., 1988, 1990). This is a questionnaire measure of the quality of the marital relationship with high scores representing greater marital difficulty and has been shown to have good reliability and validity.

Parent-child interaction

Interviews with mothers and fathers were adapted from an investigator-based semi-structured standardized interview designed to assess the quality of parenting (Quinton and Rutter, 1988). This interview has been validated against observational ratings of parent-child relationships in the home, demonstrating a high level of agreement between global ratings of the quality of parenting by interviewers and observers. Detailed accounts were obtained of the child's behaviour and the parent's response to it, with reference to the child's relationships within the family. Particular attention was paid to parent-child interactions relating to parental warmth, parental control and the facilitation of autonomy; aspects of parenting that are considered particularly important in relation to the psychological adjustment of adolescents.

Ratings of the quality of parenting were made for mothers and fathers separately from data obtained for the entire interview using a standardized coding scheme to produce the following variables for each parent. **Expressed warmth** was rated on a 6-point scale from 0 (none) to 5 (high) and was based on the parent's tone of voice, facial expression and gestures when speaking about the child, spontaneous expressions of warmth, sympathy and concern about any difficulties experienced by the child, and interest in the child as a person. **Sensitive responding** was rated on a 5-point scale from 0 (none) to 4 (very sensitive) and represented the parent's ability to recognize and respond appropriately to the child's fears and anxieties. **Emotional involvement** was rated on a 4-point scale from 0 (no involvement) to 3 (enmeshed) and measured the extent to

which family life and the emotional functioning of the parents centred on the child and the extent to which the parent was overly concerned about or overprotective towards the child. **Supervision** was rated on a 5-point scale from 0 (very inadequate) to 4 (oversupervised) and measured the parent's age-appropriate monitoring of the child's activities. **Disciplinary aggression** was rated on a 6-point scale from 0 (none) to 5 (abusive) and measured irritability, loss of temper and physical aggression shown by the parent towards the child during disciplinary interactions. **Frequency of disputes** between parent and child was rated on a 5-point scale from 0 (none or very rare) to 4 (more than one per week). **Severity of disputes** was rated on a 4-point scale ranging from 0 (no confrontations) to 3 (major battles). In previous studies of DI and other assisted conception families in which the present research group used this interview, randomly selected interviews coded by a second interviewer who was 'blind' to family type showed acceptable to high inter-rater reliabilities for the variables, with intraclass correlation coefficients ranging from 0.50 to 0.80 (Golombok et al., 2002b, 2011).

Children were interviewed using a modification of the Child and Adolescent Functioning and Environment Schedule (CAFE; John, 1989), a semi-structured interview designed to obtain information on children's relationships with their parents. Information obtained from the interview was rated according to a standardized coding scheme to produce the following variables relating to parent-child interaction for mothers and fathers separately. **Parent's affection** measured the parent's overt affectionate and caring behaviour. **Confiding in parent** assessed how often the child confided difficulties and anxieties to the parent. **Parents' availability** measured how much time the parent was perceived to have available for the child. **Parent's dependability** assessed the parent's reliability and trustworthiness. **Admiration of parent** represented the degree of admiration that child has for the parent as a person, including their perceived traits and skills. **Emulation of parent** measured the degree to which the child feels, and aspires to be, like the parent. **Frequency of disputes** and **severity of disputes** were rated using the same scales as in the parent's interview. Each variable was measured on a 4- or 5-point scale with a higher score representing a higher level of the behaviour. In a comparable study conducted by this research group, inter-rater reliabilities for these variables ranged from 0.50 to 0.87 (Golombok et al., 2002b).

Children's psychological adjustment

In the interviews with mothers, the child's psychiatric state was assessed using a standardized interview procedure with well-established reliability and validity (Rutter et al., 1975). Detailed descriptions of any emotional or behavioural problems shown by the child were obtained as part of the mother's interview. These descriptions of actual behaviour, which included information about where the behaviour was shown and its severity, frequency, precipitants and course over the past year, were transcribed and then rated by a clinical child psychologist who was blind to knowledge of the family or the objectives of the study. Psychiatric disorder was rated according to **severity** on a 4-point scale from

0 (no disorder) to 3 (definite or marked disorder) and **type** (emotional, conduct, mixed, developmental, other).

The presence of emotional and behavioural problems in the adolescents was also assessed using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1994, 1997), which was administered to mothers, fathers and teachers. This questionnaire produces a 'total difficulties score' of the adolescents' adjustment, as well as subscale scores of conduct problems, emotional difficulties, hyperactivity, peer problems and prosocial behaviour. For parents' questionnaires, total difficulties scores of 13 or below are classified as within the normal range, scores of 14–16 are classified as borderline and scores of 17 or above are classified as abnormal (i.e. indicating psychological disorder). For teachers' questionnaires, scores of 11 or below are classified as within the normal range, scores of 12–15 are classified as borderline and scores of 16 or above are classified as abnormal. The SDQ has been shown to have good validity and reliability, with correlations between parent and teacher scores reported to be 0.62. In addition, the SDQ discriminates well between psychiatric and non-psychiatric samples (Goodman, 1994, 1997).

Data analysis

Families were grouped according to disclosure status (disclosed versus non-disclosed) and child's sex (male versus female) for the purpose of comparison. The disclosed group ($n = 10$) comprised families where mothers reported that their child had been told about their donor conception. Mothers in the non-disclosed group ($n = 20$) reported that the child had not been told about their donor conception and included those who did not intend to tell ($n = 13$), were uncertain about telling ($n = 4$) or intended to tell sometime in the future ($n = 3$). The distinction between disclosers and non-disclosers was therefore based on actual disclosure rather than intended disclosure which has been used in studies of younger children (Brewaeyts et al., 1997; Lycett et al., 2004; Nachtigall et al., 1997; Shehab et al., 2008), as previous research suggests that parents who have not disclosed by the time their child reaches adolescence will most likely not do so despite their earlier intentions (Golombok et al., 2002b). In one instance, a mother and father had a different disclosure status (the mother had told the child about their donor conception without the father's knowledge). Families were therefore grouped according to the mother's disclosure status as this was the best reflection of actual disclosure. Comparisons for variables relating to socio-demographic characteristics, parents' marital and psychological state and children's psychological state were conducted using independent sample t-tests and multivariate analyses of variance (MANOVAs) as appropriate. Comparisons for variables relating to mother–child and father–child interaction were conducted using a factorial analysis of variance (ANOVA) design detailed below.

Results

Disclosure status and child's age at disclosure

There was no difference regarding the child's sex for disclosure status: there were five (50%) boys and five (50%) girls in

the disclosed group, and nine (45%) boys and 11 (55%) girls in the non-disclosed group. The child's age at first disclosure ranged from 3 to 9 years, with the mean age at which the child had been told about their conception being 5.4 ± 2.37 years. There was also no sex difference in the child's age at disclosure.

Socio-demographic characteristics

As shown in **Table 1**, significant differences between the disclosed and non-disclosed groups were found with regard to mother's age and duration of marriage: mothers in the disclosed group were younger ($t_{(28)} = 2.36$, $P < 0.05$) and the marriages were shorter ($t_{(28)} = 2.22$, $P < 0.05$) compared with the non-disclosed group. There were no further differences in the family's socio-demographic characteristics (i.e. child's age and sex, father's age, number of siblings, social class, marital status, mother's and father's current employment) according to disclosure status.

Parents' marital and psychological state

There was no difference in the divorce rate according to parents' disclosure decision. The overall divorce rate of 23% is in line with population norms for England and Wales, based on the mean age and date of birth of the women (47 years, 1960) and men (53 years, 1954) in this sample, with the proportion of women for this age and birth cohort who had ever divorced being 289 per 1000 (29%) and the equivalent for men being 304 per 1000 (30%) (ONS, 2009). Only two of the divorces had occurred since the families were first interviewed, and none was reported as being related to issues associated with the DI. For those marriages that remained intact, there was no group difference according to disclosure status in the degree of marital satisfaction as measured by the GRIMS for either mothers or fathers.

Four (13%) mothers had made contact with medical services about their psychiatric state during the 6 years since the previous phase of the study, and two (7%) had been prescribed anti-depressant medication. Five (24%) fathers had made contact with medical services about their psychiatric state since the last interview, and two (10%) had been prescribed anti-depressant medication. There was no significant difference in the proportion of mothers or fathers who had made contact with medical services about their psychiatric state or had been prescribed anti-depressant medication between the disclosed and non-disclosed groups.

Mother–child interaction

Mothers' data

The variables relating mother–child interaction from the interview with the mother were entered into a principal components analysis. Two factors emerged with eigen values greater than 1, Warmth and Conflict. The two factors were subjected to a direct oblimin rotation ($\delta = 0$). Warmth had a loading of 0.81 for **expressed warmth**, 0.83 for **sensitive responding**, 0.86 for **emotional involvement** and 0.72 for **supervision**. Conflict had a loading of 0.82

Table 1 Socio-demographic information by disclosure status.

	<i>Disclosed</i>	<i>Non-disclosed</i>	<i>t</i>	<i>P-value</i>
Age of child (years)	12.40 ± 1.08	12.60 ± 1.19	0.45	NS
Age of mother (years)	44.70 ± 4.03	48.50 ± 4.22	2.36	<0.05
Age of father (years)	50.86 ± 3.08	53.37 ± 6.78	1.29	NS
Duration of marriage (years)	17.10 ± 4.75	21.45 ± 5.22	2.22	<0.05
<i>Child's sex</i>				
Male	5	9		NS ^a
Female	5	11		
<i>Siblings</i>				
Yes	3	9		NS ^a
No	7	11		
<i>Social class</i>				
Professional/managerial	3	7		NS ^a
Associate professional/technical	4	5		
Skilled/non-manual	3	6		
Semi-skilled/unskilled	0	2		
<i>Marital status</i>				
Married	7	16		NS ^a
Divorced/separated	3	4		
<i>Mother's current employment</i>				
Not working	1	2		NS ^a
Working	9	18		
<i>Father's current employment</i>				
Not working	0	6		NS ^a
Working	7	13		

Values are mean ± SD or *n*. NS = not significant.

^aFisher's Exact test.

for **disciplinary aggression**, 0.90 for **frequency of disputes** and 0.87 for **severity of disputes**.

The factor scores for Warmth and Conflict were entered into a 2 × 2 multivariate analysis of variance (MANOVA) with child's sex (male versus female) and disclosure status (disclosed versus non-disclosed) as between-subjects factors. The main effects for child's sex and disclosure status were not significant. However, there was a significant interaction between child's sex and disclosure status (Wilks' Lambda_(2,25) 4.71, *P* < 0.05). An analysis of variance (ANOVA) was carried out for Warmth and Conflict separately. For Conflict, a significant main effect was found for child's sex ($F_{(1,26)} = 5.36$, *P* < 0.05), reflecting lower levels of conflict between mothers and sons than between mothers and daughters. In addition, a significant interaction was found between child's sex and disclosure status ($F_{(1,26)} = 4.46$, *P* < 0.05), showing that the lower levels of conflict between mothers and sons than mothers and daughters occurred in the disclosed families only. There were no significant effects for Warmth (Table 2).

Children's data

The variables relating to mother–child interaction from the interview with the children were entered into a principal components analysis. Two factors emerged with eigen values greater than 1, Warmth and Conflict. The two factors

were subjected to a direct oblimin rotation (delta = 0). Warmth had a loading of 0.56 for **mother's affection**, 0.89 for **confiding in mother**, 0.50 for **mother's availability** and 0.76 for **mother's dependability**, 0.71 for **admiration of mother** and 0.85 for **emulation of mother**. Conflict had a loading of 0.83 for **frequency of disputes with mother** and 0.91 for **severity of disputes with mother**.

The factor scores for Warmth and Conflict were entered into a 2 × 2 multivariate analysis of variance (MANOVA) with child's sex (male versus female) and disclosure status (disclosed versus non-disclosed) as between-subjects factors. No significant effects were found for either Warmth or Conflict (Table 2).

Father–child interaction

Fathers' data

The variables relating to father–child interaction from the interview with the father were entered into a principal components analysis. Two factors emerged with eigen values greater than 1, Warmth and Conflict. The two factors were subjected to a direct oblimin rotation (delta = 0). Warmth had a loading of 0.83 for **expressed warmth**, 0.73 for **sensitive responding** and 0.84 for **emotional involvement**. Conflict had a loading of –0.57 for **supervision**, 0.82 for **disciplinary aggression**, 0.94 for **frequency of disputes** and 0.95 for **severity of disputes**.

Table 2 Mother–child interaction by disclosure status and child’s sex.

	<i>Disclosed</i> (mean ± SD)	<i>Non-disclosed</i> (mean ± SD)	<i>Disclosure status</i>		<i>Child’s sex</i>		<i>Interaction</i>	
			<i>F</i>	<i>P-value</i>	<i>F</i>	<i>P-value</i>	<i>F</i>	<i>P-value</i>
Mothers’ data			0.93	NS	3.34	NS	4.71	<0.05
Warmth			0.85	NS	0.27	NS	2.51	NS
Expressed warmth	4.20 ± 1.03	4.40 ± 1.00						
Sensitive responding	2.70 ± 1.16	2.85 ± 0.93						
Emotional involvement	1.20 ± 1.23	1.75 ± 1.02						
Supervision^a	2.50 ± 0.97	2.70 ± 0.80						
Conflict			0.52	NS	5.36	<0.05	4.46	<0.05
Disciplinary aggression	1.20 ± 1.32	1.55 ± 0.95						
Frequency of disputes	1.80 ± 1.55	2.45 ± 1.70						
Severity of disputes	1.30 ± 1.06	1.30 ± 1.03						
Children’s data			1.15	NS	0.97	NS	0.53	NS
Warmth			1.46	NS	0.34	NS	0.92	NS
Mother’s affection	3.10 ± 0.99	3.55 ± 0.69						
Confiding in mother	3.30 ± 0.65	3.55 ± 0.68						
Mother’s availability	3.20 ± 0.79	3.40 ± 0.68						
Mother’s dependability	3.30 ± 0.68	3.55 ± 0.61						
Admiration of mother	2.90 ± 0.99	3.15 ± 0.93						
Emulation of mother	2.90 ± 0.88	3.05 ± 1.36						
Conflict			1.44	NS	1.32	NS	0.05	NS
Frequency of disputes	2.00 ± 1.70	2.20 ± 1.40						
Severity of disputes	1.63 ± 1.06	1.30 ± 0.80						

^aSupervision loaded onto the Warmth factor for mother–child interaction and the Conflict factor for father–child interaction.

The factor scores for Conflict and Warmth were entered into a 2 × 2 multivariate analysis of variance (MANOVA) with child’s sex (male versus female) and disclosure status (disclosed versus non-disclosed) as between-subjects factors. No significant effects were found for either Conflict or Warmth (Table 3).

Children’s data

The variables relating to father–child interaction from the interview with the children were entered into a principal components analysis. Two factors emerged with eigen values greater than 1, Warmth and Conflict. The two factors were subjected to a direct oblimin rotation (delta = 0). Warmth had a loading of 0.88 for **father’s affection**, 0.81 for **confiding in father**, 0.84 for **father’s availability**, 0.88 for **father’s dependability**, 0.59 for **admiration of father** and 0.74 for **emulation of father**. Conflict had a loading of 0.93 for **frequency of disputes with father** and 0.73 for **severity of disputes with father**.

The factor scores for Warmth and Conflict were entered into a 2 × 2 multivariate analysis of variance (MANOVA) with child’s sex (male versus female) and disclosure status (disclosed versus non-disclosed) as between-subjects factors. There was a significant main effect for disclosure status (Wilks’ Lambda_(2,23) 4.99, $P < 0.05$). Neither the main effect for child’s sex nor the interaction between child’s sex and disclosure status

were significant. An analysis of variance (ANOVA) was carried out for Warmth and Conflict separately. For Warmth, a significant main effect was found for disclosure status ($F_{(1,24)} = 8.72$, $P < 0.01$), reflecting lower levels of Warmth in the disclosed group. There were no significant effects for Conflict (Table 3).

Children’s psychological adjustment

The large majority of adolescents obtained total difficulties scores from the SDQ within the normal range. From the mothers’ questionnaires, no child obtained score within the abnormal range and only two (7%) out of 30 children obtained a score within the borderline range (one boy disclosed group, one boy non-disclosed group). Of the 21 children whose father completed a questionnaire, none obtained a score within the abnormal range and only one (5%) obtained a score within the borderline range (one girl disclosed group). Of the 20 children for whom teachers completed a questionnaire, three (15%) obtained a score within the abnormal range (one boy disclosed group, two girls non-disclosed group) and the others were all within the normal range. The mothers’, fathers’ and teachers’ scores are therefore in line with, or fall below, the population norm of 10% abnormal and 10% borderline. No significant group differences were found for either mothers’, fathers’ or teachers’ scores regarding child’s sex and disclosure status. Of the total number of children who

Table 3 Father–child interaction by disclosure status and child’s sex.

	<i>Disclosed (mean ± SD)</i>	<i>Non-disclosed (mean ± SD)</i>	<i>Disclosure status</i>		<i>Child’s sex</i>		<i>Interaction</i>	
			<i>F</i>	<i>P-value</i>	<i>F</i>	<i>P-value</i>	<i>F</i>	<i>P-value</i>
Fathers’ data			0.59	NS	0.06	NS	0.43	NS
Warmth			1.17	NS	0.13	NS	0.01	NS
Expressed warmth	4.00 ± 1.27	4.13 ± 1.13						
Sensitive responding	1.67 ± 0.52	2.47 ± 0.83						
Emotional involvement	1.17 ± 1.47	1.47 ± 1.06						
Conflict			0.42	NS	0.04	NS	0.73	NS
Supervision^a	2.00 ± 1.10	2.53 ± 0.92						
Disciplinary aggression	2.00 ± 1.67	1.40 ± 1.18						
Frequency of disputes	2.33 ± 1.97	1.73 ± 1.49						
Severity of disputes	1.17 ± 0.98	1.13 ± 0.99						
Children’s data			4.99	<0.05	0.32	NS	0.96	NS
Warmth			8.72	<0.01	0.28	NS	1.29	NS
Father’s affection	2.22 ± 1.09	3.35 ± 0.93						
Confiding in father	2.22 ± 1.09	2.90 ± 0.97						
Father’s availability	2.22 ± 0.83	3.05 ± 0.89						
Father’s dependability	2.56 ± 1.01	3.25 ± 0.79						
Admiration of father	2.33 ± 0.71	3.10 ± 0.79						
Emulation of father	2.00 ± 0.87	2.90 ± 1.21						
Conflict			3.63	NS	0.25	NS	0.34	NS
Frequency of disputes	2.11 ± 1.69	1.60 ± 1.43						
Severity of disputes	2.13 ± 1.13	1.00 ± 0.97						

^aSupervision loaded onto the Warmth factor for mother–child interaction and the Conflict factor for father–child interaction.

obtained borderline scores, two (one boy, one girl) were in the disclosed group and one (one boy) was in the non-disclosed group, and of the children who obtained abnormal scores, one (one boy) was in the disclosed group and two (two girls) were in the non-disclosed group children, indicating the lack of group differences according to disclosure status and child’s sex.

For mothers’, fathers’ and teachers’ data separately, the SDQ subscale scores of emotional symptoms, conduct problems, hyperactivity, peer problems and prosocial behaviour were entered into a 2 × 2 multivariate analysis of variance (MANOVA) with child’s sex (male versus female) and disclosure status (disclosed versus non-disclosed) as between-subjects factors. No significant effects were found for either mothers’, fathers’ or teachers’ scores.

With regards to the assessment of psychiatric disorder by the clinical child psychologist, two (7%) of the 30 children were identified as having a ‘definite or marked’ disorder (two girls non-disclosed group: one conduct disorder, one mixed disorder). There were no significant differences in the proportions of children classified as having a definite or marked disorder according to child’s sex or disclosure status.

Discussion

Overall, the DI families in this study appeared to be functioning well at early adolescence, with positive relation-

ships being maintained between mothers, fathers and children. Whilst there were no significant differences regarding the psychological wellbeing of children and parents between families where the child had, or had not, been told about their donor origins, some differences emerged in terms of parent–child relationships. In families where children had been told about their donor conception, mothers of boys reported significantly lower levels of conflict with their child than mothers of girls. By contrast, children in families where parents had disclosed reported lower levels of warmth in their relationships with their fathers compared with children who were not aware of their donor origins. These findings suggest that the sex of both the child and parent may be important factors when investigating the differential impact of secrecy and openness on relationships in DI families.

An association between disclosure and lower levels of mother–child conflict was also found at Phase 1 when this sample of children were in early childhood (Lycett et al., 2004), and has likewise been found in other studies of DI children at early adolescence (Golombok et al., 2002a). The current study introduces a gender dimension by confirming a positive relationship between disclosure and decreased maternal conflict but identifying this as pertaining to mother–son relationships only at adolescence. Indeed, mother–daughter relationships were found to have significantly higher levels of conflict than mother–son relationships overall, with girls in the disclosed group displaying

the highest levels. These findings are therefore in line with the general observation that, whilst early adolescence is a time when conflict between children and parents is likely to occur (Allison, 2000; Steinberg, 1988), conflict is most frequent between mothers and daughters (Paikoff and Brooks-Gunn, 1991).

The lower levels of father–child warmth reported by children who had been told about the nature of their conception is a new and interesting finding, and may indicate the potential for father–child relationships to become increasingly distanced at adolescence for those who are aware that their father is not their genetic parent. This finding also supports, and sheds light on, the tentative association between lower levels of paternal supervision and disclosure that was found for this sample at Phase 1, with lower levels of supervision also being associated with higher levels of father–child conflict in the current phase. Furthermore, a recent study by Casey et al. (data not shown) found that DI children at age 7 displayed higher levels of negativity towards their fathers than those in egg donation and surrogacy families. Taken together, these findings suggest that the absence of genetic relatedness between fathers and children in DI families may become important in the development of father–child relationships as children grow older, especially for those who have been told about their donor origins. This is of interest given that parents', and especially fathers', concern that a child's knowledge of their donor origins could damage the father–child relationship, particularly at adolescence, has been identified as an important factor in the decision not to tell (Blake et al., 2010; Cook et al., 1995; Lycett et al., 2004). However, considerable caution must be exercised when drawing any inferences about the negative impact a donor-conceived child's knowledge of their lack of genetic relatedness with their father may have on their relationship with him. Indeed, an in-depth exploration with the current sample of adolescents' perspectives on their parental relationships and their feelings about being donor conceived revealed the relative unimportance attributed to the non-genetic link with their father (Freeman and Golombok, data not shown). It is also important to bear in mind that tensions in parent–child relationships are to be expected during early adolescence, including a decline in reported closeness between parents and children (Larson and Richards, 1994).

Although no sex differences regarding father–child warmth were evident overall, the data suggest that the differential impact of disclosure versus secrecy on parent–child relationships may be more pronounced for boys than girls, with the lowest levels of both father–child warmth and mother–child conflict being apparent for boys in disclosed families. Exploratory analyses of the boys' and girls' data separately were conducted to investigate this further. A comparison of means showed that differences between disclosed and non-disclosed families were greater for boys than girls with regards to both levels of father–child warmth and mother–child conflict: for boys, the decreased levels of father–child warmth in disclosed than non-disclosed families was significant ($t_{(12)} = 3.12$, $P < 0.05$) and the decreased levels of mother–child conflict approached significance ($t_{(12)} = 2.14$, $P = 0.053$), whilst differences between girls in the disclosed and non-disclosed groups were non-significant in both cases. Although it is

not possible to draw any conclusions from the current study regarding the role a child's sex might play in terms of the impact of parents' disclosure decisions on parent–child relationships, these exploratory findings suggest that this line of enquiry may be worth investigating further in the future as more definitive sex differences may become apparent with a larger sample.

Whilst being a common feature of research in this field, the small sample size limits the scope of this study and the generalizability of the findings. There are also further important considerations that should be taken into account when interpreting the findings.

First, the observed differences between disclosed and non-disclosed families cannot be directly attributed to the parents' disclosure decisions. Other differences between these families (e.g. parenting style) may have influenced these outcomes.

Second, the identification of difference is not synonymous with the identification of dysfunction. Indeed, the families in this study were generally functioning well regardless of parents' disclosure decision, and thus observed differences in parent–child relationships between disclosed and non-disclosed families should be understood as relative, rather than indicative of pathology. This is of particular relevance given that increased conflict and lower levels of warmth between parents and children have been identified as a 'normal' and expected feature of adolescence.

This leads to a third point concerning the transitional nature of early adolescence, with any difficulties or tensions in parent–child relationships identified at this time likely to be transient in nature. Likewise, it is reasonable to assume that an individual's feelings about their donor origins can, and will, change over the life course. Early adolescence is typically associated with questioning one's identity and struggling to achieve independence (Erikson, 1968; Steinberg and Morris, 2001). For donor-conceived children who are aware of their origins, it is possible that any identity issues and difficulties associated with this stage may be exacerbated. This may be particularly the case for adolescents conceived using an anonymous donor, although a longitudinal study of DI children in lesbian couple families did not find any difference in psychological adjustment at late adolescence between those who were conceived with a known or unknown donor (Bos and Gartrell, 2011). The circumstances and age at which disclosure occurs are also likely to be significant factors, with donor-conceived children who are told about their origins earlier in life, or who have 'always known', tending to be more accepting of this information than those who find out at a later stage (Jadva et al., 2009). For example, Turner and Cole (2000) reported that adults who had found out about their donor conception in adolescence or adulthood attributed feelings of mistrust within the family and poor father–child relationship to their donor origins. In this light, observations of positive functioning in non-disclosed families must be weighed against the risk of accidental disclosure in later life and the potentially negative outcomes associated with this. Conversely, observations of positive functioning in disclosed families must be contextualized with regards to the circumstances of disclosure. In the current sample, it is therefore of significance to note that

children in the disclosed group had been told about their donor conception during early childhood (mean child's age at first disclosure = 5.4 years).

Overall this study found that, at early adolescence, there were lower levels of conflict in mother–son than mother–daughter relationships in disclosed families and lower levels of father–child warmth in disclosed than non-disclosed families. However, given the considerations outlined above, these findings cannot simply be read as representing positive and negative outcomes of parental openness about DI respectively. Rather, it is perhaps prudent to conclude that being open about DI does not appear to create significant difficulties in family functioning and child psychological adjustment, and that a child's sex and age may be important in assessing the relative impact of secrecy and disclosure at any stage. Furthermore, although the children's data indicated that father–child relationships may become less close for adolescents who are aware of their donor conception, this must be balanced against the recognition that increased distance in parent–child relationships forms part of a child's healthy transition towards adulthood. Indeed, as this longitudinal study suggests, parental disclosure decisions are likely to have varying impacts over the life course and, unlike secrecy, openness does not carry the risk of unintended disclosure at a later stage.

As greater openness about gamete donation is being encouraged in policy and practice in many countries, it is vital to assess the long-term psychological impact of telling children about their donor conception. This study builds on existing research that suggests that children's psychological wellbeing and family relationships are not negatively affected by being donor conceived (Golombok et al., 2002b; Owen and Golombok, 2009; van Gelderen et al., 2012) or by being informed about their donor conception at an early age (Nachtigall et al., 1997, 1998; Chan et al., 1998; Golombok et al., 2005; Lycett et al., 2005). Whilst the present study is of immediate relevance to current discussions on increasing openness about gamete donation, it is also of significance that, having been conceived before the removal of donor anonymity in 2005, the children in this study have no means of accessing identifying information about their donor (except in the rare instance of a donor deciding to make their details available through a voluntary register or clinic). Issues concerning identity and parental relationships that may arise for such children may be quite different from those who have identifiable donors. In the drive towards donor identification, the specific needs of the generation of children conceived using non-identifiable donors, and indeed, of their parents, must not be sidelined in research and policy debates. Moreover, the fact that differences in father–child relationships between disclosed and non-disclosed families were more pronounced in adolescents' reports than fathers' demonstrates the methodological value of gaining insight into the experiences of donor-conceived children from their own perspectives rather than relying on parental accounts. More generally, this study highlights the need for future studies of sex differences in the experiences of donor-conceived children and their parents and the importance of longitudinal research assessing the changing needs of these families over time.

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