Solo mothers and their donor insemination infants: follow-up at age 2 years

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BACKGROUND: Findings are presented of the second phase of a longitudinal study of solo-mother families created through donor insemination (DI). METHODS: At the time of the child’s second birthday, 21 solo DI mother families were compared with 46 married DI families on standardized interview and questionnaire measures of the psychological well being of the mothers, mother–child relationships and the psychological development of the child. RESULTS: The solo DI mothers showed greater pleasure in their child and lower levels of anger accompanied by a perception of their child as less ‘clingy’. Fewer emotional and behavioural difficulties were shown by children of solo than married DI mothers. CONCLUSIONS: The findings from this first cohort of solo DI families to be studied lend further weight to the view that these women represent a distinct subgroup of single parents, who, out of a strong desire for a child, have made the active choice to go it alone. Moreover, this route to parenthood does not necessarily seem to have an adverse effect on mothers’ parenting ability or the psychological adjustment of the child.

Key words: child development/donor insemination/parenting/solo mother

Introduction

Large-scale epidemiological studies of father-absent families consistently show that children raised by single mothers are more likely to show psychological problems and are less likely to perform well at school than their counterparts from two-parent homes. These studies include an examination of four nationally representative samples in the US (McLanahan and Sandefur, 1994), an investigation of father-absent children sampled from the National Child Development Study in the UK (Ferri, 1976) and, most recently, a study of single-mother families from the Avon Longitudinal Study of Pregnancy and Childhood (Dunn et al., 1998). For example, McLanahan and Sandefur (1994) found that adolescents raised by single mothers during some period of their childhood were twice as likely to drop out of high school, twice as likely to have a baby before the age of 20 years and one and a half times more likely to be out of work in their late teens or early twenties than those from a similar background who grew up with two parents at home. In the investigation by Dunn et al. (1998) of 4-year-olds and their siblings, children from single-parent families showed higher levels of psychological disorder than their counterparts from two-parent homes.

Why is it that children from single-mother families show poorer outcomes? Is it because of the absence of a father, or are other factors involved? In examining this question, researchers have found that factors such as financial hardship and the mother’s lack of social support are largely responsible for children’s difficulties (Ferri, 1976; McLanahan and Sandefur, 1994). Another important contributing factor is exposure to conflict and hostility between parents before, during and sometimes after separation or divorce (Amato, 1993; Hetherington et al., 1998). The majority of single-parent families result from marital breakdown, and the negative effects of such conflict for children has been documented over several years (Hetherington et al., 1982; Hetherington, 1988; Hetherington and Stanley-Hagan, 2002). Interestingly, longitudinal studies have demonstrated that children can begin to show problems years before the divorce actually takes place, sometimes even before the parents have considered separation (Cherlin et al., 1991), showing that the psychological problems shown by children when their parents divorce do not simply result from the divorce itself but arise in response to the arguments and bitterness between parents that they experience at home.

Researchers have also looked at the impact of single parenthood on parenting, and have demonstrated that, on average, children in single-parent households experience a poorer quality of parenting than children who live with two parents (Hetherington et al., 1998). In the study by Dunn et al. (1998), scores on a scale of maternal negativity were higher for single mothers than for mothers in two-parent families. This scale included items such as ‘This child gets on my nerves’ and ‘I have frequent battles of will with this child’. Greater maternal negativity was associated with a higher rate of behavioural problems in children. Similarly, McLanahan
and Sandefur (1994) reported that single mothers exert less control over their children in terms of supervision and establishing rules than mothers in two-parent families. Not only do children in single-parent families experience less discipline and monitoring from their mother than children in two parent families, but also they receive no discipline from their father, an aspect of parenting that is often associated with the paternal role.

The poorer quality of parenting shown by single mothers may also be explained, at least in part, by the higher rates of psychological problems, particularly depression, found among single mothers. In the study by Dunn et al. (1998), depression was high among single mothers, and was associated with psychological disorder in children. One explanation for the association between maternal depression and psychological disorder in children is that depression reduces the ability to be an effective parent. Depression is thought to interfere with parents’ emotional availability and sensitivity to their children, and also with their control and discipline of them (Cummings and Davies, 1994). It has been demonstrated that depressed parents tend either to be very lenient with their children or very authoritarian, often switching between the two (Kochanska et al., 1997).

Section 13(5) of the Human Fertilisation and Embryology Act (1990) states that ‘A woman shall not be provided with treatment services unless account has been taken of the welfare of any child born as a result of the treatment (including the need of that child for a father).’ This has led to much controversy in recent years about whether single heterosexual women should have access to assisted reproduction to allow them to have a child without the involvement of a male partner. The specific concerns centre around the effects of growing up in a fatherless family and are based on the research described above that shows negative outcomes in terms of cognitive, social and emotional development for children raised by single mothers following parental separation or divorce. However, these outcomes cannot necessarily be generalized to children born to single mothers following donor insemination (DI) (solo mothers) because these children have not experienced parental separation and generally are raised without financial hardship. It remains possible, however, that other pressures on solo mothers, such as social stigma and lack of social support, may interfere with their parenting role, leaving their children vulnerable to emotional and behavioural problems. Moreover, from the perspective of the child, it is not known what the psychological consequences will be of discovering that their biological father is an anonymous sperm donor whom they may never meet.

In the first study of single heterosexual women who opted for DI as a means of having a child (Murray and Golombok, 2005), it was found that the main reason for choosing donor insemination as a route to parenthood was to avoid the need to have casual sex in order to become pregnant. There was a strong sense that time was running out to fulfil the lifelong dream of having a child and that there was no choice but to have a child in this way, owing to the lack of a partner. No differences were found between the solo DI mothers and the comparison group of married DI mothers in levels of anxiety, depression or stress associated with parenting. Solo DI mothers appeared to be more open towards disclosing the donor conception to the child than were the married DI mothers; 93% of solo mothers reported that they planned to tell their child compared with 46% of the married DI mothers. With respect to parent–child relationships, solo DI mothers showed similar levels of warmth and bonding to their infant as married DI mothers. However, solo mothers showed lower levels of interaction and sensitivity. A possible explanation for this finding is that the presence of a partner allowed married DI mothers more time with their child, which may have enhanced sensitive responding.

The first phase of this investigation was conducted when the child was 1 year old. The aim of the present study was to follow up the families around the time of the child’s second birthday. By age 2 years, attachment relationships to parents have been fully established. Age 2 years is also an important period in relation to children’s cognitive and emotional development, with respect to the emergence of autonomy from parents, emotional regulation and a sense of place as a member of the family (Edwards and Liu, 2002; Carter et al., 2004). In addition, the increase in resistant and angry behaviour in children of this age, often described as ‘the terrible twos’, has been associated with parenting difficulties (Belsky et al., 1996; Carter et al., 2004). Data on parent–child relationships were obtained using the Parent Development Interview (PDI) (Aber et al., 1985; Slade et al., 1999), an in-depth technique designed to assess the nature of the emotional bond between the parent and the child, using the coding scheme developed by Steele et al. (2000). The PDI produces variables relating to both the emotional experience of the parent such as joy and anger, and the parent’s perception of the emotional experience of the child such as affection and rejection. Owing to the difficulties associated with single parenthood, it was predicted that solo DI mothers would express higher levels of negative emotions and lower levels of positive emotions regarding their relationship with their child than married mothers of DI children, with associated difficulties in children’s psychological adjustment and cognitive development.

**Methods**

**Participants**

Twenty-one solo mother families with a child conceived by DI were studied in comparison with 46 married DI families, representing a response rate of 77% and 92%, respectively, of the samples of solo DI and married DI families who took part in the first phase of this investigation. Excluding non-participants who had moved abroad or could not be traced, the cooperation rate for solo DI and married DI families was 100% and 94%, respectively. A detailed description of the original sampling procedures employed in this investigation is presented in Murray and Golombok (2005).

There were similar proportions of boys and girls in each family type. There was a significant group difference in the age of the children ($t = -2.33$, $P < 0.05$). The children of solo DI mothers were the oldest, with a mean age of 25.2 months, while the children of married DI mothers were aged 24.7 months. A significant group difference was also found in the age of the mothers ($t = -3.22$, $P < 0.001$). The poorer quality of parenting shown by single mothers may also be explained, at least in part, by the higher rates of psychological problems, particularly depression, found among single mothers. In the study by Dunn et al. (1998), depression was high among single mothers, and was associated with psychological disorder in children. One explanation for the association between maternal depression and psychological disorder in children is that depression reduces the ability to be an effective parent. Depression is thought to interfere with parents’ emotional availability and sensitivity to their children, and also with their control and discipline of them (Cummings and Davies, 1994). It has been demonstrated that depressed parents tend either to be very lenient with their children or very authoritarian, often switching between the two (Kochanska et al., 1997).

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The mothers were interviewed using the PDI (Aber et al., 1985; Slade et al., 1999), an interview technique designed to assess the nature of the emotional bond between the parent and the child, using the coding scheme developed by Steele et al. (2000). This interview is derived from attachment theory and is based on the view that mothers’ thoughts and feelings about their child influence parenting behaviour. Mothers are asked not simply to describe their child but instead to describe their own and their child’s experience in moments of interaction and relatedness. For example, the mother is asked to describe the child’s reactions to normal separations, routine upsets and parental unavailability, followed by questioning that addresses the mother’s behavioural and emotional responses to these situations. In this way, the mothers’ experiences and representations of the dynamics of the relationship between themselves and their child may be evaluated. Data are scored according to well-defined coding criteria, taking account of the mother’s affective tone and coherence in addition to the content of her response. The variables used in the present study that related to the parent’s affective experience were degree of anger (rated from 1 ‘none/minimal anger’ to 4 ‘considerable anger’), acknowledgement of support needed (rated from 1 ‘minimal feelings of needing support’ to 4 ‘very strong feelings of needing support’), satisfaction with support available (rated from 1 ‘very dissatisfied’ to 4 ‘highly satisfied’), guilt (rated from 1 ‘none/minimal guilt’ to 4 ‘considerable guilt’), joy/pleasure (rated from 1 ‘minimal acknowledgement of joy or pleasure’ to 4 ‘high significant acknowledgement of joy or pleasure’), competence (rated from 1 ‘low competence’ to 4 ‘high competence’), level of child focus (rated from 1 ‘low level of child focus’ to 4 ‘high level of child focus’), disappointment with child (rated from 1 ‘none/minimal disappointment’ to 4 ‘high disappointment’), parental hostility (rated from 1 ‘none/minimal hostility’ to 4 ‘high hostility’), over-protection (rated from 1 ‘none/minimal over-protectiveness’ to 4 ‘high over-protectiveness’), disciplinary over-indulgence (rated from 1 ‘average’ to 4 ‘indulgent’) and clingy behaviour (rated from 1 ‘none/minimal clinging’ to 4 ‘high clinging’). In order to calculate inter-rater reliabilities, a second interviewer coded 39 randomly selected interviews. Percentage agreement within one scale point for degree of anger, acknowledgement of support needed, satisfaction with support available, guilt, joy/pleasure, competence, level of child focus, disappointment with child, parental hostility, over-protection, disciplinary over-indulgence and clingy behaviour ranged from 92% to 100%.

**Measures**

**Mothers’ psychological state**

The short form of the Parenting Stress Index (PSI/SF) (Abidin, 1990), a standardized assessment of stress associated with parenting, was administered to mothers to produce a total score for each mother, with higher scores reflecting greater parenting stress. Test–retest reliability for the total score was reported to be 0.96 over a 1–3-month interval and 0.65 over 1 year. Concurrent and predictive validity have been demonstrated for the full-length questionnaire, and the short form has been reported to correlate very highly with the full-length version. In addition, the Vulnerable Child Scale (Perrin et al., 1989) was administered to mothers to provide an assessment of anxiety regarding the child’s susceptibility to medical problems, with a lower score representing a greater sense of vulnerability. Test–retest reliability was reported to be 0.95 over a 4-week period, and the scale was found to discriminate between parents of formerly sick premature infants and parents of healthy full-term infants when the child was 3 years old. The Trait Anxiety Inventory (Spielberger, 1983) and the Edinburgh Depression Scale (Thorpe, 1993) were completed by mothers to assess anxiety and depression, respectively. Both of these instruments, for which higher scores represent greater difficulties, have been shown to have good reliability and to discriminate well between clinical and non-clinical groups.

**Parent–child relationships**

The mothers were interviewed using the PDI (Aber et al., 1985; Slade et al., 1999), an interview technique designed to assess the occupation of the parent with the highest ranking position according to a modified version of the Registrar General’s Classification (OPCS and Employment Department Group, 1991) ranging from 1 (professional/managerial) to 4 (manual/unskilled). The number of siblings in the family did not differ between family types. As significant differences between groups were found for mother’s and child’s ages, these variables were entered into the statistical analyses as covariates.

Researchers trained in the study techniques visited the families at home. Data were obtained from the mother by tape-recorded interview and questionnaire. Interviews were conducted with 99% of mothers. Questionnaire data were obtained from 94% of mothers. Ninety-one per cent of the children were assessed.

**Children’s psychological development**

Children’s psychological adjustment was assessed using the Brief Infant-Toddler Social and Emotional Assessment (BITSEA) (Briggs-Gowan and Carter, 2002; Briggs-Gowan et al., 2004), a questionnaire measure of social-emotional problems and competencies in 1–3-year-olds adapted from the Infant-Toddler Social and Emotional Assessment (Briggs-Gowan and Carter, 1998; Carter et al., 2001). The questionnaire was completed by the child’s mother. The BITSEA produces two scores, a Problem Scale score and a Competence Scale score, with higher scores representing greater problems and greater competence, respectively. Good test–retest reliability has been demonstrated with intraclass correlations of 0.82 and for the Problem Scale and 0.72 for the Competence Scale. The BITSEA has been validated against the ratings of independent assessors and the Child Behavior Checklist (Achenbach and Rescorla, 2000), and has also been shown to correlate with parents’ reports of parental worry, stress and interference in family life.

To assess cognitive development, the children were tested on the Mental Scale of the Bayley Scales of Infant Development Second Edition (BSID II) (Bayley, 1993) around the time of their second birthday. The Mental Scale includes items that assess memory, habituation, problem solving, early number concepts, generalization, classification, vocalizations, language and social skills. The raw score for each child is transformed to produce an age-standardized Mental Development Index. Inter-rater reliability for the Mental Development Index has been reported to be 0.96, and test–retest reliability at age 2 years 0.91. The BSID II has been demonstrated to have high content, construct, predictive and discriminant validity.

**Statistical analysis**

One-way analyses of covariance (ANCOVAs) were conducted for the mothers’ questionnaire variables relating to mothers’ psychological state. Multivariate analyses of covariance (MANCOVAs) were conducted for the variables of the PDI, followed by one-way ANCOVAs for each variable included in the MANCOVA. The covariates were mother’s and child’s age. In addition, an ANCOVA was conducted for each of the BITSEA subscales and for the Bayley Scale.
Results

Family characteristics
All of the solo DI mother children were living with their mothers and in the case of the married DI families all children were living with both parents with the exception of one child whose father had died. There was no group difference in the number of mothers who were employed outside the home, with between 13% and 28% of mothers in each family type in full-time employment.

Mothers’ psychological state
One-way ANCOVAs were conducted for each of the total scores on the PPsi/SF, the Vulnerable Child Scale, the Trait Anxiety Scale and the Edinburgh Depression Scale. No significant differences were found between the family types for any of these measures of mothers’ psychological state.

Parent Development Interview
The variables degree of anger, acknowledgement of support needed, satisfaction with support, guilt, joy/pleasure, competence, level of child focus, disappointment with child, parental hostility, over-protectiveness, disciplinary over-indulgence and clingy behaviour were entered into a MANCOVA. Wilks’s $\lambda$ showed a non-significant trend $[F(12,51) = 1.73, P < 0.10]$. As shown in Table I, one-way ANCOVAs found a significant difference between family types for joy/pleasure $[F(1,66) = 7.81, P < 0.01]$, reflecting higher levels of joy/pleasure among the solo DI mothers than the married DI mothers. There was also a significant difference between family types for degree of anger $[F(1,66) = 4.29, P < 0.05]$, reflecting lower levels of anger among solo DI mothers than married DI mothers. Finally, a significant difference was found for clingy behaviour $[F(1,66) = 4.28, P < 0.05]$, with solo DI mothers reporting that their child demonstrated lower levels of clingy behaviour than did married DI mothers.

The total score of the BITSEA Problem Scale and the total score of the BITSEA Competence Scale were each entered into an ANCOVA. A significant difference between family types was found for the BITSEA Problem Scale $[F(1,61) = 5.76, P < 0.05]$, with solo DI children showing lower levels of problems than did children of married DI mothers. A significant difference was also found for the Competence Scale $[F(1,61) = 9.02, P < 0.01]$, with children of solo DI mothers showing higher levels of competence than children of married DI mothers. Regarding the Bayley Scale, a one-way ANCOVA found no difference in the Mental Development Index between family types (see Table I).

Discussion
The findings from this follow-up of the first cohort of solo DI mothers and their children to be studied indicate that these families continue to function well as the child reaches 2 years of age. With respect to mothers’ psychological state, solo DI mothers were no more likely to be experiencing stress associated with parenting or symptoms of anxiety or depression than were the married DI mothers. This suggests that the absence of a father is not necessarily related to higher levels of psychological problems among solo DI mothers. The differences in parenting that were found between the solo DI mothers and the married DI mothers indicated greater joy/pleasure among the solo DI mothers, as well as less anger associated with parenting, accompanied by a perception of their child as less clingy. It would appear, therefore, that contrary to the concerns raised in relation to solo DI mother families, this pathway to parenthood may, instead, result in a tendency towards more positive and less negative maternal feelings towards the child.

One possible explanation for these findings may stem from differences in the reasons for opting to have a child by DI. For the majority of solo DI mothers, the decision to go it alone and have a child by DI without the involvement of

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<th>Solo DI mothers</th>
<th>Married DI mothers</th>
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<tr>
<td>PDI</td>
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<tr>
<td>Degree of anger</td>
<td>1.48</td>
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<tr>
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<td>3.24</td>
<td>1.38</td>
<td>NS</td>
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<td>1.43</td>
<td>1.73</td>
<td>3.16</td>
<td>NS</td>
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<tr>
<td>Joy/pleasure</td>
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<td>3.31</td>
<td>7.81</td>
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<td>3.09</td>
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<td>Level of child focus</td>
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<td>1.13</td>
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<td>Clingy behaviour</td>
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<td>17.24</td>
<td>9.02</td>
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a male partner was largely due to the fact that time was running out (Murray and Golombok, 2005). These mothers, therefore, were not exposed to the potentially stressful experience of either their own or their partner’s infertility. In addition, they were more likely to be open with other people about the method of their child’s conception (Murray and Golombok, 2005). For married DI mothers, however, the situation is markedly different. Having a child by DI is a solution to the male partner’s infertility and the resulting child is genetically related to the mother but not the father. Consequently, in married DI families, the way in which the child was conceived is often surrounded in secrecy, largely to protect the father from other people learning about his infertility (Cook et al., 1995; Brewaeys et al., 1997). The lack of a genetic relationship between their husband and the child, together with the secrecy about the child’s conception, may be a source of some concern for married DI mothers, which may affect the emotional experience with their child. It must be borne in mind, however, that even though the differences found between the solo DI and married DI mothers on the parenting variables were statistically significant, mothers from both types of family were functioning well.

With respect to the children, solo DI mother children were no more likely to show higher levels of psychological problems or cognitive impairment than were children from married DI families. In fact, the children of solo DI mothers obtained significantly higher competence scores and lower problem scores on the BITSEA than the children of married DI mothers. It seems, therefore, that the use of DI to have a child as a solo mother does not adversely affect children’s social, emotional and cognitive development, at least up to 2 years of age.

In the first phase of the investigation, the actual frequency of parenting behaviours were assessed and, although mothers from both types of families were functioning well, solo DI mothers were found to spend less time with their child and to be less sensitive to their child’s needs than married DI mothers. In contrast, the use of a different measure of mother–child relationships in this second phase of the investigation, designed to tap below the surface to assess the nature of the emotional bond between the mother and the child, revealed higher levels of joy/pleasure and lower levels of anger towards their child among solo DI than married DI mothers. It is not possible to draw any firm conclusions about the observed differences in mother–child relationships between age 1 and age 2 years. However, it seems likely that the older age of the child and the use of a measure designed to provide a more in-depth picture of the emotional relationship between the mother and the child may both have had a part to play.

The absence of negative outcomes for the solo DI mother families lends further weight to the view that solo DI mothers represent a specific subgroup of single-parent families (Weinraub et al., 2002), and cannot be likened to single-parent families resulting from separation, divorce or accidental pregnancy, who often show poorer outcomes for children and their mothers (Ferri, 1976; Crocket et al., 1993; Dunn et al., 1998; O’Connor et al., 1999; Weinraub et al., 2002).

Solo DI mothers have made the active choice to go it alone and are often professional women who are financially secure and have good support networks in place (Murray and Golombok, 2005), a situation that differs markedly from that of many other single mothers.

It should be borne in mind that, strictly speaking, individual ANCOVAs for the mothers’ PDI variables should not have been conducted, as the initial MANCOVA was not significant. However, as there was a non-significant trend and this is the first systematic study of parent–child relationships in solo DI mother families, an exploration of the variables was considered to be valuable. Nevertheless, the conclusions based on these results should be treated with caution. It is important to note that the solo DI and married DI mother families differed on only a few of the variables being assessed. While this may reflect a true lack of difference between the two types of families, it is plausible that differences went undetected due to the relatively small sample size of solo DI mother families. However, the fact that the findings were consistent in indicating that solo DI mothers appeared to be more comfortable about parenting than married DI mothers suggests that use of a larger sample would only further emphasize this difference. In addition, it is worth bearing in mind that with the exception of the assessment of the children’s cognitive development, all the measures were parent-reported, which creates a real possibility of social desirability bias (Colpin, 2002). This may be particularly likely to occur among solo DI mothers, who have chosen two controversial pathways to parenthood: solo motherhood and DI. Although this cannot be ruled out, it is important to note that the PDI has been specifically developed to tap into unconscious processes in the relationship between the mother and the child and is less susceptible to social desirability effects than the questionnaire measures of mother and child functioning.

The findings of this group of solo DI mother families do not give cause for concern. However, it is important to remember that the children were still only 2 years of age at the time of the study. The majority of solo DI mothers intend to tell their child about the nature of their conception (Murray and Golombok, 2005). How and when mothers choose to disclose this information and how the children will react to the knowledge that they were conceived by an anonymous sperm donor remains to be seen. Furthermore, the move towards more openness about DI, reflected by the recent decision made by the UK government to make all sperm donors identifiable from April 2005, may have implications for this current sample of children of solo DI mothers, who will never have access to such information about their donor.

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