Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: a systematic review

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BACKGROUND: It is known that infertility affects emotional well-being, satisfaction with life and self-esteem and that failed assisted reproductive technology (ART) treatment is associated with diminished life satisfaction, reduced self-confidence and substantial psychological distress. Investigations of whether these persist when treatment results in a pregnancy and live birth have been undertaken. METHODS: A systematic search for English-language research articles on psychological and social aspects of pregnancy, childbirth and the first post-partum year after ART conception. RESULTS: Of 466 retrieved papers, 46 met inclusion criteria. These reported data from 28 studies. There is consistent evidence that marital satisfaction, emotional well-being and self-regard in pregnancy, attachment to the fetus and parent–infant relationship in ART groups are similar to comparison groups. Anxiety about the survival of the fetus and early parenting difficulties appear to be higher and post-natal self-confidence lower. Evidence about adjustment to pregnancy and parenthood and the experience of childbirth is inconclusive and reports of parental perceptions of infant temperament and behaviour are contradictory. Between-study methodological differences may explain the lack of consistency in findings of the influence of infertility and ART on some aspects of the transition to parenthood. CONCLUSIONS: Overall, this body of evidence is best described as emergent. It is possible that in pregnancy after ART, parenthood might be idealized and this might then hinder adjustment and the development of a confident parental identity.

Keywords: pregnancy; assisted reproduction; psychology

Introduction

After the first successful birth following in vitro fertilization (IVF) in 1979, research focused predominantly on improving birth rates. Investigations of the psycho-social consequences of infertility (reviewed by Wright et al., 1989; Greil, 1997) and IVF treatment (reviewed by Eugster and Vingerhoets, 1999; Verhaak et al., 2007) were first published in the mid-1980s. They provided consistent evidence of the adverse effects that infertility exerts on emotional well-being, life satisfaction and self-esteem. In addition, assisted reproductive technology (ART) treatment that does not lead to pregnancy is associated with diminished life satisfaction, reduced self-confidence and psychological distress.

It has been presumed that pregnancy and parenthood experienced after infertility and assisted conception will be unproblematic and gratifying. Bernstein (1990), however, theorized that past infertility and ART conception might be associated with elevated anxiety about pregnancy loss; delayed mother–infant attachment; diminished maternal confidence; hypervigilant and overprotective parenting and idealized expectations of parenting capacity and the infant. Subsequently, clinical reports and qualitative studies suggested that pregnancy and parenting may be more complex psychologically after assisted than spontaneous conception (Sandelowski et al., 1990; Dunnington and Glazer, 1991; Brockington, 1996). Systematic investigations of perinatal psychological functioning after ART treatment are more recent, in part because there have only been cohorts of adequate size for research since the early 1990s. The aim of this study was to review the available evidence of the psychological and social consequences of pregnancy, childbirth and early parenting after assisted conception systematically.

Methodology

Search strategies

The electronic databases of Medline and PsychInfo were searched using the exploded terms ‘reproductive techniques, assisted’ and ‘fertilization in vitro’ in combination with ‘pregnancy’, ‘parenting’, ‘mothering’, ‘psychology’, ‘adaptation psychological’, ‘infant behaviour’, ‘maternal behaviour’ and ‘mother–child relations’ to identify investigations of psychological and social functioning in...
pregnancy and the first post-partum year after assisted conception published prior to November 2007. Reference lists were hand searched for other relevant articles. The titles and abstracts of all identified papers were reviewed independently by two researchers.

**Inclusion and exclusion criteria**

Studies were included if they had investigated perinatal psychological or social functioning after ART treatment involving oocyte retrieval, including IVF, intracytoplasmic sperm injection (ICSI) (fresh or cryopreserved embryos) and gamete intra-Fallopian transfer (GIFT), but not intrauterine insemination with partner or donor sperm (AIH/AID) or ovulation induction (OI). Investigations of mixed samples, only some of whom had undergone ART, with others having been treated with AIH or OI were retained. Only publications in English language peer-reviewed journals and which had an abstract were included.

Clinical case reports and investigations of sex selection, disclosure of the use of donor gametes, multi-fetal reduction, single and lesbian mothering, surrogacy, preimplantation genetic diagnosis, parenting of children older than 12 months, and child health and development were excluded.

**Results**

The search yielded 962 articles. Of these, 463 were not published in peer-reviewed journals, lacked an abstract or did not report research. Of the remaining 499 articles, 205 described psychological and social aspects of ART treatment; 120 related to donor conception; 53 addressed ethical or moral issues relating to ART; 41 parenting of children older than 12 months and/or child development; 15 clinical aspects of ART; 10 preimplantation genetic diagnosis and 9 same sex or single parenting. Only 46 reported investigations of perinatal psychological and social functioning after ART. These report data from 28 separate studies which varied in methodological approach. This is shown in Table I where the studies are numbered and these numbers are referred to in the description of methodological aspects of the reviewed studies.

**Methodological aspects of studies meeting inclusion criteria**

We do not believe that people should be defined by their fertility status and would prefer to use descriptors like ‘women conceiving with ART’. However, for the sake of brevity, participants who conceived with ART are described as ‘ART’ women/men/couples, and comparison group participants who conceived spontaneously, with OI or other forms of fertility treatment are termed ‘SC’, ‘OI’ and ‘INF’ women/men/couples, respectively. Only data relevant to this review is included from investigations which also addressed other matters like infant cognitive development (14) or parent psychological functioning beyond 1 year post-partum (17).

**Location and study design**

Eight of the 28 studies were conducted in the USA, four in Australia, two each in the UK, Israel, Sweden, the Netherlands, France and Greece, and one each in Poland, Finland, Germany and Japan. Seventeen were prospective cohort studies; three were cross-sectional; five retrospective and three used qualitative methods. Nine of the prospective studies had assessment points both in pregnancy and after birth (8, 12, 13, 15, 16, 20, 22, 23 and 28).

**Samples and comparison groups**

Inclusion and exclusion criteria varied greatly between studies but most studies were limited to first-time mothers having a singleton baby. All studies investigated women, but 12/28 (6, 9, 10, 11, 13, 15, 16, 18, 20, 23, 17 and 28) recruited couples and also report data from men.

The ART samples ranged from 10 women (7) to 367 couples (28). In order to test for a difference in group means in a continuous measure (e.g. a standardized depression or anxiety scale), required minimum sample sizes need to be calculated in advance taking into account; estimates of the variances in the outcome measure for each group, the required power level, alpha level and difference in means in the outcome measure (Bartlett *et al.*, 2001). For example, according to one sample size formula for a comparison between two groups (*Kirkwood* and *Sterne*, 1988), the size of each group would need to be approximately 95 (power = 90%, alpha = 0.05, variances in the common range for each scale) to detect a difference of 2 on the Edinburgh postnatal depression scale (EPDS) (*Cox et al.*, 1987), 3.3 on the intimate bond measure (IBM) care scale (*Wilhelm and Parker*, 1988) or 13 on the profile of mood states (POMS) (*McNair et al.*, 1971) total score. Only one of the studies in this review (24) has described a power calculation as suggested above, and it would seem that some studies had sample sizes that were not adequate in this context.

Most investigations included an ART group and a comparison group presumed to have conceived spontaneously, sometimes referred to as ‘controls’. Rather than recruiting a comparison group, one study compared characteristics and outcomes for ART women with existing evidence about general populations of childbearing women, almost all of whom would have conceived spontaneously (24).

**Method of recruitment**

Different recruitment strategies were used. Some recruited consecutive cohorts of ART participants (1, 2, 16, 20, 24, 26, 27 and 28), but others used non-systematic sampling (3, 6, 7, 11, 17 and 25). Some comparison groups were recruited systematically from large populations of presumed fertile childbearing women (13, 16, 26 and 28), but others were drawn from smaller and more homogenous populations such as women receiving private obstetric care at a single site (7, 12 and 15).

**Recruitment and retention rates**

Recruitment rates of at least 75% of the eligible ART populations were achieved in many studies (1, 2, 5, 8, 10, 12, 15, 16, 19, 20, 24, 26, 27 and 28). The <40% recruitment rate achieved by *Glazebrook et al.* (13) appears to be an exception and may reflect less effective recruitment strategies, and limits generalization of this study’s findings.

Many of the prospective investigations reported high retention of ART participants. Retention rates exceeded 90% in some studies (3, 6, 11, 14, 15, 16, 20, 23 and 24), but in some, fewer than 75% of participants were retained for the entire duration of...
<table>
<thead>
<tr>
<th>Study number/author(s) country/study design</th>
<th>Assessment times</th>
<th>Study group(s)</th>
<th>Inclusion criteria</th>
<th>Data collection methods</th>
<th>Standardized measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Reading et al. (1989)/USA/PL</td>
<td>T1</td>
<td>Pregnant women</td>
<td>(b) No infertility treatment</td>
<td>Subjective ratings of anxiety and likelihood of complications being discovered, and self-report measures completed at clinic visit</td>
<td>STAI, Impact of Event Scale, Stress/Arousal Adjective Checklist, Attitudes towards the fetus/neonate</td>
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<tr>
<td></td>
<td></td>
<td>(a) ART: 49</td>
<td>(a) and (b) matched on maternal age</td>
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<td></td>
<td></td>
<td>(b) SC: group size not stated</td>
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<tr>
<td>2 Garel and Blondel (1992)/France/Q</td>
<td>12 m pp</td>
<td>Mothers of triplets: 12</td>
<td>French speaking</td>
<td>Semi-structured interview</td>
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<td></td>
<td></td>
<td>(9 ART, 2 OI, 1 SC)</td>
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<tr>
<td>3 Sandelowski et al. (1992)/USA/Q</td>
<td>T1, T2 and T3</td>
<td>Couples</td>
<td>(a) Infertility treatment or ( \geq 2 ) years of infertility</td>
<td>In-depth interviews</td>
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<td></td>
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<td>(a) PI: 44 (17 ART, 22 INF, 5 SC)</td>
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<td>(b) SC: 19</td>
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<td>4 Raoul-Duval et al. (1993)/France/PL</td>
<td>1 w, 9 and 18 m pp</td>
<td>Mothers</td>
<td>(a), (b) and (c) matched for parity, socio-economic status, maternal age, multiplicity</td>
<td>Semi-structured interviews</td>
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<td></td>
<td></td>
<td>(a) ART: 33</td>
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<td>(b) OI: 33</td>
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<td>(c) SC: 33</td>
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<td>5 Stanton and Golombok (1993)/UK/XS</td>
<td>T2–T3</td>
<td>Pregnant women</td>
<td>( \geq 20 ) weeks gestation</td>
<td>Self-report questionnaires completed at antenatal visits</td>
<td>STAI, Cranley Maternal-Fetal Attachment Scale, CAQ, Interviews</td>
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<td>(a) ART: 15</td>
<td>(a) ( \geq 1 ) year to conceive</td>
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<td></td>
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<td>(b) SC: 20</td>
<td>(b) Maternal age ( \geq 25 )</td>
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<tr>
<td>6 Abbey et al. (1994)/USA/PL</td>
<td>Before pregnancy and 12–24 m pp</td>
<td>Childless couples</td>
<td>(a) Married, white, middle class</td>
<td>Self-report questionnaires and semi-structured interviews</td>
<td>Cranley Maternal-Fetal Attachment Scale, Jalowiec Coping Scale (no reference provided), Tennessee Self-Concept Scale</td>
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<td>(a) infertile: 174</td>
<td>(b) Wished to become parents, no known infertility problems</td>
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<td>(b) presumed fertile: 74</td>
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<td>7 Bernstein et al. (1994)/USA/PL</td>
<td>T1, T2 and T3</td>
<td>Pregnant women</td>
<td>(a) ART: 10</td>
<td>Self-report questionnaires</td>
<td>Prenatal and Post-partum Self-Evaluation Questionnaires</td>
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<td></td>
<td>(a) INF: 10</td>
<td>(a) and (b) Used own gametes</td>
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<td></td>
<td></td>
<td>(c) SC: 5</td>
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<tr>
<td>8 Halman et al. (1995)/USA/PL</td>
<td>T3 and 6 w pp</td>
<td>Pregnant women</td>
<td>(a) ART or AH: 24</td>
<td>Self-report questionnaires</td>
<td>PSI (Dutch version), GHQ-36</td>
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<td></td>
<td></td>
<td>(a) PI: 103</td>
<td>(a) Infertility treatment or ( \geq 1 ) year of infertility</td>
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<td>(b) SC: 261</td>
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<td>9 Van Balen et al. (1996)/The Netherlands/R</td>
<td>NS</td>
<td>Couples</td>
<td>PrP, singleton</td>
<td>Self-report postal questionnaire completed after birth</td>
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<td></td>
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<td>(a) ART: 45 ( \varnothing ), 40 ( \varnothing )</td>
<td>(b) ( \geq 4 ) years infertility</td>
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<td></td>
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<td>(b) PI SC: 35 ( \varnothing ), 33 ( \varnothing )</td>
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<td>(c) SC: 35 ( \varnothing ), 28 ( \varnothing )</td>
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<td>10 Colpin et al. (1999)/The Netherlands/XS</td>
<td>12 m pp</td>
<td>Couples with twins</td>
<td>Twins aged 1 year</td>
<td>Self-report postal questionnaire</td>
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<td>(a) ART or AH: 24</td>
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<td>PSI (Dutch version), GHQ-36</td>
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<td>(b) OI: 25</td>
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<td></td>
<td>(c) SC: 54</td>
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<tr>
<td>11 Holditch-Davis et al. (1998)/USA/PL</td>
<td>2 w and 4 w pp</td>
<td>Couples</td>
<td>Singleton</td>
<td>Observations and recording of maternal behaviour during 1.5 h</td>
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<tr>
<td>Holditch-Davis et al. (1999)/USA/PL</td>
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<td>(a) PI: 30 (11 ART, 16 INF, 3 SC)</td>
<td>(a) Previous infertility</td>
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<td>(b) adopted baby: 21</td>
<td>(b) Infertile, baby ( &lt; 6 ) m</td>
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<td></td>
<td></td>
<td>(c) SC: 19</td>
<td>(c) No fertility problems</td>
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<td>Study number/author(s) country/ study design</td>
<td>Assessment times</td>
<td>Study group(s)</td>
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<td>Data collection methods</td>
<td>Standardized measures</td>
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<tr>
<td>12 Klock and Greenfeld (2000)/ USA/PL</td>
<td>T1 and T3, 2 and 9 m pp</td>
<td>Pregnant women (a) ART: 74  (b) SC: 40</td>
<td>PrP, maternal age 21–44, stable relationship, adequate English</td>
<td>Self-report postal questionnaires</td>
<td>SE, STAI, BDI, Four questions from Belsky et al. (1983), Rewards and Concerns of Pregnancy/Parenting (modified), PSI, Measurement of temperment in infancy</td>
</tr>
<tr>
<td>14 Papaligoura and Trevarthens (2001)/Greece/PL</td>
<td>4, 7, 13 and 21 w pp</td>
<td>Mothers (a) ART: 8 (b) INF: 8 (c) SC: 8</td>
<td>PrP, singleton (a) Used own gametes, ≥1 failed ART, healthy infant born at term (c) No difficulties conceiving</td>
<td>Video-taped observations of interactions between mother and baby</td>
<td></td>
</tr>
<tr>
<td>15 McMahon et al. (1997a, b, 2002) Gibson et al. (1998, 2000a, b) Cohen et al. (2001)d Australia/PL</td>
<td>T3, 4 and 12 m pp</td>
<td>Couples (a) ART: 70 ♀ 62 ♂ (b) SC: 63 ♀ 56 ♂</td>
<td>PrP, 30 weeks gestation, singleton, maternal age ≥28, adequate English, parents co-habiting (a) Used own gametes (b) No history of infertility, &lt;1 year to conceive (a) and (b) matched on maternal age</td>
<td>Interviews, video-taped observations and self-report postal questionnaires</td>
<td>STAI, EPDS, CES-D, Baby Schema, AAQ, CAQ, SE, DAS, IBM, BAP, MPAQ, PACR, PSI, STSI, STST, NPI (modified), BCL, MSES, MSAS, Still-Face Procedure, The Emotional Availability Scales, SS procedure, FSS, ISSB</td>
</tr>
<tr>
<td>16 Sydsjö et al. (2002)/Sweden/PL</td>
<td>T2 and 12 m pp</td>
<td>Couples (a) ART: 108 (b) SC: 105</td>
<td>PrP, adequate Swedish (a) Used own gametes (a) and (b) matched on maternal age</td>
<td>Self-report postal questionnaires and interview</td>
<td>ENRICH (Swedish version), Toddler behaviour questionnaire</td>
</tr>
<tr>
<td>17 Yokoyama (2003)e/Japan/R</td>
<td>0–15 years pp</td>
<td>Mothers of multiple children (a) PI: 359 (76 ART, 239 OI, 25 AIH) (b) SC: 631</td>
<td>NS (a) and (b) matched on maternal age</td>
<td>Self-report postal questionnaire with questions relating to recalled anxiety and concerns during pregnancy administered 0–15 years pp</td>
<td></td>
</tr>
<tr>
<td>18 Baor et al. (2004)/Israel/XS</td>
<td>8 m pp</td>
<td>Parents of twins (a) ART: 37 (b) SC: 38</td>
<td>NS</td>
<td>Self-report postal questionnaire</td>
<td>PSI, MHI, 1-MQS</td>
</tr>
<tr>
<td>19 Papaligoura et al. (2004)/ Greece/R</td>
<td>12 m pp</td>
<td>Mothers (a) ICSI: 30 (b) IVF: 20 (c) SC: 26</td>
<td>PrP</td>
<td>Semi-structured interviews</td>
<td></td>
</tr>
<tr>
<td>20 Ulrich et al. (2004)/ Germany/PL</td>
<td>T3, 3 and 12 m pp</td>
<td>Couples (a) ART: 47 (b) SC: 45</td>
<td>PrP (a) and (b) matched on maternal age and multiplicity</td>
<td>Semi-structured interviews with psychoanalytical orientation</td>
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</tr>
<tr>
<td>21 Fisher et al. (2005)/Australia/R</td>
<td>≤12 m pp</td>
<td>Mothers: 745 admitted consecutively to a residential early parenting centre (REPC)</td>
<td>Infant &lt;12 months</td>
<td>Audit of medical records of cohort of mothers admitted to REPC</td>
<td>EPDS</td>
</tr>
<tr>
<td>22 Olshansky and Sereika (2005)f/ USA/PL</td>
<td>T2–T3, 4 m pp</td>
<td>Pregnant women PI: 25</td>
<td>Previous infertility</td>
<td>Self-report postal questionnaires</td>
<td>CES-D, BDI-II, M5, STSS</td>
</tr>
<tr>
<td>23 Hjelmstedt et al. (2003a,b, 2004, 2006)/Sweden/PL</td>
<td>T1, T2 and T3 trim, 2 and 6 m pp</td>
<td>Couples (a) ART: 57 ♀, 55 ♂ (b) SC: 43 ♀, 39 ♂</td>
<td>PrP, maternal age 29–36, singleton, good health, non-smoker, adequate Swedish. (a) Used own gametes (b) No infertility, &lt;1 year to conceive</td>
<td>Interviews and self-report postal questionnaires</td>
<td>EPDS, Wikman Attitude Scale, IRS, Barnett Scale, Karolinska Scales of Personality, STAI, Prenatal Attachment Inventory, STAI, EPDS, SPSQ</td>
</tr>
</tbody>
</table>
24 Fisher et al. (2007)/Australia/PL

T1 and T3

Pregnant women
ART: 183
Ultrasound verified viable pregnancy at 6 weeks gestation, adequate English

25 Harf-Kashdaei and Kaitz (2007)/Israel/Q

T3

Pregnant women
(a) ART: 30
(b) SC: 30
PrP, singleton, no mental or physical disorders, adequate Hebrew or English
(a) healthy pregnancy, no infertility
(b) and (b) matched on maternal age, education, gestational age
PrP, singleton
(a) Delivered at term
(b) Planned pregnancy, no infertility treatment, delivered healthy child
PrP, maternal age <35 or ≥38

26 Lepecka-Klusek and Jakiel (2007)/Poland/R

NS
Mothers
(a) PI: 125 (40 ART, 45 AIH, 40 AID)
(b) SC: 125
PrP, singleton
(a) Used own gametes
PrP, maternal age <35 or ≥38

27 McMahon et al. (2007)/Australia/PL

T1, T2 and T3

Couples
(a) ART mat age <35: 38
(b) ART mat age ≥38: 28
Adequate Finnish, singleton

28 Repokari et al. (2005, 2006, 2007)

T2, 2 and 12 m pp

Couples
(a) ART: 367
(b) SC: 379
(a) Used own gametes
(b) No previous infertility or infertility treatment, maternal age >25 years

Poikkeus et al. (2006)/Finland/PL

1)Type of infertility treatment not stated.
2)Proportion of subfertile women who had ART not stated.
3)These studies used subsamples of the study population described by Glazebrook et al. (2001): women only (Glazebrook et al., 2004); primiparous women with singletons only (Cox et al., 2006) and primiparous women who had had ART treatment only (Sheard et al., 2007).
4)This study used the subsample of men only of the study sample described by McMahon et al. (1997a) and some additional participants.
5)Nineteen out of 359 (5%) type of infertility treatment not identified.
6)Eight percentage had conceived with AIH.

Study design: PL, prospective longitudinal; XS, cross-sectional; R, retrospective; Q, qualitative. Assessment times: T1, T2, T3, trimester 1, 2, 3; w/m pp=weeks/months post-partum; NS, Not stated. Study group mode of conception: ART, assisted reproductive technology; INF, other infertility treatment; OI, ovulation induction; AIH, intrauterine insemination (husband); AID, intrauterine insemination (donor); SC, spontaneous conception; PI, previously infertile. Inclusion criteria: NS, none stated; PrP, primiparous (articles may refer to these women as ‘nulliparae’ in pregnancy studies). Standardized measures:

AQP, antenatal attachment questionnaire (Condon, 1993); Attitudes towards the fetus/neonate (Reading et al., 1984); Baby schema (Gloger-Tippelt, 1983); BAP, being A parent unpublished; Barnett scale (Barnett et al., 1993); BCL, behaviour check list (Richman et al., 1982); BDI, beck depression inventory (Beck et al., 1961); BDI-II, beck depression inventory (Beck and Steer, 1987); CAQ, childbearing attitudes questionnaire (Ruble et al., 1990); CES-D, centre for epidemiological studies depression scale (Rydel, 1977); Cranley maternal-fetal attachment scale (Cranley, 1981); DAS, dyadic adjustment scale (Spanier, 1976); ENRICH (Fournier et al., 1983); EPDS, Edinburgh post-natal depression scale (Cox et al., 1987); ERPS, emotional responses to pregnancy scale (Hjelmstedt et al., 1999); GHQ-36, Fear-of-Childbirth Questionnaire (Areskog et al., 1982); FSS, family support scale (Dunst et al., 1984); GHQ-36, general health questionnaire (Goldberg, 1972); GHQ-12, general health questionnaire (Goldberg, 1992); HADS, the hospital anxiety and depression scale (Zigmond and Snith, 1983); Impact of event scale (Horowitz et al., 1979); IBM, intimate bonds measure (Wilhelm and Parker, 1988); I-MQS, Israeli marital quality scale (Lavee, 1995); IRS, infertility reaction scale (Hjelmstedt et al., 1999); ISSB, inventory of socially supportive behaviours (Barrera, 1981); Karolinska scales of personality (Gustavsson, 1997); Measurement of temperament in infancy (Rothbart, 1981); MHI, mental health inventory (Veit and Ware, 1983.a,b); M(P)PAQ, maternal (paternal) post-natal attachment questionnaire (Condon and Corkindale, 1998); MSAS, maternal separation anxiety scale (Hock et al., 1989); MSES, maternal self-efficacy scale (Teti and Gelfand, 1991); MSS, marital satisfaction scale (Roach et al., 1981); NPI, neonatal perception inventory (Brousard and Hartber, 1970); PACR, parenting attitudes to child rearing scale (Goldberg and Easterbrooks, 1984); Parenting self-efficacy scale unpublished; Prenatal attachment inventory (Müller, 1993); POMS, profile of mood states (McNair et al., 1971); Prenatal self-evaluation questionnaire (Lederman et al., 1979); Pregnancy anxiety scale (Levin, 1991); PSI, parenting stress index (Abidin, 1995); Post-partum self-evaluation questionnaire (Lederman et al., 1981); Rewards and concerns of parenting (Barnett and Marshall, 1992); PVS III R, personal view survey (Maddi and Khoshaba, 2001); Rewards and concerns of pregnancy (Barnett and Marshall, 1992); SE, self-esteem scale (Rosenberg, 1965); SPSS, Swedish parenthood stress questionnaire (Ostberg et al., 1997); SS, strange situation procedure (Ainsworth et al., 1978); STAI, state trait anxiety inventory (Spiewek et al., 1983); Still-face procedure (Gianino and Tronick, 1985); Stress/arousal adjective checklist (King et al., 1983); STSI, short temperament scale for infants (Oberklaaid et al., 1986); STSS, silencing the self-scale (Jack and Dill, 1992); STST, short temperament scale for toddlers (Prior et al., 1989); Tennessee self-concept scale (Fits, 1965); The emotional availability scales (Birgents et al., 1993); The self-concept questionnaire (Robson, 1989); Toddler behaviour questionnaire; UIB, unsettled and irregular behaviour (St James-Robert and Wolke, 1988); VPSQ, vulnerable personality scale questionnaire (Boyce et al., 2001); Wikman attitude scale (Wikman, 1994).
the study (12, 13 and 28) or retention rates were not stated (1, 7 and 8).

Overall, only 6 of the 28 studies included in this review met all or most criteria for methodological rigour: a systematically recruited sample of adequate size and representative of the ART conceiving population, an appropriate comparison group and high recruitment and retention rates (15, 15, 20, 24, 26 and 28).

**Pregnancy**

There are 25 peer-reviewed reports of aspects of psychological functioning in women who are pregnant after assisted conception, seven of these also reported data collected from their male partners, and there is a single paper which only describes men’s experiences (Table II). These have been classified into considerations of emotional well-being, self-regard, attitudes and adjustment to pregnancy, marital relationship and antenatal attachment to the fetus.

**Emotional well-being in pregnancy**

General psychological well-being has been conceptualized most usually in terms of frequency and severity of self-reported symptoms of anxiety and/or depression and was assessed and reported in 16 papers.

**Anxiety.** No differences in general anxiety levels assessed contemporaneously by the state-trait anxiety inventory (STAI) (Spielberger et al., 1983) have been found between SC and ART women in either early (Klock and Greenfeld, 2000) or late pregnancy (Stanton and Golombok, 1993; McMahon et al., 1997a; Harf-Kashdai et al. and Katz, 2007). Mean antenatal STAI scores were also the same in ART women aged ≥38 years and those aged <35 years (McMahon et al., 2007). Yokoyama (2003) asked 990 mothers to recall pregnancy-specific anxieties up to 15 years after having a multiple birth. Fewer concerns about the practical aspects of infant care and financial consequences of multiple infants were recalled by the ART than the SC mothers, and more of them had been delighted to learn of the multiple gestation, but there were no differences in recalled general anxiety levels.

The only study to make comparisons with psychometric data derived from general, and therefore almost all SC pregnant populations, actually found that antenatal anxiety was significantly lower in an inclusive ART sample than in pregnant women in general (Fisher et al., 2007).

There were no between ART and SC group differences in mid-trimester pregnancy-specific anxieties, including intense anticipatory fear of childbirth assessed by the Pregnancy Anxiety Scale (Levin, 1991) and a revised form of the Fear-of-Childbirth Questionnaire (Areskog et al., 1982) in a large prospective investigation of Finnish women (Poikkeus et al., 2006).

In contrast, van Balen et al. (1996) found that ART women recalled the pregnancy as significantly ‘more stressful’ than those who had conceived spontaneously. In qualitative interviews, Bernstein et al. (1994) reported that previously infertile pregnant women described higher anxiety and more compulsive checking for vaginal bleeding and frequent disturbing dreams than SC women. Interviews conducted by McMahon et al. (1997a) also revealed more anxiety among ART than SC women as they trusted the survival of, and informed others about the pregnancy later, expressed more fears about threats to the baby during birth and more negative feelings about childbirth. Hjelmstedt et al. (2003a) found that ART women had more ‘muscular tension’, although the significance of this was not discussed, and were more irritable than SC women. Reading et al. (1989) concluded that ART women were more distressed and anxiously aroused prior to a first ultrasound examination than those who had conceived spontaneously.

McMahon et al. (1997a) found that in late pregnancy specific anxieties, as assessed by the Baby Schema Questionnaire (Gloger-Tippelt, 1991), about fetal normality and survival, potential for childbirth to damage the infant, and anticipatory anxiety about being separated from the baby were more common among ART than SC women. They also found that women who had experienced treatment failure were more anxious than those who had conceived on their first ART treatment cycle. In contrast, Hjelmstedt et al. (2003a), who derived the Emotional Reactions to Pregnancy Scale from the Gloger-Tippelt instrument, found that in early pregnancy, ART women were less anxious about fetal health than SC women, but they were more anxious about the potential to lose the pregnancy. Women who recalled high levels of distress relating to the infertility experience were more anxious about losing the pregnancy than those with less distress.

None of these investigations used diagnostic measures of psychological morbidity, including anxiety and all reported between group differences in mean scores. Although most concluded that anxiety levels were within the normal range, only two reported the proportion scoring above clinical cut-off levels. Glazebrook et al. (2001) reported that 31% of women with ART multiple gestation scored >10, indicating clinically significant anxiety on the hospital anxiety and depression scale (HADS) (Zigmond and Snaith, 1983) in mid-pregnancy, a higher proportion than among ART women with a singleton pregnancy (19%) and SC women (13%). However, there were low response and retention rates in this study and the possibility that the most vulnerable were more likely to participate cannot be excluded. In contrast, only 3% of Fisher et al.’s (2007) representative cohort scored in the clinical range of >19 on the POMS (McNair et al., 1971) Tension-Anxiety subscale in late pregnancy with no differences between those with multiple and singleton gestations.

There have only been a small number of investigations of self-reported anxiety in the male partners of ART women. There is apparent inconsistency in reports of the groups of men recruited to the McMahon et al. prospective investigation. In their first report (McMahon et al., 1997a), there were no differences in third trimester antenatal STAI-assessed general anxiety between 51 ART and 53 SC fathers. However, in a subsequent report of the same cohort with some additional participants (now 62 ART and 56 SC fathers), Cohen et al. (2001) report higher mean STAI scores in ART than SC fathers in advanced pregnancy. Glazebrook et al. (2001) also report higher mean antenatal STAI scores in the partners of women with multiple ART gestation compared with those with SC pregnancies, but also to singleton ART pregnancies.

Specific anxieties about the security of the pregnancy and fetal health were higher in ART than SC fathers, and they had more somatic anxiety symptoms in Hjelmstedt et al.’s (2003a,b) study. This study also identified more anxiety about the health of the baby among men with high recalled infertility distress.
Van Balen et al. (1996) found that fathers with previous infertility recalled the pregnancy as more ‘exceptional’ and more ‘stressful’ than SC fathers.

**Depression.** There have been fewer investigations of the prevalence of symptoms of depression or low mood than of anxiety during pregnancy.

Klock and Greenfeld (2000) using the beck depression inventory (BDI) (Beck and Steer, 1987), and Hjelmstedt et al. (2006) and Harf-Kashdai and Kaiz (2007) using the EPDS (Cox et al., 1987) found no differences between ART and SC groups in antenatal symptoms of depression. Repokari et al. (2005) using the depressive symptoms subscale of the general health questionnaire (GHQ-36) (Goldberg and Hiller, 1979) and Fisher et al. (2007) using the EPDS and POMS reported significantly lower rates of antenatal depressive symptoms in ART than SC groups or population norms. Where reported, scores above clinical cut-offs were rare (0%, Glazebrook et al., 2001; <3%, Fisher et al., 2007).

Glazebrook et al. (2001) reported higher mean late gestation HADS depression scores in women with ART multiple, than ART singleton or SC pregnancies. Ulrich et al. (2004) using psychoanalytic interviews found that women in both groups described themselves as being ‘rather depressed’, but did not quantify this in terms of severity or persistence of symptoms.

A similar pattern of low rates of antenatal depressive symptoms is reported in men. Cohen et al. (2001) found no differences between ART and SC fathers on mean scores or proportion scoring $\geq 16$, the clinical cut-off score of the centre for epidemiological studies depression scale (CES-D) (Radloff, 1977). Glazebrook et al. (2001) using HADS found no differences between ART and SC fathers in late pregnancy and Repokari et al. (2005) that ART fathers had significantly fewer antenatal depression symptoms than SC fathers as measured by the GHQ-36.

**Self-regard in pregnancy**

The experience of infertility can have adverse effects on self-confidence and self-esteem and it has been argued that infertility-related low self-regard might persist in pregnancy (Cox et al., 2006). Six papers considered self-regard in pregnancy.

Neither Klock and Greenfeld (2000) who used the Rosenberg self-esteem scale (Rosenberg, 1965) nor Cox et al. (2006) who used the self-concept questionnaire (Robson, 1989) found differences in antenatal self-esteem scores between ART and SC women. Stanton and Golombok (1993) using the childbearing attitudes questionnaire (Ruble et al., 1990) found no differences between the two groups in terms of self-confidence and formation of a maternal identity. McMahon et al. (2007) showed that within a population of women with ART pregnancies, those aged $\geq 38$ years were more resilient, and had greater capacity to respond actively to adversity than those $<35$ years. Both Klock and Greenfeld (2000) and Cox et al. (2006) reported increases in self-esteem scores between early and advanced pregnancy in ART women.

In contrast, Bernstein et al. (1994) using the Tennessee self-concept scale (Fitts, 1965) found that in early pregnancy, ART women were more self critical and had more ‘fragile ego strength’ than SC women.

Cohen et al. (2001) reported that ART fathers had lower antenatal self-esteem (modified Rosenberg self-esteem scale mean score $= 16.0 \pm 4.8$) than SC fathers ($15.0 \pm 3.6$) but the actual scores published in the paper appear to indicate the reverse.

**Attitudes and adjustment to pregnancy**

Some between ART and SC comparisons of a general construct of attitudes towards and general adjustment to the pregnant state were made in 12 papers. This construct has been defined variously as: negative and positive attitudes to the pregnant state (Reading et al., 1989); acceptance of pregnancy, including changes in body shape and fetal sex (Halman et al., 1995; Hjelmstedt et al., 2003); formation of a maternal identity (Sandelowski et al., 1992; Stanton and Golombk, 1993; Halman et al., 1995); pregnancy behaviours (Papaligoura et al., 2004) and anticipated reactions to losses of employment and independence (Klock and Greenfeld, 2000; Łepecka-Klusek and Jakiel, 2007).

Reading et al. (1989) found no differences between ART and SC groups in general negative or positive attitudes to pregnancy using adjective rating scales. Halman et al. (1995) developed the prenatal self-evaluation measure (PSEM) and found no differences in acceptability of pregnancy between ‘fucund’ and ‘sub-fucund’ groups. Similarly Stanton and Golombok (1993) using the Childbirth Attitudes Questionnaire and Halman et al. (1995) using the PSEM found no differences between ART and SC groups in ‘identification with motherhood’.

Hjelmstedt et al. (2003) found that the physical demands of pregnancy and the changes in body form were less problematic for an ART than an SC group. They were also less concerned about the sex of the fetus and about the potential losses associated with motherhood. Klock and Greenfeld (2000) found that compared with SC women, ART women were more gratified to be pregnant and had fewer concerns about the losses of independence and income associated with parenthood. Similarly, Ulrich et al. (2004) found that although the ART group had more antenatal medical complications and hospital admissions, they had fewer complaints about the pregnant state (except describing more ‘limbic pain’, a concept that was not defined) and McMahon et al. (1999) that pregnancy was more ‘positive and fulfilling’ and less uncomfortable than for the SC comparison groups.

In direct contrast, Bernstein et al. (1994) found that previously infertile (PI) women used more frequent negative self-descriptors including being ‘fat and bloated’ than the SC group. Sandelowski et al. (1992) using in-depth interviews informed by grounded theory concluded that the formation of a pregnant identity was more complex for the ART than the SC group partly as a result of the earlier confirmation of conception. Papaligoura et al. (2004) used semi-structured interviews to assess recalled pregnancy behaviours in mothers of SC and ART 1 year olds. More women in the two ART groups (IVF and ICSI) than the SC group had spent the first month of pregnancy in bed and or abstained from sexual intercourse throughout pregnancy. Łepecka-Klusek and Jakiel (2007) surveyed 250 mothers (50% ART) up to several years after having given birth and found that pregnancy adjustment was recalled as having been more difficult by ART than SC mothers. The potential impact of recall bias on these conclusions was not discussed.

There have been very few investigations of the equivalent construct in men. Ulrich et al. (2004) found that ART fathers had
| Author, year | Research question/s/ *Comparison groups ( if applicable)* | Main findings mothers/fathers *  
|---|---|---
| Reading *et al.*, 1989 | Comparison of anxiety & attitudes to pregnancy before and after ultrasound examination  
*ART/ SC* | ART group >investment in pregnancy and fetus, >concern about problems developing  
When fetal heartbeat detected, ART group >attachment to the fetus and <negative feelings toward the pregnancy  
When fetal heartbeat not detected, ART group >concerns about the pregnancy, <attachment to the fetus  
ART couples had difficulties relinquishing negative identity, feelings, and thought patterns related to infertility. Formation of pregnancy identity >complex  
|  
| Sandelowski *et al.*, 1992 | Comparison of experience of pregnancy and antenatal preparation for childbirth  
*ART/ SC* |  
| Stanton and Golombok, 1993 | Comparison of anxiety, maternal-fetal attachment and adjustment to pregnancy  
*ART/SC* | ART group poorer relationship with husband  
| Bernstein *et al.*, 1994 | Comparison of maternal-fetal attachment, coping, self-esteem, and adaptation to pregnancy  
*ART/INF/SC* | ART and INF groups >‘self-reliance’ coping, disbelief about being pregnant, anxiety about pregnancy loss, negative self-image, and closeness to family of origin and partner  
ART group <‘emotive coping’ than INF and SC group  
ART and INF groups continued to perceive themselves as infertile and avoided preparing the home for the baby before birth  
|  
| Halman *et al.*, 1995 | Comparison of adaptation to pregnancy  
*INF/SC* | No group differences  
| Van Balen *et al.*, 1996 | Comparison of the experience of pregnancy and delivery  
*ART/PI SC/SC* | ART and PI SC groups older, >pregnancy complications, >‘stressful’ pregnancy, and >‘exceptional’ delivery  
*ART and PI SC groups >‘exceptional’ and ‘stressful’ pregnancy, ART group >‘enjoyable’ pregnancy*  
| McMahon *et al.*, 1997a | Comparison of anxiety & quality of attachment to fetus  
*ART/SC* | Repeat cycle ART group >anxiety than one cycle ART and SC groups  
ART group trusted survival of pregnancy and told others about pregnancy later, >concerns about child health and threats to baby during birth, negative feelings about childbirth, and anticipatory anxiety about separation from the baby  
*Anxiety not related to number of ART cycles*  
| McMahon *et al.*, 1999 | Comparison of adjustment to pregnancy, relationship with the unborn baby, and acquisition of the maternal role  
*ART one cycle/ART repeat cycle/SC* | Repeat cycle ART found pregnancy >positive and fulfilling than SC and were >likely to identify with pregnancy than one cycle ART and SC groups  
One cycle ART group <information seeking than repeat cycle ART and SC groups  
ART groups expected >difficult baby and had <conversations with unborn baby, and delayed preparation of baby’s room  
|  
| Klock and Greenfeld, 2000 | Comparison of self-esteem, anxiety, depression, marital adjustment & pregnancy adjustment  
*ART/SC* | ART group older, longer in relationship, and >multiple pregnancies  
ART group >satisfaction with ability to conceive, <concern about weight gain, impending loss of sexual freedom, partner’s attention, independence and family closeness, and <marital satisfaction  
ART group †self-esteem, ↓anxiety from 1st to 3rd trimester  
*ART group older, >anxiety, <self-esteem, and <marital satisfaction*  
|  
| Cohen *et al.*, 2001 | Comparison of mood, self-esteem, marital satisfaction and paternal–fetal attachment  
*ART/SC (♂)* | ART multiple group >anxiety in 1st trimester and >depressive symptoms in 3rd trimester than other groups  
*ART multiple group >anxiety than both other groups*  
|  
| Glazebrook *et al.*, 2001 | Comparison of anxiety and depression  
*ART multiple/ART singleton/SC* | ART group (combined scores ♀ and ♂) better marital adjustment  
|  
| Sydsjö *et al.*, 2002 | Comparison of quality of marital relationship  
*ART/SC* |  

*Table II. Social and psychological aspects of pregnancy and birth after ART.*
<table>
<thead>
<tr>
<th>Authors, Year</th>
<th>Description</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hjelmstedt et al., 2003</td>
<td>Comparison of emotional responses to pregnancy, and attitudes to pregnancy, parenthood and children ART/SC</td>
<td>ART group &gt; anxiety about losing pregnancy, &lt; concern about the child restricting freedom and sex of child, &lt; neg pregnant body image, and discomforts of pregnancy &gt; 'worthwhile' Both groups</td>
</tr>
<tr>
<td>Hjelmstedt et al., 2003</td>
<td>Comparison of personality factors and emotional responses to pregnancy ART/SC</td>
<td>ART group &gt; 'muscular tension' and anxiety about losing pregnancy, &lt; 'monotony avoidance' and anxiety about baby health ART group &gt; 'somatic anxiety', 'detachment', 'indirect aggression' and 'guilt', &gt; anxiety about losing pregnancy, &lt; 'monotony avoidance' and ambivalence about pregnancy ART group older, &gt; likely to have &gt; two babies and ≥ one disabled child</td>
</tr>
<tr>
<td>Yokoyama, 2003</td>
<td>Comparison of recalled emotions during pregnancy between women with a multiple birth ART/SC</td>
<td>ART group &lt; 'not delighted' with having multiple birth, &lt; anxiety about nursing infants and financial cost of multiple birth Both groups &gt; recalled anxiety about health of fetuses and financial cost if &gt; two fetuses</td>
</tr>
<tr>
<td>Papaligoura et al., 2004</td>
<td>Comparison of recalled precautions and frequency of sexual activity during pregnancy ICSI/IVF/SC</td>
<td>ART group &gt; ICSI (27%) and IVF (37%) than SC (4%) women stayed in bed in early pregnancy ART group &gt; ICSI (70%) and IVF (65%) than SC (19%) women abstained from sexual intercourse throughout pregnancy</td>
</tr>
<tr>
<td>Ulrich et al., 2004</td>
<td>Comparison of stress in family of origin, quality of partner relationship, and physical and psychological aspects of pregnancy ART/SC</td>
<td>ART group &gt; 'avoidant relationships' and 'traditional role divisions', &lt; 'satisfaction with sexuality', &gt; pregnancy complications and hospitalizations, and &lt; 'distress from exhaustion' and limbic pain ART group &gt; 'traditional role divisions', &lt; 'satisfaction with sexuality' ART group longer in relationship and &gt; nulliparous ART group &lt; depressive symptoms ART group &lt; depressive symptoms</td>
</tr>
<tr>
<td>Repokari et al., 2005</td>
<td>Comparison of mental health during the transition to parenthood ART/SC</td>
<td>ART group longer in relationship and &gt; nulliparous</td>
</tr>
<tr>
<td>Poikkeus et al., 2006</td>
<td>Comparison of prevalence and predictors of fear of childbirth and pregnancy-related anxiety ART/SC</td>
<td>ART group longer in relationship and &gt; nulliparous Both groups</td>
</tr>
<tr>
<td>Cox et al., 2006</td>
<td>Comparison of self-esteem and anxiety ART/SC</td>
<td>Both groups nulliparous women &gt; severe fear of childbirth and pregnancy related anxiety ART group older and longer in relationship ART group anxiety ↓ over time Both groups self-esteem negatively correlated with anxiety and self-esteem ↑ over time ART group older ART group &lt; 'detached personality', and &lt; ambivalence about pregnancy Both groups ↑ antenatal attachment over time ART group &gt; socio-economically advantaged</td>
</tr>
<tr>
<td>Hjelmstedt et al., 2006</td>
<td>Investigation of correlates of prenatal attachment ART/SC</td>
<td>ART group &gt; socio-economically advantaged</td>
</tr>
<tr>
<td>Fisher et al., 2007</td>
<td>Comparison of mood, personality, quality of intimate relationship and fetal attachment ART/Community samples of childbearing ?</td>
<td>ART group &gt; quality of intimate relationship, &gt; intense &amp; protective emotional attachment to the unborn baby, &lt; depressive symptoms and anxiety in early and late pregnancy ART group &gt; positive feelings about self and baby, and &lt; negative affect</td>
</tr>
<tr>
<td>Harf-Kashdaei and Kaitz, 2007</td>
<td>Comparison of emotionality, affect, mood, anxiety and depression ART/SC</td>
<td>ART and INF group older and &gt; socio-economically advantaged ART and INF group &gt; adaptation difficulties, and &gt; Caesarean sections Older women &gt; resilience/hardiness, &lt; 'identification with motherhood' Older men &lt; 'social orientation'</td>
</tr>
<tr>
<td>Łepecka-Klusek and Jakiel, 2007</td>
<td>Comparison of adaptation to pregnancy ART and INF/SC</td>
<td></td>
</tr>
<tr>
<td>McMahon et al., 2007</td>
<td>Comparison of psychosocial adjustment during pregnancy ART (age ≥ 30)/ ART (age ≤ 35)</td>
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</tbody>
</table>
similar positive, ambivalent and negative anticipatory fantasies about the growing baby to those of SC fathers. In contrast, Hjelmstedt et al. (2003a,b) found that ART fathers held less ambivalent attitudes to pregnancy than SC fathers, but that general attitudes to pregnancy and the value of having children were similar.

Marital relationship in pregnancy

There is consistent evidence that the quality of relationship with an intimate partner is a determinant of mood in pregnant women (Scottish Intercollegiate Guidelines Network, 2002). Eight studies included measures of marital quality and satisfaction.

Hjelmstedt et al. (2003) using the Barnett Scale (Barnett et al., 1993) to assess satisfaction with aspects of the marital relationship found no differences between ART and SC groups in pregnancy. Similarly, Ulrich et al. (2004) found that most participants were highly satisfied with their marital relationships and that although the ART group had a more traditional division of roles, there were no differences between groups in 'appréciation of their partners' and marital contentment.

Two investigations (Sydsjö et al., 2002; Fisher et al., 2007) found that quality of marital relationship, including perceived affection, and trust and absence of coercion or control [intimate bonds measure (IBM); Parker and Wilhelm, 1988] was significantly better in ART than either a SC group or population norms.

In contrast, Klock and Greenfeld (2000) using a modified form of a questionnaire designed by Belsky et al. (1983) found lower levels of marital satisfaction in early pregnancy in the ART than the SC group, and Stanton and Golombok (1993) that the marital relationship was generally poorer and perceived more negatively by the ART than the SC group.

In the small number of investigations of fathers’ perception of quality of intimate relationship, Hjelmstedt et al. (2003) found equally high levels of marital satisfaction in both ART and SC groups. However, Cohen et al. (2001) reported lower marital satisfaction [dyadic adjustment scale (DAS); Spanier, 1976] and perceived care (IBM) in ART than SC men, although these differences were not regarded as clinically significant.

Antenatal attachment to the fetus

The formation of an emotional relationship between a mother and her growing fetus continues through pregnancy and is reflected in maternal protective and health behaviours (Condon, 1993). In seven papers, antenatal attachment was measured and reported. Stanton and Golombok (1993) using the maternal fetal attachment scale (Cranley, 1981), McMahon et al. (1997a) using the antenatal attachment questionnaire (AAQ) (Condon, 1993) and Hjelmstedt et al. (2006) using the prenatal attachment inventory (Müller, 1993) found no differences between ART and SC groups in antenatal emotional attachment.

Fisher et al. (2007) found using the AAQ that ART mothers formed a more intense protective attachment to the fetus from earlier in the pregnancy than reported in the SC group from whom the test norms were derived and that it increased as pregnancy progressed.

However, Bernstein et al. (1994) and McMahon et al. (1999) found that women pregnant after ART delayed preparation of a room for the baby until late in the pregnancy and the latter group that they had ‘fewer conversations’ with the fetus.

Cohen et al. (2001) found similar paternal–fetal attachment using the AAQ and expectation of life with a baby between ART and SC fathers.

Childbirth

Women who become pregnant through ART are more likely than women who conceive spontaneously to have a multiple birth, short gestation, low birthweight babies and operative birth (Helmerhorst et al., 2004; Jackson et al., 2004). To date, no study has explored comprehensively the ways in which these factors may influence women’s experience of childbirth after ART.

Van Balen et al. (1996) compared the experience of childbirth among ART, PI SC and SC groups of first-time mothers with a singleton baby. The experience of the birth was evaluated on three-dimensions: ‘enjoyment’, 'exceptionality' and 'stress' on three-point scales. The ART and PI SC groups rated the birth as a more ‘exceptional’ event than did mothers who had conceived without difficulty but it was not elaborated what this might have meant. There were no group differences on reported ‘enjoyment’ or ‘stress’. The clinical implications of these dimensions were not discussed and mode of delivery was not reported.

Ulrich et al. (2004) found no between-group difference on the recalled global satisfaction with the birth 3 months post-partum between ART and SC women.

Poikkeus et al. (2006) compared the prevalence of severe fear of childbirth in groups of pregnant women with singleton pregnancies who had conceived with ART and spontaneously. They found that the prevalence of severe anticipatory anxiety was ~10%, irrespective of mode of conception and that nulliparous women in both groups were more likely than parous women to report severe fear of childbirth. After the birth, the ART group was more likely than the SC group to report having had an operative birth and less likely to report recalling a ‘pleasant birth experience’ (Repokari et al., 2006).

Parenting in the first post-partum year

There are 28 peer-reviewed papers describing psychological and social aspects of early parenting after ART. All but one report data on mothers, 13 also have paternal data and one describes only fathers’ experiences. Their findings have been classified into considerations of: emotional well-being, self-regard, adjustment to parenthood, marital relationship, parent–infant relationship, and perception of infant temperament and behaviour (Table III).

Emotional well-being

Sixteen studies reported findings on post-partum emotional well-being conceptualized and assessed in terms of global psychological symptoms, quality of life (QOL) and prevalence and severity of symptoms of depression and or anxiety, with some investigations using a combination of these dimensions. Most have used standardized self-report measures, but some have used structured or semi-structured interviews (Table I).

The established risk factors for depressed mood after childbirth, which include being young, un-partnered, of low socioeconomic status, of high parity, having an unwanted pregnancy and experiencing marital conflict (Righetti-Velletta et al., 1998; Johanson et al., 2000; Scottish Intercollegiate Guidelines Network, 2002),
Table III. Social and psychological aspects of parenting in the first post-partum year.

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Research question(s)/Comparison groups (if applicable)</th>
<th>Main findings mothers/fathers[^a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garel and Blondel, 1992</td>
<td>Assessment of psychological consequences of mothering triplets</td>
<td>Most reported social isolation, lack of support, strained marital relationship, and difficulty in providing attention to each individual child, psychological difficulties, and clinical depression</td>
</tr>
<tr>
<td>Raoul-Duval et al., 1993</td>
<td>Comparison of maternal mood, mother–infant attachment and infant behaviour ART/OI/SC</td>
<td>ART and OI groups &gt; depressive symptoms and &gt; infant sleeping problems 9 months (trends)</td>
</tr>
<tr>
<td>Abbey et al., 1994</td>
<td>Comparison of effects of parenthood INF/Fertile</td>
<td>42% of infertile and 36% of fertile couples were parents at follow-up INF mothers &gt; positive effects of parenthood than INF fathers and comparison group mothers</td>
</tr>
<tr>
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[^a]: ART = Assisted Reproductive Technology; OI = Ovum Donation; SC = Surrogacy
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<td>ART multiple &gt; negative themes; ‘tiredness’, ‘feelings of stress/depression’ and ‘questioning parenthood’</td>
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<td>ART singleton &gt; positive theme; ‘feeling wonderful’</td>
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*aOnly important descriptive data and reported group differences are included in the table.*
are either absent or very rare in ART populations, and it might therefore be expected that post-natal mood disturbance would be uncommon in this group.

Comparisons of general psychological well-being and QOL assessed by either short or longer forms of the GHQ, the mental health inventory (MHI) (Veit and Ware, 1983a,b) and study-specific interviews between ART and SC mothers at a range of post-partum intervals have mixed findings. Abbey et al. (1994) report decreased stress and improved QOL in PI parents compared with those without fertility difficulties 1 year post-partum. However, both Colpin et al. (1999) and Baor et al. (2004) found that primiparous ART mothers of twins had lower well-being at 8–12 months post-partum than the equivalent SC mothers.

Given the differences in prevalence of risk factors it is surprising that comparisons of prevalence of symptoms of depression using the EPDS, CES-D and BDI, and of anxiety or mixed mood symptoms using the HADS, and the STAI have found no differences between ART and SC mothers (McMahon et al., 1997b; Colpin et al., 1999; Gibson et al., 2000b, Glazebrook et al., 2001, 2004; Greenfeld and Klock, 2001; Cox et al., 2006) or fathers (Colpin et al., 1999; Gibson et al., 2000b; Cohen et al., 2001; Glazebrook et al., 2001). It is possible that these measures are insensitive to distress specific to mode of conception. Mood disturbance is multifactorially determined and Repokari et al. (2005) report that multiparity, older maternal age and worry about the child are associated with increased depressive symptoms in both ART and SC mothers. Adolescent motherhood is known to be psychologically problematic and if it is assumed that age is a linear determinant, it is apparently contradictory that older mothers are also vulnerable. However, there is evidence that mothers at both extremes of the age range (≤18 or ≥35 years) of reproductive life have greater prevalence of psychological difficulties (Astbury et al., 1994; Johanson et al., 2000).

Most investigators have reported only between group comparisons of mean scores and not proportions scoring in the clinical range. However, Gibson et al. (2000a,b) report that 5% and Glazebrook et al. (2001) 17.1% of ART mothers of singletons had clinically significant depressive symptoms. This might be attributable to sampling differences; Gibson et al. (2000a,b) recruited socio-economically advantaged Australian women and Glazebrook et al. (2001) a more socio-economically diverse English sample. However, it is more likely to be to do with the EPDS cut off score that was used and the timing of assessment. Gibson et al. (2000a,b) tested at infant age 1 year, using an EPDS score of 13 or more. Glazebrook et al. (2001) tested at 6 weeks post-partum and used an EPDS score of 12 or more. Both estimates are outside the rates of 7.4% 3 months and 8.1% 8 months post-partum established in general populations of mothers of infants using the same measure (Johanson et al., 2000; Evans et al., 2001). One still perplexing finding is that ART mothers are at a 4-fold risk of admission to Australian residential early parenting services for treatment of mild to moderate mood disorder and infant behaviour disturbance than SC mothers from the same socioeconomic group, with similar severity of mood disturbance on admission (48% of each group had EPDS scores >12) (Fisher et al., 2005).

It is possible that mood change from pregnancy to post-partum is different in ART than SC groups, but there are few systematic investigations of this. Glazebrook et al. (2001) found a general lowering of anxiety from pregnancy to post-partum in all participants. Repokari et al. (2005) observed fewer pregnancy depressive symptoms in pregnancy in ART than SC couples but these increased over time in the ART group, and levels were the same in the two groups 1 year post-partum. However, neither Olshansky and Sereika (2005), who studied ART women, nor Cohen et al. (2001), who compared ART and SC fathers, detected changes in depressive symptoms in these groups from pregnancy to post-partum.

Multiple birth, which is more common after ART than SC, has a well-documented negative impact on post-natal maternal emotional well-being (Fisher and Stocky, 2003). Baor et al. (2004) found that mothers of ART and SC twins had similar psychological well-being, suggesting that the psychological impact of mothering multiples is unaffected by mode of conception. Mood disturbance is more common in primiparous than multiparous ART mothers of twins (Colpin et al., 1999; Baor et al., 2004; Sheard et al., 2007) and almost universal in mothers of triplets (Garel and Blondel, 1992).

Few of these investigations took duration of infertility or extent of treatment into account and these might influence post-partum mood. It is also possible that parenthood is idealized after infertility and that ART parents are less well-prepared for the unrelenting workload and losses that are inevitable for parents of newborns.

Self-regard
Infertility and infertility treatment diminish self-confidence and self-esteem (Hynes et al., 1992; Anderson et al., 2003). Three investigations used self-report measures to assess general self-esteem, two of which also assessed parenting self-efficacy after ART (McMahon et al., 1997b; Gibson et al., 2000b; Greenfeld and Klock, 2001; Cox et al., 2006).

Four months post-partum ART mothers had lower self-esteem and maternal self-efficacy than SC mothers (McMahon et al., 1997b). Mothers who had required more than one ART treatment cycle to conceive had lower maternal self-efficacy than those who had conceived on the first cycle, which suggests that the corrosive effects of treatment-failure on confidence accrue. Lower self-confidence persisted: 1 year post-partum, these ART mothers had lower sense of parenting competence than the SC group and tended to have lower self-esteem (Gibson et al., 2000b). Gibson et al. (2000b) also found lower self-esteem, but not paternal self-efficacy among ART than SC fathers 1 year post-partum.

In contrast, neither Greenfeld and Klock (2001) nor Cox et al. (2006) found differences in self-esteem or maternal self-efficacy between ART and SC groups at any point post-partum. Selection biases might have governed these findings. In Greenfeld and Klock's (2001) study, 29% of ART participants were mothers of twins or triplets compared with only 4% in the comparison group. Although there are generally poorer health outcomes in multiple than singleton infants, these mothers all assessed infant health as good. Further, of the 97 ART participants, only 53 (55%) were retained at the 9 month final assessment, and it is possible that those experiencing most difficulties were lost to follow-up. Similarly Cox et al. (2006) had very low recruitment and retention rates. The possibility that infertility-related diminished self-confidence persists after childbirth cannot be excluded.
Adjustment to parenthood

Adjustment to the work of infant care and the state of parenthood after ART has been conceptualized and assessed in terms of parenting stress, self-evaluation of parenting effectiveness and non-specific evaluations of satisfaction with the state of parenthood and was reported in 14 papers.

Colpin et al. (1999), Gibson et al. (2000b) and Glazebrook et al. (2001) found no differences between ART and SC groups in mean parenting stress index (PSI) scores (Abidin, 1995). Repokari et al. (2006) reported fewer adjustment problems among ART than SC mothers 2 and 12 months post-partum and that ‘unpleasant birth experiences’, low birthweight and difficulties soothing the baby increased parenting stress in the SC but not the ART group. Greenfeld and Klock (2001) reported decreased parenting stress from 2 to 9 months post-partum among ART, but not SC primiparae. This is perplexing as almost a third of the ART mothers were caring for twins or triplets, which is usually more difficult (Fisher and Stocky, 2003). Other investigators report higher levels of parenting stress among primiparous ART mothers of multiple infants than in comparison groups, in particular because care has to be withheld from one baby in service of another (Garel and Blondel, 1992; Colpin et al., 1999; Baor et al., 2004; Glazebrook et al., 2004). Sheard et al. (2007) found that mothers of 6-week-old ART multiples were more likely than mothers of ART singletons to describe ‘tiredness’, ‘feelings of stress/depression’ and ‘questioning [of] parenthood’ while the latter were more likely to be ‘feeling wonderful’ than the former.

ART fathers had similar PSI scores to SC fathers in Colpin et al.’s (1999) study, but Baor et al. (2004) detected more parenting stress in fathers of ART than SC twins. Halman et al. (1995) used the post-partum self-evaluation questionnaire (Lederman et al., 1981) and found no differences between PI mothers (ART rates were not reported) and SC mothers in early adaptation to motherhood. Similarly, Hjelmstedt et al. (2004) found no differences between ART and SC mothers or fathers using the Swedish parenthood stress questionnaire (SPSQ) (Östberg et al., 1997) 2 and 6 months post-partum, but when interviewed, ART couples reported that negative infertility-related feelings persisted.

Using study-specific measures, Abbey et al. (1994) found that achieving motherhood decreased negative affect, improved life quality and increased personal control for PI women. These positive effects were less evident among their partners and parents who had not experienced infertility. Similarly, Ulrich et al. (2004) found that ‘satisfaction with current situation’ increased from pregnancy to 1 year post-partum in the ART group but not in the SC group.

Fisher et al. (2005) audited the medical records of a large consecutive cohort of mothers admitted to a clinical service for treatment of early parenting difficulties and found that ART was associated with a 4.0 relative risk of admission. In this cohort, ART mothers were older than SC mothers and more likely to have had a Caesarean birth, twins and low birthweight infants. These data indicate that repeated adverse reproductive events in addition to infertility and ART, including operative birth, multiple birth and mothering a low birthweight infant might have a cumulative negative effect on adjustment to motherhood.

Marital relationship

Infertile couples who undergo ART generally report high satisfaction with their intimate partnerships (Hammarberg et al., 2001; Schmidt et al., 2005; Sydsjö et al., 2005). This might be a selection effect in which well-adjusted couples with equal commitment to parenthood are more likely to initiate and persist with ART treatment (Edelmann et al., 1994). The birth of a baby imposes increased demands on this relationship and post-partum decline in marital satisfaction is common (Cox et al., 1999). There are 10 investigations of whether this also occurs after the birth of ART infants.

Using the DAS, McMahon et al. (1997b) and Gibson et al. (2000b) found no differences between ART and SC mothers 4 and 12 months post-partum. However, ART fathers had poorer marital adjustment than SC fathers. In addition to an overall score, the DAS yields subscale scores. Two and 12 months after the birth Repokari et al. (2007) found no difference between ART and SC couples on the overall quality of the marital relationship using the DAS. However, there was a decline in scores on the ‘dyadic consensus’ subscale, which assesses degree of agreement between partners, among SC but not ART mothers over time. Interestingly, these investigators also found that having several previous unsuccessful ART treatment cycles was associated with good ‘dyadic cohesion’ (degree of shared interests and conversational engagement) and ‘dyadic consensus’, supporting Edelmann et al.’s (1994) contention that couples who persist with ART treatment might function particularly well. It was also found that lower marital satisfaction was associated with previous spontaneous abortions in women, longer duration of infertility in men and having older children in both women and men.

Sydsjö et al. (2002) investigated changes in the marital relationships of ART and SC couples from pregnancy to 1 year postpartum using ENRICH (Fournier et al., 1983). They found that the relationship remained stable over time in ART couples, but marital satisfaction decreased in SC couples. Two other longitudinal studies reported less marital satisfaction 3 (Ulrich et al., 2004) and 6 (Hjelmstedt et al., 2004) months post-partum than during pregnancy among both ART and SC couples, but Ulrich et al. (2004) found that by 12 months this had returned to pregnancy levels.

Baor et al. (2004) assessed marital quality 8 months after the birth of twins in ART and SC couples and Greenfeld and Klock (2001) compared marital adjustment 2 and 9 months post-partum in ARTC and SC women. Neither found between group differences. Olshansky and Sereika (2005) in their exploration of factors predicting post-natal depression in PI women reported lower rates in those with high marital satisfaction. This is consistent with evidence from population-based studies that an empathic and supportive marital relationship protects against post-partum mood disturbance (Pope et al., 2000).

Few studies have explored sexual satisfaction after childbirth in ART populations. Abbey et al. (1994) found that parenthood decreased intimacy and frequency of sexual intercourse among PI couples. Ulrich et al. (2004) reported lower sexual satisfaction 3 months post-partum in ART than SC fathers, but Repokari et al. (2007) described lower levels of sexual affection among SC than ART fathers 2 months after the birth.
The mixed evidence in this group of investigations probably reflects methodological differences between studies, but overall it appears that post-partum marital satisfaction is similar in ART and SC groups.

**Parent–infant relationship**

As a consequence of the difficulties involved in becoming a parent, it has been speculated that ART mothers might be more anxious about newborn health and take longer to form secure attachment to the baby and a maternal identity (Bernstein, 1990; Dunnington and Glazer, 1991). Nine investigations have addressed parent–infant attachment and interaction, maternal sensitivity and parental separation anxiety.

No differences between ART and SC parents were found on standardized self-report measures of mother/father–infant attachment and separation anxiety at 4 (McMahon et al., 1997a,b; Cohen et al., 2001) and 12 months (Gibson et al., 2000a). Similarly, there were no differences in interview-assessed mother–infant attachment between ART and SC mothers (Raoul-Duval et al., 1993).

Systematically scored video-tapes have been used to assess mother–baby interactions and maternal sensitivity (McMahon et al., 1997a,b; Holditch-Davis et al., 1998; Holditch-Davis et al., 1999; Gibson et al., 2000a; Papaligoura and Trevarthen, 2001; McMahon and Gibson, 2002). At age 4 months, ART infants were more ‘fussy’ than SC infants during the procedure (McMahon and Gibson, 2002), but there were no between-group differences in maternal sensitivity (McMahon et al., 1997b) and almost all mothers were sensitive to infant cues by 12 months (Gibson et al., 2000a). In repeated video-taped observations in the newborn period, Papaligoura and Trevarthen (2001) found that ART mothers and those who had conceived with other infertility treatments showed more ‘care-taking’ and ‘play’ episodes than SC mothers. Holditch-Davis et al. (1998, 1999) found no differences between ART and SC parents’ interactions with their newborns, but all fathers spent less time than mothers interacting and providing all forms of stimulation except playing. Overall, therefore, current evidence does not suggest a negative effect of ART on the parent–infant relationship.

**Parental perception of infant temperament and behaviour**

In general, populations of childbearing women, infant temperament and behaviour influence maternal emotional well-being. Mothers caring for infants with feeding, settling or sleeping difficulties, who resist soothing or cry inconsolably, are more likely than mothers with more settled and regular babies to be exhausted and experience mood disturbance (McMahon et al., 2001; Fisher et al., 2002). Nine articles included reports about ART mothers’ perceptions of their infants’ temperament and behaviour.

ART mothers of multiples and of singletons rated their 6-week-old infants’ behaviour similarly, but unsettled and dysregulated infant behaviour was a risk factor for maternal depression in both groups (Sheard et al., 2007). Two months after the birth Greenfeld and Klock (2000) reported that ART babies were more difficult to soothe than SC babies but this difference was no longer apparent at 9 months. Similarly, 4 months post-partum ART parents rated their babies as more difficult to care for than did SC mothers and fathers (McMahon et al., 1997; Cohen et al., 2001). By 12 months, both ART and SC mothers’ ratings of their children’s temperament were within the average range. However, the ART mothers described their children as more irritable and moody and as having a greater number of difficult behaviours than SC mothers (35% versus 16%) (Gibson et al., 1998). Although there were no between-group differences on maternal protectiveness at 12 months, ART mothers perceived their children as more vulnerable and ‘special’ (Gibson et al., 2000b). In contrast, Sydsjö et al. (2002) found that at 12 months ART parents perceived their children as more regular, sensitive, attentive and manageable than SC parents.

Global assessments of infant behaviour have also been used. In interviews with ART, INF and SC mothers 9 months post-partum, Raoul-Duval et al. (1993) found no between group differences in rates of infant sleeping or feeding problems. Repokari et al. (2006) asked participants 2 month post-partum whether or not the baby smiled at the parent’s face, had regular eating and sleeping patterns and was easy to soothe. Although there were no differences between ART and SC parents in reports of these infant behaviours, difficult infant behaviour had a more negative effect on the parenting experience of the SC than the ART group. Further, infant resistance to soothing was associated with a more negative parenting experience among SC but not ART fathers. The authors conclude that couples who overcome infertility may be more resilient than those who conceive spontaneously to infant related stressors. However, the higher rate of admission of ART mothers to early parenting centres for parenting difficulties reported by Fisher et al. (2005) suggests that this might not be true for all, and that subgroups might be more vulnerable.

**Discussion**

Overall, there is a moderate body of research about the social and psychological aspects of pregnancy, childbirth and early parenting after ART and it has both strengths and limitations. It is investigating a contemporary phenomenon and therefore has had to be exploratory in nature. Overall, although there is consistent evidence about some aspects, in others it is either inconclusive or contradictory. This is probably attributable to the varied methods of investigation that have been employed. These include in research design; inclusion and exclusion criteria; recruitment strategies; adequacy of sample size; choice of comparison group; timing of assessments in relation to conception; recruitment and retention rates and data collection tools.

Almost half only investigated nulliparous pregnant women or primiparæ. Many only included women having a singleton baby, but some were specific investigations of parents of multiples. Some were confined to participants who had used their own gametes to conceive; who were healthy or who gave birth to a healthy baby at term. These criteria preclude generalization of findings to the whole population of people conceiving with ART.

Couples, who conceive with ART are socio-demographically heterogeneous, have varied fertility difficulties and are older than average when they conceive and constructing an equivalent comparison group or matching on these factors is unlikely to be possible. Evidence of this is demonstrated in the fact that there were significant differences between ART and SC groups in characteristics that might have contributed to the findings such as age, number of years in the relationship with the partner,
prevalence of multiple birth and reproductive history. Findings from studies with low or undisclosed retention rates need to be interpreted with some caution as they may not represent the whole study population.

Emotional well-being was conceptualized and assessed most commonly in terms of depression and anxiety. There was consistent evidence that ART women and men report fewer depressive symptoms in pregnancy and proportions scoring above clinical cut-off scores are low. However, the evidence about anxiety in pregnancy is more equivocal. Levels of general anxiety appear similar to those of SC groups, but specific anxieties about pregnancy security and fetal health are heightened in ART women, especially those who experienced prolonged treatment failure and high infertility-related distress.

As the prevalence of established risk factors is low, it would be expected that rates of post-partum depression in ART groups would be lower than in SC groups. It is surprising therefore that rates of depression in ART mothers are similar to those of the general population of childbearing women. This is apparent in the whole ART population not just those mothering multiples who are known to be at increased risk of mood disturbance compared with those with singletons.

Evidence about emotional adjustment to pregnancy after ART is inconclusive, with some suggesting that it is quite unproblematic, and others, that there are self-protective delays in believing in the pregnancy, forming an emotional attachment to the fetus and preparing for life with a baby. This probably reflects variation in the constructs that were assessed and means of measuring attitudes and adjustment to pregnancy.

The evidence about the adjustment to parenthood in ART couples is also mixed. Some investigators found no differences between ART and SC groups, others that they had fewer adjustment difficulties. A consistent finding appears to be that ART mothers who have multiple births, especially primiparae, have higher rates of adjustment difficulties than ART and SC mothers with singletons.

Few differences between ART and SC groups in antenatal self-regard (variably defined) were found. There was some evidence that post-natal self-confidence and confidence in parenting ability is lower in ART than SC couples. This was especially prominent and sustained in those who had experienced repeated ART treatment failure prior to conception. There are consistent findings from cohort studies, and a medical record audit, of elevated rates of admission of ART mothers to Australian residential early parenting services for treatment of mild to moderate mood disturbance and infant behaviour difficulties. These were in part but not completely due to the higher rates of multiple births, and the authors suggest that infertility, fertility treatment, pregnancy scrutiny and operative interventions in childbirth might accrue and reduce confidence in caretaking capacity.

Overall, it is suggested that after ART conception couples might idealize parenthood, and consequently lack preparation for the inevitable losses that it brings. Mothers who conceive with ART might also feel more constrained about actually expressing ambivalence or regrets than those conceiving spontaneously and have a low sense of entitlement to complain or seek additional support (Repokari et al., 2005; Fisher et al., 2007), but these hypotheses are yet to be tested.

There is a dearth of evidence regarding the experience of childbirth after ART and the available data is limited and contradictory, but appears to suggest that it might be more difficult than anticipated.

Infants admitted with their mothers to early parenting services have more difficult temperaments, in particular a low threshold to arousal, more intense reactions to novel experience and less rhythmicity (Fisher et al., 2004). The evidence relating to parental perceptions of infant temperament and behaviour after ART is contradictory. Some report that ART infans are no more difficult than SC infants (Sydsjö et al., 2002) and others that difficult infant behaviours are well-tolerated by ART parents (Repokari et al., 2006). However, the detailed systematic observations of McMahon et al. (1997a,b), Gibson et al. (1998) and Cohen et al. (2001) were that ART infants had higher prevalence of difficult behaviours than SC infants. Whether these behaviours reflect mode of conception or caretaking style is not yet known. However, few differences have been found between ART and SC couples in terms of parent–infant attachment and interaction, maternal sensitivity and parental separation anxiety.

Marital satisfaction appears to be at least as good as or better among ART than SC couples during pregnancy and after childbirth. While almost all comparisons, ART couples have had relationships of longer duration and therefore perhaps better mutuality than SC couples. It is also probable that couples who initiate and persist with ART treatment have a strong commitment to each other and a mutual desire for parenthood.

There is as yet limited evidence about the potential impact of the degree of difficulty involved in conceiving on parental psychological functioning. In addition to the reasons proposed by Fisher et al. (2005) for the elevated rates of post-partum admission to early parenting programs in ART mothers, McMahon et al. (1997a,b) found lower maternal self-efficacy among women who had experienced treatment failure than those who had conceived on a first attempt. Hjelmstedt et al. (2003) found higher anxiety about pregnancy loss among women and about fetal health among men with high recalled infertility distress. Several investigations report that infertility-distress persists even when pregnancy and parenthood are achieved (Sandelowski et al., 1992; Bernstein et al., 1994; Hjelmstedt et al., 2004). Together, these findings suggest that there might be subgroups in ART populations who are more vulnerable to psychological difficulties in the transition to parenthood.

Overall, therefore, this body of evidence is best described as emergent. It includes valuable observations and has identified a relevant set of constructs to apply in understanding the psychological functioning and social adjustment of people who conceive with ART. In order to address the inconsistencies in current evidence, it is clear that in all future research in this field, there is a need for systematic recruitment of participants, minimization of exclusions and the use of appropriate comparison populations. ART women have characteristics that will influence maternal post-natal adjustment, including being older, more likely to have premature, operative and multiple births and infants of low birthweight and the separate and combined effects of these on psychological adjustment have not been explored to date. The use of the same data collection measures would improve cross-study comparability. Finally, sensitive quantification of the effects of previous adverse reproductive events including spontaneous pregnancy loss, and
the degree of difficulty involved in conceiving on later perinatal psychological functioning would improve understanding.

In practice, these findings suggest that healthcare professionals involved in the care of parents during pregnancy and after birth should be aware of the potential cumulative negative effect of infertility and ART on antenatal psychological functioning and post-partum adjustment.

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