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A review of psychosocial interventions in infertility

J. Boivin*

School of Psychology, Cardiff University, P.O. Box 901, Cardiff CF10 3YG, UK

Abstract

Counselling has been strongly recommended by numerous governmental, medical and community associations to help infertile people. The purpose of this review was to determine whether psychosocial interventions improved well-being and pregnancy rates, and to identify the kinds of interventions that were most effective. A systematic search identified all published and unpublished papers in any language and any source that (1) described a psychosocial intervention and (2) evaluated its effect on at least one outcome measure in an infertile population. A total of 380 studies met the first criteria but only 6.6% ($n = 25$) of these were independent evaluation studies. Analysis of these studies showed that psychosocial interventions were more effective in reducing negative affect than in changing interpersonal functioning (e.g., marital and social functioning). Pregnancy rates were unlikely to be affected by psychosocial interventions. It was also found that group interventions which had emphasised education and skills training (e.g., relaxation training) were significantly more effective in producing positive change across a range of outcomes than counselling interventions which emphasised emotional expression and support and/or discussion about thoughts and feelings related to infertility. Men and women were found to benefit equally from psychosocial interventions. Directions for future research on the evaluation of psychosocial interventions are discussed.

Keywords: Infertility; Counselling; Stress; Support groups

Introduction

The provision of psychosocial interventions for infertile couples has been recommended since the advocacy work of Barbara Eck Menning (1980) directed research attention to emotional distress as a consequence of infertility rather than, as had been the emphasis until then, a cause of infertility. Her recommendation to provide psychological services to infertile couples has been reiterated by regulatory bodies in several countries (Bruhat, 1992; Human Fertilisation and Embryology Authority (HFEA), 1995), various associations involved in the care of infertile couples both at a professional (cf. Hammer-Burns & Covington, 1999; Boivin & Kentenich, 2002) and community level (e.g., ISSUE, CHILD, RESOLVE) as well as those of numerous mental health professionals working with infertile couples (cf. Bresnick & Taymor, 1979; Menning, 1980). Moreover, the recommendation is consistent with the interest infertile people themselves have expressed in receiving more psychosocial help (Laffont & Edelmann, 1994; Sundby, Olsen, & Schei, 1994).

Despite widespread belief in the worthiness of such counselling, relatively few studies have evaluated the effectiveness of psychosocial interventions in the field of infertility. Moreover, to this author's knowledge no review exists of this research base. The scarcity of evaluative studies is a significant problem within the psychology research base especially now that interventions in medical settings are expected to be evidence-based (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). A review is therefore timely. The aim of the present review was to examine the outcome studies that do exist with the intent of appraising this research and providing direction for future research on the evaluation of effective psychosocial interventions.

*Tel.: +44-2920-874007; fax: +44-2920-874858.
E-mail address: boivin@cardiff.ac.uk (J. Boivin).

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The review was organised around three main questions that have been the subject of debate in the infertility psychosocial literature. These were:

1. Do psychosocial interventions improve well-being?
2. Do psychosocial interventions increase pregnancy rates?
3. Are some interventions more effective than others?

A systematic search identified the studies needed to answer these questions. In this type of methodology the search procedure attempts to identify all research evidence concerned with the primary question, in this case, the effectiveness of psychosocial interventions for infertility (Sackett et al., 2000). These could be any published or unpublished papers from any source in any language. Accordingly, both electronic and manual searches were used to identify studies that (1) described a psychosocial intervention and (2) evaluated the intervention.

The results are presented in the same order for each question. A description of study results is provided in terms of outcomes as well as the percentage of studies finding positive results. A commentary section discussing the results is then presented.

The studies

An initial broad search of the psychological and medical research base (i.e., PsycINFO, BIDS (International Bibliography for Social Sciences), Medline, EMBASE (Excerpta Medica Database) showed that 1,957 articles and books had been published on the psychological aspects of infertility since 1966 (i.e., title or abstract included the search terms psychology and infertility or their variants). This set of articles and books was then further examined to extract only those that included intervention, group, therapy, counselling (or variants thereof) in their title or abstract, and to exclude duplicates. Abstracts were read to identify those studies that evaluated the effectiveness of at least one psychosocial intervention on at least one outcome measure. In addition, the reference list of tagged papers was examined to identify further outcome studies that might not have been picked up by the electronic search. This secondary search yielded $N = 380$ studies.

Of the 380 studies 345 (90.8%) were excluded from the review for various reasons. These were that the study (1) mentioned psychosocial intervention(s) but did not include any evaluation ($n = 290$, 76.3%); (2) described a case study which could not be generalised ($n = 47$, 12.4%); (3) evaluated non-specific patient-centered care delivered as part of routine care (e.g., "tender loving care", Stray-Pedersen & Stray-Pedersen, 1984) ($n = 5$, 1.3%) and; (4) results could not be interpreted due to the lack of statistical or other methodological detail ($n = 3$).

The final sample consisted of 35 studies, of which only 25 were independent evaluations on separate populations. This set of independent studies represents 6.6% of the potential pool of 380 studies. Table 1 provides summary details for the 25 independent studies selected. The studies were grouped according to the type of intervention evaluated. The three basic categories were (1) *counselling interventions*; (2) *focussed educational interventions*, and (3) *comprehensive educational programmes*. The feature that distinguished educational programmes (focussed or comprehensive) from counselling was the therapeutic objective. If the main aim of the intervention was to impart knowledge or provide skills training then the intervention was classed as educational. If, in contrast, the main aim of the intervention was emotional expression and support, and/or discussion of thoughts and feelings related to infertility (as cause or consequence) then the intervention was classed as counselling. The difference between *focussed* and *comprehensive* interventions was in the range of information or skills training provided to participants with focussed interventions providing one main skill (e.g., coping *or* relaxation training) and comprehensive programmes providing a range (e.g., coping *and* relaxation training). It is acknowledged that the categories were not wholly independent and that information could be provided in counselling interventions and/or emotional expression in educational programmes. However, the categories were sufficiently different in their emphasis with respect to these therapeutic interventions to warrant a separation.

The interventions

Table 1 shows selected characteristics of the interventions. As shown in Table 1 the counselling interventions could further be sub-divided into three types. The first and oldest types evaluated the effects of both short and long-term psychoanalytic or psychodynamic psychotherapy used to alleviate psychic conflicts, often originating in childhood, believed to be blocking pregnancy. The second group of studies used 'infertility counselling' which focused more directly on reactions to infertility and on discussions about the impact of infertility on various domains, for example, marital and sexual relations or on feelings of masculinity and femininity. The final set of counselling studies followed the theoretical work of Beck (1976) and aimed to identify, reality-test and correct distorted cognitions and beliefs about infertility.

The second category of interventions listed in Table 1 focussed on educational programmes which mainly incorporated one or two educational activities including coping training, stress reduction, sex therapy and

Table 1
Intervention characteristics and sample size for studies reviewed (where information provided)

Studies	Type of intervention	Duration	Format	Follow-up time	Final sample	
					Intervention	Comparison
Counselling						
Holzle et al. (2002)	Infertility counselling	7 weeks	Couple	3 months	37 C	
Strauss et al. (2002)	Infertility counselling	9 weeks	Individual/ couple	Not stated	12 C + 20 W	12 C
Emery et al. (2001)	Infertility counselling	1 week	Couple	1.5 months	30 C	30 C
Christie and Morgan (2000)	Psychoanalytic	Not stated	Group	Not stated	35 W	
McNaughton-Cassill et al. (2000)	Cognitive behavioural	3 weeks	Group	Immediate	17 C	
Wischmann et al. (2001a, b, 2002)	Infertility counselling	2 or 10 weeks	Couple	3 months	134 C	23 C
Kemeter and Fiegl (1999)	Psychodynamic	1 or 2 weeks	Couple	Immediate	49 C + 20 W	
Pengelly et al. (1995)	Infertility counselling	3 weeks	Couple	Not stated	29 C	
Connolly et al. (1993)	Infertility counselling	3 weeks	Couple	1.5 months	37 C	45 C
Liswood (1995)	Cognitive behavioural	6 weeks	Couple	Immediate	18 C	18 C
Bents (1991)	Cognitive behavioural	15 weeks	Couple	4 months	15 C	
Brandt and Zech (1991)	Infertility counselling	4 weeks	Couple	10 months	15 C	
Sarrel and deCherney (1985)	Psychodynamic	2 weeks	Couple	18 months	10 C	10 C
Ellenberg and Koren (1982)	Psychoanalytic	32 weeks	Individual	36 months	10 W	7 W
Bresnick and Taymor (1979); Bresnick (1981)	Psychodynamic	5 + weeks	Individual/ couple	Not stated	31 W, 22 M	
Focussed educational programmes						
Tuschen-Caffier et al. (1999)	Sex therapy	32 weeks	Couple	6 months	17 C	12 C
McQueeney et al. (1997)	Coping training	6 weeks	Group	18 months	18 W	8 W
Stewart et al. (1992)	Support and stress reduction	8 weeks	Group	Immediate	25 C + 14 W	35 W
Takefman et al. (1990)	Preparatory information	12 weeks	Couple	6 months	26 C	13 C
Wallace (1984, 1985)	Preparatory information	1 week	Individual	1.5 months	20 W	17–26 W
O'Moore et al. (1983)	Autogenic training	10 weeks	Group	2 months	15 C	10 C
Comprehensive educational programmes						
Domar et al. (2000a, b)	Mixed	10 weeks	Group	12 months	47 W	25–48 W
Domar et al. (1990)	"	"	"	6 months	54 W	
Domar et al. (1992)	"	"	"	"	41 W	
Clark et al. (1995, 1998)	Mixed	24 weeks	Group	12 months	13 W	5 W

Note: For duration number of weeks equals number of sessions as sessions were usually given weekly. W = Women; M = Men; C = Couples.

receiving preparatory information about medical tests or treatments. The final category of studies was also educational but assessed the effectiveness of more comprehensive and structured educational psychosocial interventions. For example, the Behavioral Medicine Program for Infertility (BMPI, also known as the mind/body program) (Domar, Seibel, & Benson, 1990) is a 10-week group program that includes, for example, cognitive-restructuring, methods for emotional expression, relaxation training, nutrition and exercise. Similarly, the intervention designed by Clark and colleagues (Clark et al., 1995; Clark, Thornley, Tomlinson, Galletley, & Norman, 1998) for obese anovulatory women includes not only education about nutrition and medical topics but also group support and stress management techniques.

In addition to the difference in the type of intervention, the studies presented in Table 1 also differed with respect to other intervention characteristics. Duration described the number of weeks necessary to carry out the intervention. While educational interventions were time-limited, many of the counselling interventions were open-ended with duration determined by the needs of the client. For these interventions an average number of weeks was recorded in Table 1. It should be noted that the number of weeks in all but two studies (i.e., Holzle, Brandt, Lutkenhaus, & Wirtz, 2002; Takefman, Brender, Boivin, & Tulandi, 1990) was equal to the number of sessions. About the same number of studies delivered the intervention to individuals (in a group or individual format) ($n = 11$) with slightly fewer studies using a couple format ($n = 13$). One study presented data for both individual and couple interventions (Strauss, Hepp, Stading, & Mettler, 2002). When the intervention was directed to individuals it was almost always delivered to women only. Finally, sample size differed depending on the study with the range between 10 and 134 people in intervention studies versus 5–48 people in the comparison group.

Quality of studies reviewed

According to evidence-based medicine, the methodology that yields the least biased evidence for the effectiveness of an intervention is the randomised controlled trial where consecutive patients are randomly assigned to experimental and control conditions (Khan, Riet, Popay, Nixon, & Kleijnen, 2001). This type of design is effective because it controls for non-specific factors that may influence the responses of treated and untreated groups on outcome measures. Randomisation and the use of control groups ensures that differences between groups on outcome measures are due to intervention effects rather than to other factors not controlled as part of the experiment.

None of the studies reviewed met all the criteria of evidence-based medicine and almost all showed some shortcomings with regard to good practice for evaluation studies. Randomisation protocols were not adhered to in several studies (e.g., Domar, Clapp, Slawsby, Dusek, Kessel, & Freizinger, 2000a; Domar, Clapp, Slawsby, Kessel, Orav, & Freizinger, 2000b; McQueeney, Stanton, & Sigmon, 1997; Takefman et al., 1990) and/or high refusal and/or attrition rates compromised randomisation when it was used (Wischmann et al., 2001a; Connolly et al., 1993; Clark et al., 1995). Although many studies used a comparison group it often comprised of people who refused to participate, dropped out of treatment or were fertile (McQueeney et al., 1997; Clark et al. 1995; O'Moore, O'Moore, Harrison, Murphy, & Carruthers, 1983). These were not adequate controls because such individuals may differ markedly from participants. Indeed, four of five studies comparing participants who withdrew to those who continued found pre-treatment differences on demographic and/or psychological variables (Clark et al., 1995; Stewart et al., 1992; Domar et al., 2000b; Holzle et al., 2002). Almost all studies used at least one 'in-house' questionnaire designed specifically for the study but for which they provided no psychometric evaluation. In 16% of studies this was the only measure used to assess outcomes. Together these methodological shortcomings indicated the need to take into account the quality of studies when reviewing study findings.

Table 2 shows methodological characteristics of the studies reviewed where information was available. Table 2 shows that the final sample represented, on average, about 59% of the sample initially recruited (or randomised) to the study groups (based on studies providing attrition information). The types of participant included in the intervention group were for the most part infertility patients or infertile people from the community. Of the 25 studies reviewed, 36% ($n = 9$) did not use any comparison group, 44% ($n = 11$) used a routine care, waiting list or other control group (e.g., support only) whereas the remainder compared study findings to women who did not participate in the intervention for various reasons (e.g., dropped out, refused to attend counselling). The majority of studies using control groups (81.8%, $n = 9$ of 11 studies) used randomisation procedures to allocate participants to intervention or control groups. The majority of studies (60%, $n = 15$) included a pre-to-post intervention comparison, though seven studies (28%) used only a single assessment (i.e., post-only) to evaluate the intervention. Finally, the majority of studies used both validated questionnaire measures as well as questionnaires developed specifically for the study (i.e., in-house measures).

In light of the variability in methodological characteristics, it was decided that review findings should be considered not only for the group of studies as a whole but also for those studies which were deemed of 'better quality'. Studies of better quality were defined as studies those that used a control group, either routine care, wait list or support-only controls, and that used either random assignment and/or a pre-to-post design to account for the influence of uncontrolled factors on intervention effects. In total 11 of the 25 studies (44%) reviewed could be said to meet these requirements. Nine studies (36%) included random assignment to a control or intervention group (Connolly et al., 1993; Domar et al., 2000a, b; Emery et al., 2001; Liswood, 1995; Sarrel & deCherney, 1985; Strauss, & Mettler, 2002; Takefman et al., 1990; Wallace, 1984; Wischmann et al., 2001a). The other two studies (8%) included a routine care or wait-list control group *and* a pre-to-post design (without random assignment) (Tuschen-Caffier, Florin, Krause,

Table 2
Methodological characteristics of the studies reviewed (where information provided)

Studies	Final sample as %initially invited	Type of participant in intervention	Type of comparison group	RA	Design	Standard or in-house measures
Counselling						
Holzle et al. (2002)	40.7%	I from community	Clinic cohort not studied		Wait–pre–post	Both
Strauss et al. (2002)[a]	57.1%	P	Wait list	RA	Pre–post	Both
Emery et al. (2001)[a]	Initial not given	IVF P	RC	RA	Pre–post	Both
Christie and Morgan (2000)	Initial not given	I in psychoanalysis	None		Retrospective	Pregnancy only
McNaughton-Cassill et al. (2000)	68%	IVF P	None		Post only	In-house
Wischmann et al. (2001a, b, 2002)[a]	28.3–34.5%	P	Waiting list	RA	Pre–post	Both
Kemeter and Fiegl (1999)	Initial not given	P: mandatory interview	None		Post only	In-house
Pengelly et al. (1995)	64.3%	IVF P	None		Post only	In-house
Connolly et al. (1993)[a]	53.9%	consecutive IVF admission	RC	RA	Pre–post	Both
Liswood (1995)[a]	Initial not given	Adoption list or clinic	Support only	RA	Post only	Both
Bents (1991)	Initial not given	P	None		Wait–pre–post	Both
Brandt and Zech (1991)	Initial not given	IVF P	None		Post only	Pregnancy only
Sarrel and deCherney (1985)[a]	Initial not given	P	RC	RA	Post only	Pregnancy only
Ellenberg and Koren (1982)	58.8%	P referred to psychiatry	P refused counselling		Post only	Pregnancy only
Bresnick and Taymor (1979); Bresnick, 1981)	50%	P	None		Retrospective	In-house
Focussed educational programmes						
Tuschen-Caffier et al. (1999)[a]	Initial not given	P in andrology clinic	Matched		Pre–post	Both
McQueeney et al. (1997)	81%	I from community	P could not attend		Pre–post	Both
Stewart et al. (1992)[a]	86.5%	P	Wait list		Pre–post	Both
Takefman et al. (1990)[a]	41.9%	P in diagnosis stage	RC	RA	Pre–post	Both
Wallace (1984, 1985)	Initial not given	P at laparoscopy	RC	RA	Pre–post	Both
O'Moore et al. (1983)	Initial not given	P	Fertile people		Pre–post	Both
Comprehensive educational programmes						
Domar et al. (2000a, b)[a]	39.7–83.4%	I from community	RC or support only	RA	Pre–post	Both
Domar et al. (1990)	Initial not given	I from community	None		Pre–post	Both
Domar et al. (1992)	78.8%	I from community	None		Pre–post	Both
Clark et al. (1995, 1998)	60%	Obese P	P dropped out of study		Pre–post	Both

Note. I = Infertile; P = Patient; RC = Routine Care; RA = Random assignment.
[a] Studies identified as 'good quality' (see text).

& Pook, 1999; Stewart et al., 1992). The findings of the review were reported in terms of the overall sample of 25 studies and again when only considering the findings of these 11 studies.

The findings

Tables 3–5 present the results extracted from the studies selected. It was not possible to present results in

Table 3
Intervention effects on negative affect

Studies	Depression			Anxiety		Psychiatric morbidity		
	BDI	HAD/HRSD	POMS	STAI	POMS	GHQ	BSI	MHI
Counselling								
Holzle et al. (2002)							□	
Strauss et al. (2002)[a]							□	
Emery et al. (2001)[a]	□			□				
Christie and Morgan (2000)								
McNaughton-Cassill et al. (2000)								
Wischmann et al. (2001a, b, 2002)[a]							□	
Kemeter and Fiegl (1999)								
Pengelly et al. (1995)								
Connolly et al. (1993)[a]			□	□	□	□		
Liswood (1995)[a]							□	
Bents (1991)								■
Brandt and Zech (1991)								
Sarrel and deCherney (1985)[a]								
Ellenberg and Koren (1982)								
Bresnick and Taymor (1979); Bresnick (1981)								
Focussed educational programmes								
Tuschen-Caffier et al. (1999)[a]								
McQueeney et al. (1997)	■							■
Stewart et al. (1992)[a]	■	■					■	
Takefman et al. (1990)[a]	□			□				
Wallace (1984, 1985)[a]			□	■	□			
O'Moore et al. (1983)				■				
Comprehensive educational programmes								
Domar et al. (2000a, b)[a]	□	□	□	■	■			
Domar et al. (1990)			■	■	■			
Domar et al. (1992)			□	■	■			
Clark et al. (1995, 1998)		■				■		

■ = positive intervention and □ = no intervention effect.
Note: BDI = Beck Depression Inventory; HAD = Hospital Anxiety and Depression Scale; HRSD = Hamilton Rating Scale for Depression; STAI = Spielberger State Anxiety Inventory; POMS = Profile of Mood Scale; GHQ = General Health Questionnaire; BSI = Brief Symptom Inventory or Symptom Checklist; MHI = Mental health Inventory.
[a] Studies identified as 'good quality' (see text).

terms of effect sizes, as is often the case in meta-analyses or systematic reviews because many of the studies did not provide sufficient statistical detail to be able to compute effect sizes.[1] The only exception was for pregnancy rates as all studies provided the number of people who achieved a pregnancy in intervention versus comparison groups (when used). Consequently, effect sizes were presented for pregnancy data. For the remaining variables the Tables show whether an outcome was assessed (i.e., presence of a square) and if it was, whether the outcome showed a positive intervention effect (i.e., filled square) or a non-significant intervention effect (i.e., unfilled square). Positive interventions were defined as significant pre-to-post comparisons and/or significant experimental versus control group comparisons which favoured interventions. In none of the studies was a negative intervention effect (i.e., deterioration) observed. Studies identified as better quality were indicated in these tables by the use of superscript 'a' beside the author name.

[1] Of the 25 studies, 68% failed to provide any information that could be used to calculate effect size for one or more outcomes. Even among those that provided information, certain assumptions would still have had to be made in calculating the effect size (e.g., assume a *p*-value level for results called 'not significant'). For these reasons it was felt that effect sizes would not be reliable. The only exception was for pregnancy rates where analyses could easily be re-computed from data provided by the authors.

Table 4
Intervention effects on non-affect measures

Studies	*Behavioural features*		*Infertility-specific measures*	
	Interpersonal functioning		Infertility distress	Target behaviour
	Marital	Social		
Counselling				
Holzle et al. (2002)	□			
Strauss et al. (2002)[a]	□		■	■
Emery et al. (2001)[a]				
Christieand Morgan (2000)				
McNaughton-Cassill et al. (2000)				■
Wischmann et al. (2001a, b, 2002)[a]	□		■	
Kemeter and Fiegl (1999)				
Pengelly et al. (1995)				■
Connolly et al. (1993)[a]	□	□		■
Liswood (1995)[a]	□	□		
Bents (1991)	■		■	
Brandt and Zech (1991)				
Sarrel and deCherney (1985)[a]				
Ellenberg and Koren (1982)				
Bresnick and Taymor (1979); Bresnick (1981)			■	
Focussed educational programmes				
Tuschen-Caffier et al. (1999)[a]	■			■
McQueeney et al. (1997)			■	■
Stewart et al. (1992)[a]				■
Takefman et al. (1990)[a]	□		■	
Wallace (1984, 1985)				■
O'Moore et al. (1983)				
Comprehensive educational programmes				
Domar et al. (2000a, b)[a]	■			■
Domar et al. (1990)				
Domar et al. (1992)				
Clark et al. (1995, 1998)				■

■ = positive intervention; □ no intervention effect.
[a] Studies identified as 'good quality' (see text).

Are psychosocial interventions beneficial to well-being?

A wide range of measures was used to assess the effect of psychosocial interventions on well-being and the findings depended to a certain extent on the outcome measure used.

Affect measures

As shown in Table 3, a total of 64% (16) of studies measured negative affect and these generated 35 analyses. Of the analyses, 48.6% (17) revealed positive intervention effects whereas the remainder was not significant. If only better quality studies were taken into account then 21 analyses were carried out across nine studies with six or 28.6% of analyses yielding positive intervention effects on negative affect.

As shown in Table 3 mixed results were obtained with anxiety and depression measures. The most commonly used affect measures were the Spielberger State Anxiety Inventory (STAI), Beck Depression Inventory (BDI) and the Profile of Mood Scales (POMS). Overall, positive effects were observed more frequently on measures of anxiety (8/13 analyses: 61.5%) than on measures of depression (5/13 analyses: 38.4%). In the seven studies that assessed both anxiety and depression, three studies found no effect on either measure (Connolly et al., 1993; Emery et al., 2001; Takefman et al., 1990) whilst one study found an effect on both outcomes (Domar et al., 1990). The remaining studies presented mixed results with respect to the two outcomes.

A handful of studies assessed psychiatric symptomatology. While infertile people are not considered at risk

Table 5
Intervention effects on pregnancy rates and effect sizes (*r*-statistic)

Studies	Pregnancy rate	Effect size (*r*)
Counselling		
Holzle et al. (2002)	Excluded	
Strauss et al. (2002)[a]	□	0.285
Emery et al. (2001)[a]	□	0.039
Christie & Morgan, 2000	Excluded	
McNaughton-Cassill et al. (2000)		
Wischmann et al. (2001a, b, 2002)[a]	□	0.016
Kemeter and Fiegl (1999)		
Pengelly et al. (1995)		
Connolly et al. (1993)[a]		
Liswood (1995)[a]		
Bents (1991)		
Brandt and Zech (1991)	Excluded	
Sarrel and deCherney (1985)[a]	■	0.506
Ellenberg and Koren (1982)	Excluded	
Bresnick and Taymor (1979); Bresnick (1981)		
Focussed educational programmes		
Tuschen-Caffier et al. (1999)[a]	■	0.928
McQueeney et al. (1997)	Excluded	
Stewart et al. (1992)[a]	□	0.177
Takefman et al. (1990)[a]	□	0.000
Wallace (1984, 1985)		
O'Moore et al. (1983)	Excluded	
Comprehensive educational programmes		
Domar et al. (2000a, b)[a]	■	0.258
Domar et al. (1990)		
Domar et al. (1992)		
Clark et al. (1995, 1998)	Excluded	

■ = positive intervention; □ no intervention effect. Excluded = studies which assessed pregnancy rate but which did not use an adequate control condition for ongoing treatment (see text).

[a] Studies identified as 'good quality' (see text).

for psychiatric conditions, some individuals may experience sufficient symptomatology to produce what can be considered clinically elevated levels of distress, especially on subscales of depression and anxiety (Berg & Wilson, 1990). The most frequently used psychiatric measure was the Brief Symptom Inventory (BSI) or its source the Symptom-Checklist (SCL-90). Again the review yielded inconsistent results with regard to these outcomes. No changes were reported on the BSI after conjoint cognitive behavioural therapy or infertility counselling (Connolly et al., 1993; Holzle et al., 2002; Liswood, 1995; Strauss et al., 2002). In contrast, Clark et al. (1995) found a significant decrease in General Health Scores (GHQ) after a 6 month weight reduction program and Stewart et al. (1992) found a decrease in some subscales of the BSI (i.e., depression, anxiety, hostility and obsessive compulsive symptoms) after a support group intervention that included stress management training. Wischmann et al. (2001a) found some changes in the BSI but only in the longer-term therapy program and primarily for women. Finally, Bents (1991) reported a decrease in psychiatric symptomatology following conjoint cognitive behavioural therapy.

Interpersonal measures

Overall the interventions generally failed to demonstrate consistent positive effects on interpersonal relationships (see Table 4). Nine studies (36% of studies) assessed interpersonal functioning and of the 11 analyses carried out few (27.3%, 3/11 analyses) were significant. Seven of the better quality studies assessed interpersonal functioning and of the nine analyses carried out 22.2% (2/9) generated positive intervention effects.

Several studies using infertility counselling reported no effect of their intervention on partner or relationship satisfaction (Connolly et al., 1993; Holzle et al., 2002; Wischmann et al., 2001a). Takefman et al. (1990) found their preparatory information intervention about the sexual and marital effects of infertility on marital variables to be of no benefit. Liswood (1995) found that conjoint cognitive behaviour therapy had no effect on various domains of marital relations including conflict resolution, cohesion, intimacy and affection, whereas Bents (1991) found an effect using the same type of intervention. Two other studies found significant effects on marital functioning and both used questionnaires specifically targeting marital domains known to be affected by infertility. Tuschen-Caffier et al. (1999) reported a significant decrease in marital distress after their 8-month sex therapy program with couples reporting more satisfaction with sexual activity. Domar et al. (2000b) found that marital distress, as measured by a nine-item questionnaire adapted for infertility, was significantly lower in the groups receiving a psychosocial intervention (e.g., relaxation training or group support) compared to those in the routine care control group.

Liswood (1995) examined the effect of conjoint cognitive-behaviour therapy on social adjustment. There was no difference between the experimental and control group in terms of role performance and the majority of couples showed healthy relationships with family and friends, workers and other members of the community. Connolly et al. (1993) asked patients undergoing IVF to rate the amount of support they were receiving from family and friends. The experimental group receiving infertility counselling did not differ from the no-intervention control group and both reported high levels of support from these sources.

Infertility specific-distress

A number of studies used outcome measures specifically tailored either to the intervention or to infertility. These universally produced positive intervention effects.

As shown in Table 4, six studies, 24%, used invalidated measures of infertility-specific distress. These questionnaires requested participants to either rate various reactions that were specific to infertility, for example, "feeling empty" or "defective" or to indicate the intensity of their desire for a child. The latter measure has been shown to be strongly related to poor adjustment among infertile women (Collins, Freeman, Boxer, & Tureck, 1992). Positive intervention effects were reported in all analyses using these types of measures whether generated by better quality studies or not. Specifically, a decrease in infertility-specific distress was reported after psychotherapy (Bresnick & Taymor, 1979), conjoint cognitive behavioural therapy (Bents, 1991), infertility counselling (Wischmann et al., 2001a; Strauss et al., 2002) and a preparatory information intervention (Takefman et al., 1990) whereas an increase in infertility-specific well-being was reported after coping training (McQueeney et al., 1997).

Target behaviour

Seven studies (28%) assessed their intervention in relation to some specific behaviour that was the target of the intervention. As shown in Table 4 a positive effect on the target behaviour was found in all studies whether of better quality or not. Tuschen-Caffier and colleagues (1999) used daily diaries to determine the effect of their sex therapy intervention on the occurrence of sexual intercourse during the fertile period of the menstrual cycle. They found that before sex therapy only 50% of couples were accurately scheduling intercourse during the fertile period whereas this percentage increased to 100% after the 8-month intervention. Wallace (1984) found that patients receiving preparatory information about a diagnostic test had a faster recovery and discharge rate than did patients not receiving this package. Clark et al. (1995) reported that after a 6-month weight-reduction program the intervention group showed significantly lower fat intake, a more varied dietary intake and more healthy eating habits than the control group of women not completing the intervention. Additionally, the former group also lost weight whereas the control group of women did not.

Several interventions specifically targeted coping behaviors and these too showed beneficial intervention effects. McQueeney et al. (1997) found that women trained in the use of emotion-focused coping strategies (e.g., distraction, emotional expression) and those trained in the use of problem-focused strategies (e.g., planning, information-gathering) used more of these strategies then did the control group of women who could not attend the training program. Stewart et al. (1992) reported a decrease in avoidance coping and an increase in active coping following a group intervention that included stress management techniques. Strauss et al. (2002) emphasised coping-oriented information in their counselling intervention and found improved coping in the counselling group relative to the waiting list controls. Finally, Domar et al. (2000b) found that women trained to use the relaxation response showed a more adaptive stress management style 6 months after the intervention than the routine care control group or social support control group not receiving this training.

Three studies used only Likert-type scales to assess the impact of counselling and these found that interventions were perceived to be "at least somewhat helpful" in enhancing knowledge and finding new ways of coping with infertility (McNaughton-Cassill et al., 2000; Pengelly, Inglis, & Cudmore, 1995). Additionally, Kemeter and Fiegl (1999) reported that 71% of men and 79% of women felt relieved following a two hour counselling intervention.

The effect of gender

Eleven studies carried out gender analyses and these generally showed that men and women benefited equally from counselling. The few differences found showed that women became less self-reproaching after autogenic training (O'Moore et al., 1983); showed a lower external locus of control after a cognitive behavioural intervention (Bents, 1991); experienced a decrease in depression after infertility counselling (Bents, 1991; Connolly et al., 1993); and reported more changes in emotional upheaval after psychotherapy (Bresnick & Taymor, 1979) compared to men. Additionally, Wischmann et al. (2001a) found that women reported less distress in a wider range of domains than did men. While these differences may point to the possibility that men may benefit less, the fact that such differences arose in only eight of 42 comparisons (i.e., 19.0% of analyses) suggested that they were likely to be spurious. Similar findings were obtained in better quality studies in that only two of nine studies showed gender differences.

Comment

Overall there was moderate support for beneficial effects of psychosocial interventions on the well-being of infertile people. Almost all interventions showed positive effects on at least one of the outcomes assessed and none of the studies reported a negative effect on well-being. The few studies that failed to show *any* positive intervention effects on any outcome measure were those where the assessment coincided with medical events which could have provoked such intense reactions that the beneficial effects of the intervention would have been

obscured (e.g., treatment failure, diagnosis) (i.e., Connolly et al., 1993; Emery et al., 2001; Takefman et al., 1990). The positive evaluations were consistent with favourable participant reports of the interventions (e.g., Liswood, 1995; Stewart et al., 1992).

Interventions were primarily effective in reducing negative affect rather than in changing more fixed characteristics of the person. That is, 48.6% of analyses on negative affect showed positive intervention effects compared to 27.3% of analyses on interpersonal functioning. Similar findings were obtained in better quality studies although affects were somewhat less pronounced for negative effect. Feelings of anxiety, tension and worry, especially those associated with infertility were almost always associated with positive change. In contrast, the way people related to their partners and other members of their social network was rarely affected by the interventions discussed here. Depression and psychiatric distress were not consistently affected by interventions even though both could be considered affect measures. However, the methods used to assess these constructs were designed to identify more chronic depressive and psychiatric features (e.g., appetite loss, suicidal ideation and withdrawal, see Bowling, 1997) and less change might be expected on trait rather than state measures.

That negative affect was the principle outcome affected by interventions was not surprising given that all interventions, whether counselling or educational, had as a primary goal the reduction of distress associated with infertility. Moreover, many educational interventions relied on techniques primarily designed to reduce negative affect, for example stress management or coping training. Indeed, 62.5% of positive affect studies used relaxation training as one of their therapeutic components.

Interventions were also more likely to produce positive effects on questionnaires designed to detect specific effects of infertility (i.e., infertility-specific distress and intervention targets) than on non-specific questionnaires that could be used in any context (e.g., Beck Depression Inventory). Two explanations can potentially account for discrepancies between specific and global assessments. First, as most of the specific infertility measures had not received extensive psychometric evaluation it was possible that significant effects on these measures were spurious or artefacts of poor psychometric construction. However, the consistency in positive effects across a range of infertility measures and a range of studies would argue against this possibility.

Second, it may be that the kinds of emotional and behavioural reactions infertile people experience were in fact confined to specific domains which were not properly addressed in general measures of functioning. For example, Tuschen-Caffier et al. (1999) found an effect on marital functioning whereas Takefman et al. (1990) did not. The sexual satisfaction measure used by Tuschen-Caffier et al. addressed motivation and satisfaction with "sexual relations during the fertile period" whereas the marital adjustment measure used by Takefman and colleagues requested an overall evaluation of "sexual relations with your partner". Research has shown that sexual problems encountered by infertile people are mainly restricted to problems with scheduled intercourse rather than to overall sexual satisfaction with the partner (McGrade & Tolor, 1981; Boivin, Takefman, Brender, & Tulandi, 1992).

Interestingly, men benefited as much from counselling as women did. This was somewhat unexpected since women are generally more interested in counselling and generally report more distress than men. Accordingly one might have expected that women would find the experience of counselling more useful. Lentner and Glazer (1991) provided some interesting data suggesting that while men and women both benefited from interventions they did so for different reasons. The majority of women found counselling useful because of the sense of belonging and validation of their reactions whereas most men felt support groups were good because of the practical information and advice they received. This finding was consistent with data from infertility telephone helplines that showed that men called more for practical or medical reasons compared to more emotional issues for women (Bartlam & McLeod, 2000).

Do psychosocial interventions increase pregnancy rates?

In total 15 studies investigated pregnancy as an outcome variable. However, all but one study (Clark et al., 1995) sampled individuals currently undergoing fertility treatment introducing the possibility that pregnancies were due to medical treatment rather than the psychosocial intervention. Consequently, in this section only the better quality studies assessing impact on pregnancy ($n = 8$ of 11 studies) and using a control group were examined.[2] As shown in Table 5, three studies showed a positive intervention effect on pregnancy whereas five studies showed no intervention effect. Domar et al. (2000a) also reported that the time to pregnancy was faster in the intervention group using the BMPI program than in the control groups. The cumulative pregnancy rate in positive effects studies ranged from 30% to 60% with an average of 48.3%. In contrast, the cumulative pregnancy rate in the no-effect studies ranged from 15% to 40% with an average of 24.7%. The cumulative pregnancy rate reported for the positive effects studies was approximately similar to the

[2] Three of the 11 good quality studies did not assess pregnancy rates.

cumulative pregnancy rate following five consecutive IVF cycles (Stolwijk, Wetzels, & Braat, 2000) or 6 months of unprotected sexual intercourse in fertile couples (van Balen, Verdurmen, & Ketting, 1997).

Table 5 also shows effect sizes (i.e., *r*-statistic) for each of the comparisons on pregnancy rates. For each study a chi-square statistic was computed to compare pregnancy rate between intervention and comparison groups. The chi-square statistic was then converted to the *r*-statistic according to the method described by Rosenthal, Rosnow, and Rubin (2000). Because the effect size gives the strength of the intervention effect independent of sample size, effect sizes can be compared across studies. As with any other correlation, higher values indicated a stronger effect with correlations of 0.30 and above indicating moderate effects (Rosenthal et al., 2000). The average effect size across positive effect studies was $r = 0.564$ whereas it was $r = 0.103$ for no effect studies.

The positive and no effect studies did not markedly differ with regard to participant characteristics that might influence pregnancy rates. Participants were in their early 30s, had been infertile for less than 6 years, and represented a range of medical diagnoses.

Comment

Numerous infertility studies claim to show that stress or other negative psychosocial factors can reduce fertility potential and/or block pregnancy in humans. For example, increased distress prior to or during in vitro fertilisation has been associated with a poorer biological response and/or a reduced pregnancy rate (e.g., Smeenk et al., 2001; Boivin & Takefman, 1995). On the basis of such findings psychosocial interventions have frequently been promoted as an indirect way of increasing pregnancy rates (see for example, Domar & Dreher, 1996). However, on the basis of the evidence examined in this section one cannot confidently conclude that psychosocial interventions increased pregnancy rates among participating couples. Only three of eight good quality studies showed higher pregnancy rates in the group receiving psychosocial interventions compared to the group receiving routine care. In light of this scant evidence it seems clear that more research needs to be devoted to the systematic evaluation of pregnancy effects before psychosocial interventions can be recommended as a way of helping couples improve their chances of achieving a pregnancy.

Are some interventions more effective than others?

The original intention in this section was to compare individual interventions. However, this was not possible because too few replications of the same intervention (e.g., coping training, sex therapy) existed and in fact, only one intervention was evaluated more than once on independent samples (i.e., Domar et al., 1990, mind/body program). As a result of the limited replications, this question addressed the broader intervention categories, that is, counselling versus educational interventions. Focussed and comprehensive educational interventions were combined to increase the sample size in the educational category.[3]

The measure of effectiveness was operationalised as the percentage of positive changes produced by a given intervention, that is, the number of analyses yielding significant positive intervention effects as a function of all analyses carried out in the study. Only studies that assessed at least two outcomes were therefore included (i.e., 68% of studies). In this dataset positive change ranged from zero to 100% with an average of 54.7% (SD = 36.0).

The counselling and educational interventions were compared with respect to the percent of positive change as well as other intervention and methodological characteristics. The final sample for these analyses was 17 studies ($n = 7$ counselling, $n = 10$ educational). Comparison tests and effect sizes in Table 6 showed that, on average, counselling interventions yielded significantly fewer positive changes than did educational interventions. Specifically, 30% of analyses in counselling interventions yielded positive intervention effects versus about 70% in educational interventions. Counselling interventions were of a shorter duration and also had a shorter follow-up period compared to educational interventions. It was also noteworthy that 100% of counselling interventions were delivered to couples and 70% of educational interventions were delivered to groups. Hence one could say that the analyses produced in this section were comparing couple counselling to group educational interventions.

In terms of methodological characteristics, counselling interventions had a greater sample size in the intervention group than did the educational programmes but this was because counselling included couples rather than individuals, therefore doubling sample size. Finally, there was no difference between counselling and educational studies in terms of the percentage of studies that used a control group (i.e., routine care, wait-list or support-only) and consequently could be classified as being better quality.

The results of the comparison tests revealed that while educational interventions produced more positive changes, this effect could be due to the other factors differentiating the two types of counselling. In order to isolate the source(s) of positive changes, a multiple

[3] Results were the same whether the educational categories were considered together or separately.

Table 6
Summary statistics for comparisons between counselling and educational interventions

Variable	Type of intervention		Values	dfs	Effect size
	Counselling	Educational	t or χ^2		
	($n = 7$)	($n = 10$)			
Outcome					
Percent positive change (No. of positive analyses/all analyses in study)	29.8% ± 0.34	71.7% ± 0.27	$t = 2.88$ **	15	0.598
Intervention characteristics					
Duration of intervention (no. weeks)	6.71 ± 4.5	12.30 ± 9.0	$t = 1.50$	15	0.361
Duration of follow-up period (no. months)	2.42 ± 1.5	6.95 ± 5.5	$t = 2.08^{t}$	15	0.474
Format[a]	100% couple	70% group	—		
Study characteristics					
Sample size[b]	83.71 ± 83.1	37.30 ± 17.1	$t = 1.74$	15	0.322
Percent of studies using a control group	71.4%	50%	$\chi^2 = 0.78$	1	0.006

**$p < 0.01$; $^{t}p < 0.10$; dfs = degrees of freedom.
[a] A chi-square could not be computed because all counselling interventions used a couple format.
[b] The large standard deviation for counselling is due to the large sample size ($n = 268$) for Wischmann et al. (2002). Without this study average sample size would be 53.00 ± 19.13, effect size = 0.330.

regression analysis was computed. The analytic strategy consisted of entering all the characteristics that differentiated the groups (i.e., type, duration, follow-up) on the same step of the regression analysis predicting positive change. Format and sample size were not included because they were confounded with type of intervention. In this type of regression the semi-partial correlation-squared (sr^2) indicated the proportion of variance in positive change explained by each characteristic once the influence of other characteristics had been taken into account, that is, the percent of variance that could be explained by that and only that characteristic. In this analysis the participant-to-variable ratio was at the accepted minimum limit for regression analysis, that is, 5:1 (Tabachnick & Fidell, 1989).

The overall equation was significant ($F(3, 13) = 7.88$, $p < 0.01$) accounting for 56% of the variance in positive change (the R^2 adjusted for small sample size is reported). The results showed that positive change was associated with all three variables: type ($sr^2 = 8.6\%$, $p < 0.10$), duration of intervention ($sr^2 = 13.0\%$, $p < 0.05$) and length of follow-up period ($sr^2 = 9.1\%$, $p < 0.10$). Positive change was associated with educational interventions, interventions of a longer duration and studies that used a longer follow-up period. Together these variables accounted for 30.7% of the variance in positive change showing that the remaining explained variance, about 25%, was shared among the different predictors.

Comment

The analyses in this section showed that educational interventions were more effective than counselling interventions and that this advantage remained after controlling for differences with respect to other intervention and methodological features. Educational interventions produced twice as many positive changes across a broad range of measures including negative affect, interpersonal functioning, pregnancy and other infertility-specific domains. As can be seen from Table 1, the counselling and educational categories included many different types of interventions. For example, coping training, sex therapy, preparatory information and relaxation training. As a result it would be impossible to identify precisely which ingredient in the educational interventions made them more effective relative to their counselling counterpart. Nevertheless, there were some common ingredients linking the different interventions within each broad class (i.e., counselling, educational) that might explain the differences in outcome between the broad classes.

The main feature distinguishing these two types of interventions was the therapeutic method used to reduce infertility distress. As noted previously, counselling sessions had a greater emphasis on emotional expression and discussion of thoughts and feelings related to infertility whereas educational programs focused on providing information and new skills. While emotional

expression and support were also important to some educational interventions they were not the main or only focus of sessions and were typically embedded in other activities and learning opportunities. Additionally, counselling was generally non-directive in that couples were expected to initiate topics for discussion and decide the number of sessions to attend whereas educational interventions were structured with a predetermined number of meetings, directed discussions or specific goals for each session.

There was some evidence to show that these differences were important in explaining the relative advantage of educational programmes. Numerous studies showed directly or indirectly that one of the more important outcomes of interventions, from the participants' perspective, was the opportunity to increase medical knowledge (Bartlam & Mcleod, 2000; Liswood, 1995; McNaughton-Cassill et al., 2000; Pengelly et al., 1995). Goodman and Rothman (1984) proposed that a primary focus on medical issues could occur because these issues are easier to talk about than emotional issues. However, in two evaluations of anonymous telephone counselling services more than two thirds of calls were about medical issues (Bartlam & McLeod, 2000; van Balen, Verdurmen, & Ketting, 2001) and only 21% of calls requesting medical information "hid" an emotional problem which eventually surfaced during the telephone exchange (van Balen et al., 2001). There was also support for the skills training. Schuth, Keck, Vogelgesang, and Breckwoldt (1999) reported that after a structured psychosocial intervention lasting two consecutive days about 65% of couples reported that coping training had been an important component of the intervention whereas only 9% of people reported that reflecting on the emotional aspects of infertility had been useful. Several other studies also reported that learning how to cope with infertility was a key determinant of participant satisfaction with the intervention (Holzle et al., 2002; McNaughton-Cassill et al., 2000).

The two different categories of interventions were also confounded with format in that the majority of educational interventions were carried out in a group format whereas all the counselling interventions were carried out in the couple format. The group format per se may have separate independent effects on positive change although this effect could not be evaluated. The group format may be beneficial for a number of reasons. First, no one can better understand your experiences than people having similar problems. Whilst counsellors can reassure people that their reactions are 'normal' and justified, such reassurance is often more readily accepted when it comes from the stories told by other infertile people (Shapiro, 1999). Indeed, several studies have reported that the main benefits of support group interventions were perceived to be the common experience and the exchange or sharing with other infertile people (Lentner & Glazer, 1991; Schuth et al., 1999). Second, a common coping strategy among infertile people is downward comparison (Stanton, 1992). In this type of strategy people make themselves feel better by seeing their problem as being not as bad as the problems of other infertile people. For example, by perceiving their fertility problem as being more treatable or their distress as being lower, than that of others with the same condition. By using this strategy people find the experience of infertility less threatening (Stanton, 1992). Insofar as group members shared medical and treatment experiences, this format afforded more opportunity to use this type of coping strategy as well as increase their medical knowledge.

Measurement issues might also account for the fewer positive changes observed in counselling interventions. Despite the lack of gains on standardised questionnaires, ratings of counselling and qualitative data from other studies (e.g., Goodman & Rothman, 1984; Pengelly et al., 1995) showed that counselling was perceived as having been helpful (e.g., Liswood, 1995; Stewart et al., 1992). In light of such positive evaluations it may be that the assessment methods used in counselling studies were not sensitive to the types of changes produced by such interventions. One problem noted earlier was the use of global rather than infertility-specific measures. Additionally, the effects of counselling might be too diffuse to capture on general questionnaires. For example, Lentner and Glazer (1991) found that people participating in support interventions commonly reported an increase in the 'sense of belonging' and the 'strength to go on'. These outcomes are much more difficult to operationalise and therefore assess than are, for example, the acquisition of relaxation techniques (Domar et al., 1990) or an increase in intercourse frequency during the fertile period (Tuschen-Caffier et al., 1999).

Another intervention feature showing independent and significant effects on positive change was duration of the intervention. Recall that duration reflected the number of sessions that people used. A longer intervention period could have permitted more time for therapeutic gains to be consolidated and emerge. The finding that educational interventions lasted longer than did counselling interventions may also have contributed to greater positive effects noted in the former studies. On average participants took up less than 5 sessions of counselling even though the number was theoretically unlimited (Bresnick, 1981; McNaughton-Cassill et al., 2000; Pengelly et al., 1995; Strauss et al., 2002). This was in contrast to educational interventions where participation rates were above 70% even when the interventions lasted up to 6 or 8 months (Clark et al., 1995; Tuschen-Caffier et al., 1999; O'Moore et al., 1983; McQueeney et al., 1997). However, it should be noted that people

who are more motivated to change might also be more likely to attend more sessions.

Recommendations for future research

The main way to advance research in this area would be to carry out well-controlled studies that would evaluate the effectiveness of the intervention features identified in this review as being potentially effective. The review suggested that the more successful interventions lasted between 6 and 12 weeks with a follow-up period of at least 6 months and had a strong educational and skills training component and/or group format which emphasised medical knowledge and acquisition of stress management and coping techniques. Moreover, negative affect was more likely to be affected by interventions than interpersonal functioning and/or pregnancy rate. Future research would need to evaluate not only interventions with these specific components but also determine with whom such interventions would be most effective. The latter would be especially important as most studies reviewed were carried out with couples in treatment that were functioning well psychologically. While counselling was found to be associated with fewer positive changes, future research may find it effective with some sub-groups. Indeed one study found that counselling was useful but only among highly distressed patients (Holzle et al., 2002) and these individuals might be better targets for this type of intervention as has been proposed previously (Boivin, Scanlan, & Walker, 1999).

It would be imperative for future studies to adopt more rigorous experimental methods to evaluate the effectiveness of their interventions (see for example Khan et al., 2001; Sackett et al., 2000). To achieve reasonable power in a two-group design (i.e., intervention, control) the recommended sample size is 64 participants per group (Cohen, 1992), which is far larger than the sample size achieved in most studies. In evaluation studies participants should be randomly selected from the pool of potential participants and be randomly assigned to intervention or control conditions. When randomisation is not possible because of practical (e.g., refusal) and/or ethical concerns (e.g., the *offer* of counselling mandatory in a particular country) then the control group could be individuals from the population who completed assessments but were not invited to participate in the study (i.e., cohort comparison). Alternatively, participants could be randomly assigned to different types of interventions. This strategy would not only overcome ethical concerns but would also help to identify the specific features that make interventions effective. At a minimum, effectiveness studies also need to describe the intervention and the methods of assessment to be used. Sufficient methodological and statistical detail (i.e., effect sizes) should be provided for replication and inclusion in further reviews and meta-analyses.

Finally, the design and measures need to be selected according to the goals of the intervention. If diffuse gains are expected then a qualitative methodology might be most appropriate; if change in long-standing behavioural patterns are expected then longitudinal designs with multiple assessments over a longer period of time (i.e., >6 months) should be used, for interventions targeted to more transient or reactive aspects of functioning more frequent assessments spaced closer in time may be required. In all cases, assessments should ideally take place before the intervention to determine baseline levels of functioning and ensure that intervention and control groups were similar before implementation of the intervention. The measures selected should be able to detect the kinds of changes anticipated from the intervention and have satisfactory psychometric properties. For example, in-house infertility-specific measures of distress were often used when existing validated measures were available (see for example Bernstein, Potts, & Mattox, 1985; Boivin & Takefman, 1995; Glover, Hunter, Richards, Katz, & Abel, 1999; Newton, Sherrard, & Glavac, 1999). Taking such experimental issues into account in designing intervention studies would hopefully improve the overall quality of the evaluation and increase the reliability and validity of the evidence base for psychosocial interventions in infertility.

Conclusion

Thirty years of research has produced 25 independent studies evaluating psychosocial interventions for infertile people and of these, only eight met minimum requirements for good quality studies. The analyses carried out in this review have revealed the limited nature of this evidence base. Despite the lack of sound evaluation, the same time period saw the publication of almost 400 papers strongly recommending psychosocial interventions. Therefore, the main take home message from this review, as stated by one anonymous reviewer of this paper, is that we need high quality studies in order to address the effectiveness of psychosocial interventions unequivocally. It is hoped that the findings of this review will increase the quality of future evaluations and, in the interim, encourage a more cautious approach to recommendations. The aim of future research should now be to answer the "who", "what" and "when" questions—who benefits from interventions, using what kinds of interventions, and delivered when? Answering such questions using controlled methodology will produce more effective

psychosocial interventions for infertile people undergoing treatment.

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References

Bartlam, B., & McLeod, J. (2000). Infertility counselling: The ISSUE experience of setting up a telephone counselling service. *Patient Education and Counseling*, *41*, 313–321.

Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.

Bents, H. (1991). Verhaltenstherapeutische Paartherapie bei Kinderwunschpatienten [Behavioral couple therapy for patients with infertility]. *Jahrbuch fur Medizinische Psychologie*, *5*, 144–155.

Berg, B. J., & Wilson, J. F. (1990). Psychiatric morbidity in the infertile population: A reconceptualization. *Fertility and Sterility*, *53*, 1654–1661.

Bernstein, J., Potts, N., & Mattox, J. (1985). Assessment of psychological dysfunction associated with infertility. *Journal of Obstetrics, Gynaecological and Neonatal Nursing, (supplement)*, 63–65.

Boivin, J., & Kentenich, H. (2002). *ESHRE monographs: Guidelines for counselling in infertility*. London: Oxford University Press.

Boivin, J., Scanlan, L. C., & Walker, S. M. (1999). Why are infertile patients not using psychosocial counselling? *Human Reproduction*, *14*, 1384–1391.

Boivin, J., & Takefman, J. E. (1995). Stress levels across stages of in vitro fertilization in subsequently pregnant and nonpregnant women. *Fertility and Sterility*, *64*, 802–810.

Boivin, J., Takefman, J. E., Brender, W., & Tulandi, T. (1992). The effects of female sexual response in coitus on early reproductive processes. *Journal of Behavioral Medicine*, *15*, 509–517.

Bowling, A. (1997). *Measuring health: A review of quality of life measurement scales* (2nd ed.). Buckingham: Open University Press.

Brandt, K. H., & Zech, H. (1991). Auswirkungen von Kurzzeitpsychotherapie auf den Erfolg in einem in-vitro-Fertilisierung. [effects of short-term psychotherapy on the success of an in vitro fertilization/embryo transfer program]. *Wiener Medizinische Wochenschrift*, *141*, 17–19.

Bresnick, E. (1981). A holistic approach to the treatment of the crisis of infertility. *Journal of Marital and Family Therapy*, *7*, 181–188.

Bresnick, E., & Taymor, M. L. (1979). The role of counselling in infertility. *Fertility and Sterility*, *32*, 154–156.

Bruhat, M. A. (1992). Recommendations of the French College of Obstetricians and Gynaecologists of the diagnosis, treatment, cost and results of the treatment of infertility health services. *Human Reproduction*, *7*, 1335–1337.

Christie, G., & Morgan, A. (2000). Individual and group psychotherapy with infertile couples. *International Journal of Group Psychotherapy*, *50*, 237–250.

Clark, A. M., Ledger, W., Galletley, C., Tomlinson, L., Blaney, F., Wang, X., & Norman, R. J. (1995). Weight loss results in significant improvement in pregnancy and ovulation rates in anovulatory obese women. *Human Reproduction*, *10*, 2705–2712.

Clark, A. M., Thornley, B., Tomlinson, L., Galletley, C., & Norman, R. J. (1998). Weight loss in obese infertile women results in improvement in reproductive outcome for all forms of fertility treatment. *Human Reproduction*, *13*, 1502–1505.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159.

Collins, A., Freeman, E. W., Boxer, A. S., & Tureck, R. (1992). Perceptions of infertility and treatment stress in females as compared with males entering in vitro fertilization treatment. *Fertility and Sterility*, *57*, 350–356.

Connolly, K. J., Edelmann, R. J., Bartlett, H., Cooke, I. D., Lenton, E., & Pike, S. (1993). An evaluation of counselling for couples undergoing treatment for in-vitro fertilization. *Human Reproduction*, *8*, 1332–1338.

Domar, A. D., Clapp, D., Slawsby, E. A., Dusek, J., Kessel, B., & Freizinger, M. (2000a). Impact of group psychological interventions on pregnancy rates in infertile women. *Fertility and Sterility*, *73*, 805–811.

Domar, A. D., Clapp, D., Slawsby, E., Kessel, B., Orav, J., & Freizinger, M. (2000b). The impact of group psychological interventions on distress in infertile women. *Health Psychology*, *19*, 568–575.

Domar, A. D., & Dreher, H. (1996). *Healing mind, healthy woman: Using the mind/body connection to manage stress and take control of your life*. New York: Henry Colt.

Domar, A. D., Seibel, M., & Benson, H. (1990). The mind/body program for infertility: A new behavioral treatment approach for women with infertility. *Fertility and Sterility*, *53*, 246–249.

Domar, A. D., Zuttermeister, P. C., Seibel, M., & Benson, H. (1992). Psychological improvement in infertile women after behavioural treatment: A replication. *Fertility and Sterility*, *58*, 144–147.

Ellenberg, J., & Koren, Z. (1982). Infertility and depression. *International Journal of Fertility*, *27*, 219–223.

Emery, M., Beran, M.-D., Darwish, J., Oppizzi, L., Joris, V., Capel, R., Guex, P., & Germond, M. (2001). Does counselling prior to IVF affect anxiety and depression scores? Preliminary results of a randomised control trial. Paper presented at the 17th Annual Meeting of the European Society for Human Reproduction and Embryology. *Human Reproduction*, *16*, 201.

Glover, L., Hunter, M., Richards, J.-M., Katz, M., & Abel, P. D. (1999). Development of the fertility adjustment scale. *Fertility and Sterility*, *72*, 623–628.

Goodman, K., & Rothman, B. (1984). Group work in infertility treatment. *Social Work with Groups*, *7*, 79–97.

Hammer-Burns, L., & Covington, S. N. (Eds.). (1999). *Infertility counselling: A comprehensive handbook for clinicians*. New York: The Parthenon Publishing Group.

Holzle, C., Brandt, U., Lutkenhaus, R., & Wirtz, M. (2002). Solution-focused counselling for involuntarily childless couples. In B. Strauss (Ed.), *Involuntary childlessness: Psychological assessment, counselling and psychotherapy* (pp. 105–126). Seattle: Hogrefe & Huber Publishers.

Human Fertilisation and Embryology Authority. (1995). *Code of Practice* (2nd revision). London: Human Fertilisation and Embryology Authority.

Kemeter, P., & Fiegl, J. (1999). Das psychosomatisch orientierte Gespräch im Rahmen der Sterilitätsbehandlung: Eine Quantifizierung der Gesprächsschwerpunkte und der therapeutischen Strategien. [Psychosomatically oriented counselling in relation to infertility treatment: A quantification of the main topics in the interviews and therapeutic strategies]. *Journal fur Fertilitat und Reproduktion*, *9*, 23–31.

Khan, K. S., Riet, G., Popay, J., Nixon, J., & Kleijnen, J. (2001). Study quality assessment. In: K. S. Khan, G. Riet, J. Glanville, A. J. Sowden, & J. Kleijnen (Eds.). *Undertaking systematic reviews of research on effectiveness: CRD's guidance for those carrying out or commissioning reviews.* CRD Report number 4 (2nd ed.) (pp. 1–20). New York: NHS Centre for Reviews and Dissemination.

Laffont, I., & Edelmann, R. J. (1994). Perceived support and counselling needs in relation to in vitro fertilization. *Journal of Psychosomatic Obstetrics and Gynecology*, *15*, 183–188.

Lentner, E., & Glazer, G. (1991). Infertile couples perceptions of infertility support-group participation. *Health Care for Women International*, *12*, 317–330.

Liswood, M. P. (1995). Treating the crisis of infertility: A cognitive-behavioural approach (Doctoral dissertation, University of Toronto, 1995). *Dissertation Abstracts International Section A: Humanities and Social Sciences, 55,* (12-A), 4006.

McGrade, J. J., & Tolor, A. (1981). The reaction to infertility and the infertility investigation: A comparison of the responses of men and women. *Infertility*, *4*, 7–27.

McNaughton-Cassill, M. E., Bostwick, M., Vanscoy S, E., Arthur, N. J., Hickman, T. N., Robinson, R. D., & Neal, G. S. (2000). Development of brief stress management support groups for couples undergoing in vitro fertilization treatment. *Fertility and Sterility*, *74*, 87–93.

McQueeney, D., Stanton, A., & Sigmon, S. (1997). Efficacy of emotion-focused and problem-focused group therapies for women with fertility problems. *Journal of Behavioural Medicine*, *20*, 313–331.

Menning, B. E. (1980). The emotional needs of infertile couples. *Fertility and Sterility*, *34*, 313–319.

Newton, C. R., Sherrard, W., & Glavac, I. (1999). The fertility problem inventory: Measuring perceived infertility distress. *Fertility and Sterility*, *72*, 54–62.

O'Moore, A. M., O'Moore, R. R., Harrison, R. F., Murphy, G., & Carruthers, M. E. (1983). Psychosomatic aspects in idiopathic infertility: Effects of treatment with autogenic training. *Journal of Psychosomatic Research*, *27*, 145–151.

Pengelly, P., Inglis, M., & Cudmore, L. (1995). Couples' experiences and the use of counselling in treatment centres. *Psychodynamic Counselling*, *1*, 507–524.

Rosenthal, R., Rosnow, R. L., & &Rubin, D. B. (2000). *Contrasts and effect sizes in behavioral research: A correlational approach*. Cambridge: Cambridge University Press.

Sackett, D., Straus, S. E., Richardson, W. S., Rosenberg, W., & &Haynes, R. B. (2000). *Evidence-based medicine: how to practice and teach EBM* (2nd ed.). Edinburgh: Churchill Livingstone.

Sarrel, P. M., & DeCherney, A. H. (1985). Psychotherapeutic intervention for treatment of couples with secondary infertility. *Fertility and Sterility*, *43*, 897–900.

Schuth, W., Keck, C., Vogelgesang, D., & Breckwoldt, M. (1999). Psychosoziale Bewältigung der ungewollten Kinderlosigkeit: Konzept, Inhalte und Evaluation von 27 Wochenendseminaren mit 288 sterilen Paaren. [Psychosocial coping with unwanted sterility: Concept, contents and evaluation of 27 weekend seminars with 288 sterile couples]. *Geburtshilfe and Frauenheilkunde*, *59*, 225–231.

Shapiro, C. H. (1999). Group Counseling. In L. Hammer Burns, & S. N. Covington (Eds.), *Infertility counselling: A comprehensive handbook for clinicians*. New York: The Parthenon Publishing Group.

Smeenk, J. M. J., Verhaak, C. M., Eugster, A., van Minnen, A., Zielhuis, G. A., & Braat, D. D. M. (2001). The effect of anxiety and depression on the outcome of in vitro fertilisation. *Human Reproduction*, *16*, 1420–1423.

Stanton, A. L. (1992). Downward comparison in infertile couples. *Basic and Applied Social Psychology*, *13*, 389–403.

Stewart, D. E., Boydell, K. M., McCarthy, K., Swerdlyk, S., Redmond, C., & Cohrs, W. (1992). A prospective study of the effectiveness of brief professionally led support groups for infertility patients. *International Journal of Psychiatry in Medicine*, *22*, 173–182.

Stolwijk, A. M., Wetzels, A. M. M., & Braat, D. D. M. (2000). Cumulative probability of achieving an ongoing pregnancy after in vitro fertilisation and intracytoplasmic sperm injection according to woman's age, subfertility diagnosis and primary or secondary infertility. *Human Reproduction*, *15*, 203–209.

Strauss, B., Hepp, . U., Stading, G., & Mettler, L. (2002). Focal counselling for women and couples with an unfulfilled desire for a child: a three-step model. In B. Strauss (Ed.), *Involuntary Childlessness: Psychological assessment, counselling and psychotherapy* (pp. 79–104). Seattle: Hogrefe & Huber Publishers.

Stray Pedersen, B., & Stray Pedersen, S. (1984). Etiologic factors and subsequent reproductive performance in 195 couples with a prior history of habitual abortion. *American Journal of Obstetrics and Gynecology*, *148*, 140–146.

Sundby, J., Olsen, A., & Schei, B. (1994). Quality of care for infertility patients. An evaluation of a plan for a hospital investigation. *Scandinavian Journal of Social Medicine*, *22*, 139–144.

Tabachnick, B. G., & Fidell, L. S. (1989). *Using multivariate statistics* (2nd ed.). New York: Harper Row.

Takefman, J. E., Brender, W., Boivin, J., & Tulandi, T. (1990). Sexual and emotional adjustment of couples undergoing infertility investigation and the effectiveness of preparatory information. *Journal of Psychosomatic Obstetrics and Gynaecology*, *11*, 275–290.

Tuschen-Caffier, B., Florin, I., Krause, W., & Pook, M. (1999). Cognitive-behavioural therapy for idiopathic infertile couples. *Psychotherapy and Psychosomatics*, *68*, 15–21.

van Balen, F., Verdurmen, J., & Ketting, E. (1997). Age, the desire to have a child and the cumulative pregnancy rate. *Human Reproduction*, *12*, 623–627.

van Balen, F., Verdurmen, J. E. E., & Ketting, E. (2001). Assessment of a telephone helpline on infertility provided by a patient association. *Patient Education and Counselling*, *42*, 289–293.

Wallace, L. M. (1984). Psychological preparation as a method of reducing the stress of surgery. *Journal of Human Stress*, *10*, 62–77.

Wallace, L. M. (1985). Psychological adjustment to and recovery from laparoscopic sterilization and infertility investigation. *Journal of Psychosomatic Research*, *29*, 507–518.

Wischmann, T., Stammer, H., Scherg, H., Gerhard, I., Strowitzki, T., &Verres, R. (2001a). Evaluation of the psychological effects of counselling and couple-therapy with infertile couples. Paper presented at the 17th Annual Meeting of the European Society for Human Reproduction and Embryology. *Human Reproduction, 16*, 198.

Wischmann, T., Stammer, H., Scherg, H., Gerhard, I., & Verres, R. (2001b). Psychosocial characteristics of infertile couples: A study by the 'Heidelberg fertility consultation service'. *Human Reproduction*, *16*, 1753–1761.

Wischmann, T., Stammer, H., Scherg, H., Gerhard, I., & Verres, R. (2002). Couple counselling and therapy for the unfulfilled desire for a child: The two-step approach of the ''Heidelberg Infertility Consultation''. In B. Strauss (Ed.), *Involuntary childlessness: Psychological assessment, counselling and psychotherapy* (pp. 127–150). Seattle: Hogrefe & Huber Publishers.