Psychosocial predictors of IVF success after one year: A follow-up study.

Abstract

Objectives: There is growing evidence that psychosocial factors play an important role in the success of in vitro fertilisation (IVF). The current study explored the impact of coping style, social support, self-compassion, parenthood motivation, and relationship attachment as predictors of IVF success.

Design: A follow-up survey of 305 women undergoing IVF who had initially been assessed one year earlier (Cassidy & McLaughlin, 2016).

Methods: Participants were assessed on measures of coping style, social support, self-compassion, parenthood motivation, relationship attachment, and psychological distress and reassessed one year later in terms of the outcome of IVF.

Results: Of these 156 reported successful births while 149 had been unsuccessful. Of the 149 who had been unsuccessful 66 were undertaking another cycle of IVF and 83 were not, although whether they had completely given up is not known. The significant positive predictors were, problem focused coping, mindfulness, nurturance motivation, secure attachment, support from friends, and self-kindness. In addition, social pressure motivation, and avoidance coping were negative predictors.

Conclusions: The findings point to potential psychological interventions in terms of stress management, couple counselling, and mindfulness therapy in increasing the likelihood of success from IVF.

Key words: In vitro fertilisation; self compassion; social support; coping; attachment; infertility

Psychosocial predictors of IVF success: A one year follow-up study.

Introduction

Infertility causes distress and distress levels are increased during IVF (Pasch, et al., 2012; Verhaak, et al., 2007). Fear of failure is one cause for elevated distress levels but there are arguably other sources. IVF procedures are invasive, time consuming and disruptive (Bouwmans, et al., 2008), and puts additional demands on relationships (Mindes, Ingram, & Covington, 2005), often leading to break-up thereby reducing the support that is necessary to cope with the procedure (Kjaer, et al., 2014).

A key area of debate is whether distress impacts on the success of IVF (Pasch, et al., 2012). In a meta-analysis of 14 studies with 3583 infertile women (Boivin, Griffiths, & Venetis, 2011) concluded "pre-treatment emotional distress was not associated with treatment outcome (p. 1) however, none of the studies measured distress during IVF. Other studies demonstrate significant links between stress and IVF failure (Czemiczky, Landgren, & Collins, 2000). In fact there is evidence that poor coping strategies also predict IVF failure while positive characteristics such as resilience may increase success rates (Czemiczky, Landgren, & Collins, 2000; Hjelmstedt, et al., 2003; Smeenk et al., 2005).

Interventions targeting stress have been shown to be effective in increasing the success rate of IVF ((Terzioglu, 2001; Facchinetti et al., 2004). A meta-analysis of 22 studies showed that psychotherapy accompanying IVF was related to positive IVF outcome (de Liz & Strauss, 2005).

In a systematic review Rockliff et al. (2014) identify social support, as an established predictor of reduced distress in IVF. The review also found that avoidance / escapist coping strategies were maladaptive and more positive problem-solving approaches are more effective. They also identify self-criticism, dependency, situation appraisals, and attachment style, as negatively indicated. These variables (including social support) are clustered around

what Rockliff et al. describe as 'affiliative affect regulation' and describe the quality of the partner relationship of the IVF couple. Peterson, Newton, Rosen, and Skaggs, (2006) explored gender differences in coping among couples undergoing IVF and found that, "women proportionately engaged in a greater degree of confrontative coping, accepting responsibility, seeking social support and escape/avoidance", while men "cope by distancing themselves from the infertility, keeping their feelings to themselves through self-controlling strategies and emphasizing plans to solve the problem of infertility" (p. 2447). The fact that women are more likely to confront the problem and seek social support, while men tend to distance themselves and keep their feelings to themselves, risks the breakdown of a supportive relationship which is one of the core variables in coping with stress (Martins et al., 2011; Mindes, Ingram, & Covington, 2005), and may ultimately lead to relationship break down (Kagami et al., 2012). A number of other studies point to the importance of including male partners in the process of understanding the psychosocial impact of IVF (Arya & Gibb, 2016; Pasch, et al., 2012).

Parenthood motivation has also been investigated in relation to IVF (Cassidy & Sintrovani, 2008; Colpin, De Munter, & Vandemeulebroecke, 1997). Evidence suggests that extrinsic factors such as social pressure are related to IVF stress while intrinsic factors such as nurturance may be protective against stress. The link between positive coping and intrinsic motivation is well established in predicting health and wellbeing (Allen & Leary, 2010), and both coping and motivation have been linked with self compassion in dealing with failure (Neff et al., 2005).

Cassidy and McLaughlin (2016) proposed and tested a number of predictors of positive and negative mental health in women undergoing IVF and suggest that these variables might also predict success rates. The variables included were social support, problem-focused coping, motivation for parenthood, self compassion, and attachment. The

current study aims to test if positive or negative mental health and the above psychosocial factors play a role in predicting success or failure of IVF.

Methods/Study Design

A one year follow-up survey design with questionnaire data collection was used to assess the outcome of IVF for women one year after they had been assessed on motivation for parenthood, self compassion, social support, coping style, attachment, positive and negative mental health while undergoing IVF.

Participants and Procedure

This study reports findings from a follow-up questionnaire sent to women who had provided baseline measures a year earlier (Cassidy & McLaughlin, 2016). The baseline measures are referred to as time one (T1) and the follow-up measure as time two (T2). Following ethical approval the 363 women, aged between 31-39 years (M=35.25, Sd=2.5), who had participated in a survey at T1 were contacted electronically and asked about the outcome of their IVF procedure. In line with ethical recommendations the women each received an information sheet which informed them of the purpose and aims of the study. They were informed that completion and return of the questionnaire would be taken as implicit consent. They had been contacted initially (T1) through an online support group and had consented to take part in the study by providing their e-mail address to the researcher. The inclusion / exclusion criterion was that they were currently undergoing an IVF cycle. The cause of infertility was not recorded and indeed it is true that, in the majority of cases, the cause is not known. At T2 they were sent a questionnaire which they could download and complete and return electronically. Of the 363 contacted, 305 replied. Of these 156 reported successful births while 149 had not become pregnant. Of this 149, 66 were undertaking another cycle of IVF and 83 were not. Of the 156 who had been successful, 105 had just one

cycle of IVF while 51 had two cycles. Of the 149 unsuccessful treatments 45 had just one

cycle and 104 had 2 cycles of IVF.

Measures at T1.

Personal details were requested on age, cycle of IVF (i.e. 1st, 2nd), and stage within

the cycle (1 = controlled ovarian stimulation' (COS) phase, 2 = egg collection and

fertilisation, or 3 = embryo transfer to pregnancy test).

This was followed by the following standardised measures.

**The General Health Questionnaire (*GHQ-12:* Goldberg, 1978) is a widely used

measure of psychological distress and is comprised of 12 questions each of which is rated on

a four-point Likert scale. The Likert scoring method which assigns a score (0-1-2-3) in

response to each of the 12 questions, was used in this study. More recently attention has

focused on whether it can be used to measure positive mental health as an independent

dimension (Hu, Stewart-Brown, Twigg & Weich, 2007), based on the generally accepted

conclusion that positive and negative mental health are independent dimensions (Huppert, &

Whittington, 2003). As in the Hu et al. (2007) study, we found from Principal Component

Analysis and Varimax rotation in our current data set that a two factor solution was produced

with the 6 positive items loading on one dimension ($\alpha = 0.83$), while the 6 negative items

loaded on a separate one ($\alpha = 0.81$). These factors were used to measure separate dimensions

of positive and negative mental health in the current study.

The Perceived Social Support Scales (PSS-Fr and PSS-Fa Scales) (Procidano &

Heller, 1983) are two 20-item scales designed to measure perceived levels of social support

from friends and family. Most statements appear on both subscales, but one scale is

concerned with family and the other with friends. The items are rated across a three-point

scale 'yes', 'no' and 'don't know'. In the current study the reliability coefficient values were

friends support ($\alpha =.81$), and support from family ($\alpha =.83$).

Self-compassion. Self-compassion was measured using the Self-compassion Scale (Neff, 2003). The Self-compassion Scale is a 26-item self-report inventory and consists of six sub-scales: self-kindness, self-judgment, awareness of common humanity, isolation, mindfulness, and over-identification. Each item was rated on a 5-point scale (1=*strongly disagree* to 5=*strongly agree*). Cronbach Alphas were .94, .94, .87, .89, .92, and .94 for six subscales, respectively.

Coping: We used the Brief COPE (Carver, 1997) which is a widely used 28-item questionnaire and is a short version of the full 60-item version of the COPE (Carver et al., 1989). The 28 items assess 14 coping strategies each with two items. Research supports the reliability and validity of the Brief COPE (e.g., Carver, 1997). Participants respond to each item on a 4-point scale with the categories I did not do this at all (0), I did this a little (1), I did this a medium amount (2), and I did this a lot (3) adopted from the COPE (Carver et al., 1989). Different studies have produced differing numbers of second order factors (Kimemia, Asner-Self, & Daire, 2011; Muller & Spitz, 2003). It is recommended that researchers use their own data to test factor solutions and in this study we produced a 3 factor solution which fits the widely recognised model of problem-focused & emotion-focused and avoidance.

Attachment: This was measured using the revised Hazan & Shaver 3-Category Model (Hazan & Shaver, 1987; 1990) which measures adult attachment in three categories; secure attachment, anxious / ambivalent attachment, and avoidant attachment. Secure attachment has been described as a protective factor in relationship stability (Treboux, Crowell, & Waters, 2004). This single item measure allows participants to rate each dimension on a 7 point scale from strongly agree to strongly disagree and has been shown to be reliable (Brennan & Shaver, 1995).

Motivation for Parenthood: This was measured using the Parenthood Motivation Scale (PMS) (Cassidy & Sintrovani, 2008). This 24 item scale measures 6 factors related to

motivation to have a child, *Continuity* (motivation to carry on the family line – α = .87)*, Nurturance* (intrinsic maternal desire for a child - α = .76)*, Relationship* (motivation to maintain or protect a relationship - α = .89)*, Identity* (motivation to complete the female identity as mother - α = .86)*, Social Pressure* (motivated to meet the demands of relative / friends - α = .84)*, and *Materialism* (motivation based on what a child can provide in future such as support - α = .69).

Measures at T2.

At follow up participants were contacted electronically and asked to report, how many IVF cycles they had, if they had achieved pregnancy and/ or given birth, if they were currently undergoing IVF, and if yes what stage they were at. They were also asked to complete and return the GHQ-12.

Results

The main aim of this study was to test the predictors of treatment outcome and the first stage in analysis involved Discriminant Function Analysis to identify the variables which discriminated between successful and unsuccessful participants as shown in Table 1.

Taking correlations of .3 or greater to be significant (Table 1) the pooled within group correlations show that positive mental health and negative mental health at T2 both discriminate significantly between success and failure of IVF; so too do mindfulness, problem-focused coping, positive mental health, nurturance, social pressure, and secure attachment at T1. The standardised canonical co-efficient also show support from friends to be a significant discriminator.   The function was significant in discriminating IVF success (Wilks' Lambda (24)=0.253, p<.001, χ^2 (24) = 400.445, p<.001).

Previous research is equivocal as to whether distress (negative mental health) impacts on IVF outcome and none has considered if positive mental health plays a role. In this study we have measured both positive and negative mental health and to test their effect binary

logistic regression was used. Negative mental health and positive mental health at time 1 (T1) were entered on the first step and correctly classified 70.2% of cases. The relationship for negative mental health was (Wald (1) = 2.935, p=.087, Exp(B) = 1.985). This suggests that negative mental health (distress) is associated with a decreased likelihood of success by a factor of two approximately. Positive mental health was a greater predictor of success (Wald (1) = 20.083, p<.001, Exp(B) = 10.11). This suggests that positive mental health is associated with an increase in success by a factor of ten. On the second step positive and negative mental health measured at follow-up (T2) was added to the model. Adding the time two measures increased the predictive power of both negative (Wald (1) = 2.737, p = .098, Exp(B) -3.041) and positive mental health (Wald(1) = 14.873, p <.001, Exp(B) = 20.625) measured at time 1. When time 2 mental health is added negative mental health reduces the odds of success by a factor of 3 while positive mental health increases the odds of success by a factor of 20. Negative mental health at time 2 (Wald (1) = 2.617, p = .106, Exp(B) -0.697) reduced the odds of success by half while positive mental health at time 2 (Wald(1) = 42.896, p <.001, Exp(B) = 8.494) increased the odds of success by a factor of 8.5. While negative mental health seems to have some relationship with success in IVF it is positive mental health which has the greater impact (see Table 2).

The next stage in analysis applied binary logistic regression to identify from social support, parenthood motivation, self-compassion, attachment and coping, if any variables were predictive of IVF outcome. The results are shown in Table 3.

The overall model correctly classified 94.7% of cases, proving to be a good fit for the data (χ^2 (8) =34.685, p<.001). The significant positive predictors were (in order of size), problem focused coping (Wald=14.804, p<.001; odds 19.26:1), mindfulness (Wald=17.277, p<.001; odds 18.61:1), nurturance (Wald=21.785, p<.001; odds 11.34:1), secure attachment (Wald=15.257, p<.001; odds 7.33:1), support from friends (Wald=4.838, p<.01; odds 2.20:1),

and self kindness (Wald=6.577, p<.01; odds 1.11:1). In addition social pressure motivation (Wald=7.925, p<.01; odds .35:1), and avoidance coping (Wald=8.516, p<.01; odds .17:1), were negative predictors. In essence problem focused coping was associated with a 19 fold increase in chance of success from IVF, while mindfulness was associated with a 17 fold increase, nurturance with an 11 fold increase, secure attachment with a 7 fold increase, and support from friends with almost a 5 fold increase. On the other hand avoidance coping was associated with an 83% reduction and social pressure motivation with a 65% reduction in the chance of success.

The final analysis used multiple regression to identify the potential predictors of positive mental health at both stage 1 and follow-up from the set of variables measured at time 1. The consistent predictors are shown in Table 4. Mindfulness and self-kindness from self-compassion, problem-focused coping, secure attachment, support from friends, and nurturance and social pressure from parenthood motivation were the seven variables that produced significant partial correlations at both stages.

Discussion

The study found that mindfulness, problem-focused coping, support from friends, positive mental health, nurturance motivation, social pressure motivation, negative mental health and secure attachment contributed to the discrimination between successful and failed outcomes. Women who reported higher levels of mindfulness, problem-focused coping, support from friends, positive mental health, nurturance motivation, and secure attachment, and lower levels of social pressure motivation, and negative mental health during IVF were more likely to have produced live births one year later. This concurs with the Rockliff et al., (2014) review and suggests that it is likely to be the combination of all or a number of these factors which provide the psychosocial resources that increase the likelihood of success.

In this sample we have shown that both positive and negative emotional distress correlate with success. Negative mental health reduced the probability of success by a factor of .5, while positive mental health increased the probability of success by a factor of 10. We also argued that what has often been missed in the literature are the psychosocial factors that might contribute to distress and also to success. In this study a sense of secure attachment to a partner correlated with positive mental health and increased the likelihood of success sevenfold. This links with the literature that shows support as a key factor (Rockliff et al., 2014) and the evidence that IVF places a stress on relationships (Kagami et al., 2012). Security of attachment reflects positive 'affiliative affect regulation' (Rockliff et al., 2014).

Nurturance motivation is a measure of intrinsic motivation to have a child while social pressure motivation reflects an extrinsic motivation and this data shows that nurturance increases the probability of success while social pressure has a damping effect. Problem-focussed coping also increases the probability of success. Coping and motivation have been well established in predicting health and wellbeing (Allen & Leary, 2010).

Social support has a dual role, a) as a protective buffer to stress, and b) its absence as a source of stress and as a key factor in IVF success (Rockliff et al., 2014). In this study we found that support from friends is positively related to IVF outcome and reduced stress. Support from family did not have a significant impact. However, this is not to say that it is not important. It may be that in this study its impact covaries with attachment to partner. In the process of IVF the couple provide the most obvious and close source of support for each other, yet this very important source is under threat at this time (Kjaer, et al., 2014; Mindes, Ingram, & Covington, 2005). In this study we found that secure attachment, which arguably reflects a strong and resilient relationship, was predictive of success. The impact of family support may also be counteracted by the impact of social pressure motivation in that most

social pressure to have a child is likely to come from (or be perceived as coming from) family.

From self-compassion the variables of self-kindness and mindfulness increase the probability of success. Rockliff et al. (2014) identified self-criticism as a negative factor in IVF but there has been no literature on the role of its opposite (self-kindness) in this area. Mindfulness has a very large impact in this study increasing the likelihood of success by a factor of 17. This points to the potential efficacy of mindfulness interventions to reduce the stress of IVF and possibly increase the success rates (Grossman, Niemann, Schmidt, & Walach, 2004).

We concur with Pasch, et al. (2012) in that the findings herein point to increased psychosocial intervention before and during IVF if success rates are to be improved. Prior to IVF some basic counselling to enable the couple to understand their motivation to have a child, and in particular, to ensure that both partners buy into the treatment. Any intervention must involve both partners (Arya & Gibb, 2016; Pasch, et al., 2012), that is where there is a partner, acknowledging that some women choose to undergo IVF alone. The case of solo mothers should be recognised and included in future research. Stress reduction or management interventions should be available to both partners, or in the case of a solo mother, to both the mother and any person providing her with personal support. Part of this is simply bringing to awareness the stress experienced. There are a number of therapeutic approaches that have received evidential support, perhaps the most widely known of these being mindfulness. This approach would be supported by the current study. It is important that interventions adopt a resource model, in that they do not simply focus on reducing stress but also engage in building resources in terms of resilient coping strategies. While there are standard interventions available, to be successful they must be tailored to the couple by a trained health professional with training in health psychology.

There are of course limitations to this study as there are other measures we could have used and it would have been useful to assess the women at a number of time points. In our defence measures were taken at the two time points and we did not rely on retrospective accounts. Other studies have used more fertility specific measures of stress or used different methods such as diary data collection. The latter would have been a strength although difficult to administer to a large sample. As we were more interested in trying to explain success rather than failure we chose to apply measures that are more positively focused which may make our data less easy to compare with previous findings.

Overall the current study provides evidence that the proposed model combining social support, problem-focused coping, motivation for parenthood, self-compassion, and attachment is predictive of success following IVF and could be used as a basis for intervention. Exploring motivation to have a child alongside the provision of support in strengthening relationships could be usefully combined with a stress reduction intervention based on mindfulness or acceptance and commitment therapy principles.

References

Allen, A. B., & Leary, M. R. (2010). Self-compassion, stress, and coping. *Social and Personality Psychology Compass. 4(2):* 107–118, 10.1111/j.1751-9004.2009.00246.x

Arya, S. T., & Dibb, B. (2016) The experience of infertility treatment: the male perspective. Human Fertility, 19 (4), 242–248 http://dx.doi.org/10.1080/14647273.2016.1222083

Boivin, J., Griffiths, E. & Venetis, C. A. (2011). Emotional distress in infertile women and failure of assisted reproductive technologies: meta-analysis of prospective psychosocial studies. *British Medical Journal; 342*:d223: doi:10.1136/bmj.d223

Bouwmans, C. A., Lintsen, B.A., Verhaak, C. M., Eijkemans, R. J., Habbema, J. D., Braat, D. D., & Hakkaart-Van Roijen, L. (2008). Absence from work and emotional stress in women undergoing IVF or ICSI: an analysis of IVF-related absence from work in women and the contribution of general and emotional factors. *Acta Obstetricia et Gynecologica Scandinavica; 87(11):*1169-75. doi: 10.1080/00016340802460305.

Brennan, K. A., & Shaver, P. R. (1995). Dimensions of adult attachment, affect regulation, and romantic relationship functioning. *Personality and Social Psychology Bulletin, 21,* 267-283.

Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the Brief COPE. *International Journal of Behavioral Medicine*, *4,* 92-100.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, *56,* 267-283.

Cassidy, T. & McLaughlin, M. (2016). Distress and coping with in vitro fertilisation (IVF): The role of self-compassion, parenthood motivation and attachment. *Journal of*

Psychology and Clinical Psychiatry, 6(4): 00363. DOI:

10.15406/jpcpy.2016.06.00363

Cassidy, T. & Sintrovani, P. (2008) Motives for parenthood, psychosocial factors and health in women undergoing IVF. *Journal of Reproductive and Infant Psychology. 26(1).* 4-17.

Colpin, H., De Munter, A., & Vandemeulebroecke, L. (1997). Parenthood motives in IVF-mothers. *Journal of Psychosomatic Obstetrics & Gynaecology; 19*:19 –27.

Czemiczky, G., Landgren, B. M. & Collins, A. (2000). The influence of stress and state anxiety on the outcome of IVF-treatment: psychological and endocrinological assessment of Swedish women entering IVF-treatment. *Acta Obstetricia et Gynecologica Scandinavica 79*,113–118.

Facchinetti, F., Tarabusi, M. & Volpe, A. (2004). Cognitive-behavioral treatment decreases cardiovascular and neuroendocrine reaction to stress in women waiting for assisted reproduction. *Psychoneuroendocrinology 29*,162–173.

Goldberg, D. (1978). *Manual of the General Health Questionnaire*. NFER Publishing Company: Windsor.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research, 57(1),* 35–43.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology, 52*, 511-524.

Hazan, C., & Shaver, P. R. (1990). Love and work: An attachment theoretical perspective. *Journal of Personality and Social Psychology, 59,* 270-280.

Hjelmstedt, A., Widstrom, A.M., Wramsby, H., Hathiesen, A. S. & Collins, A. (2003). Personality factors and emotional responses to pregnancy among IVF couples in early

pregnancy: a comparative study. *Acta Obstetricia et Gynecologica Scandinavica,* 82,152–161.

Hu, Y., Stewart-Brown, S., Twigg, L. & Weich, S. (2007). Can the 12-item General Health Questionnaire be used to measure positive mental health? *Psychological Medicine, 37,* 1005–1013.

Huppert, F. A. & Whittington, J. E. (2003). Evidence for the independence of positive and negative well-being: implications for quality of life assessment. *British Journal of Health Psychology 8,* 107–122.

Kagami, M., Maruyama, T., Koizumi, T., Miyazaki, K., Nishikawa-Uchida, S., Oda, H., Uchida, H., Fujisawa, D., Ozawa, N., Schmidt, L., & Yoshimura, Y. (2012). Psychological adjustment and psychosocial stress among Japanese couples with a history of recurrent pregnancy loss *Human Reproduction, 27 (3):* 787-794.

Kjaer, T., Albieri, V., Jensen, A., Kjaer, S. K., Johansen, C., & Dalton, S. O. (2014). Divorce or end of cohabitation among Danish women evaluated for fertility problems. *Acta Obstetricia et Gynecologica Scandinavica 93*, 269–276

de Liz, T. M. & Strauss, B. (2005). Differential efficacy of group and individual/couple psychotherapy with infertile patients. *Human Reproduction, 20,*1324–1332.

Martins, M. V., Peterson, B. D., Vasco M. Almeida, V. M. & Maria E. Costa, M. E. (2011). Direct and indirect effects of perceived social support on women's infertility-related stress. *Human Reproduction, 26 (8):* 2113-2121

Mindes, E. J., Ingram, K. M., & Covington, S. N., (2005). The Influence of Spousal Support and Unsupportive Social Interactions on Emotional Responses During In Vitro Fertilization. *Fertility & Sterility, 84(1),* 232–233. DOI: http://dx.doi.org/10.1016/j.fertnstert.2005.07.600

Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity, 2,* 223–250. doi:10.1080/15298860309027.

Neff, K. D., Hsieh, Y-P., & Dejitterat, K.(2005). Self-compassion, Achievement Goals, and Coping with Academic Failure. *Self and Identity; 4:*263–287.

Pasch, L.A., Gregorich, S.E., Katz, P.K., Millstein, S.G., Nachtigall, R.D., Bleil, M.E., et al. (2012) Psychological Distress and In vitro Fertilization Outcome. Fertility and Sterility, 98, 459-464. https://doi.org/10.1016/j.fertnstert.2012.05.023

Peterson, B. D., Newton, C. R., Rosen, K. H., & Skaggs, G. E. (2006). Gender differences in how men and women who are referred for IVF cope with infertility stress. *Human Reproduction 21(9).* 2443–2449: doi:10.1093/humrep/del145

Procidano, M.E. & Heller, K. (1983). Measures of Perceived Social support from friend and from family: Three validation studies. *American Journal of Community Psychology*, *11 (1)* 1-23.

Rockliff, H. E., Lightman, S. L., Rhidian, E., Heather Buchanan, H., Uma Gordon, U., & Kavita Vedhara, K. (2014). A systematic review of psychosocial factors associated with emotional adjustment in in vitro fertilization patients. *Human Reproduction Update, 20(4).* 1–20. doi:10.1093/humupd/dmu010

Smeenk, J. M. J., Verhaak, C. M., Vingerhoets, A. J., Sweep, C.G., Merkus, J.M., Willemsen, S. J., van Minnen, A., Straatman, H. & Braat, D. D. (2005). Stress and outcome success in IVF: the role of self-reports and endocrine variables. *Human Reproduction, 20,*991–996.

Terzioglu, F. J. (2001). Investigation into the effectiveness of counselling on assisted reproductive techniques in Turkey. *Journal of Psychosomatic Obstetrics & Gynaecology, 22(3).* 133-41.

Treboux, D., Crowell, J. A., & Waters, E. (2004). When 'New' Meets 'Old': Configurations of

    Adult Attachment Representations and Their Implications for Marital Functioning.

    Developmental Psychology, 40(2), 295-314.

Verhaak, C. M., Smeenk, J. M. J., Evers, A. W. M., Kremer, J. A. M., Kraaimaat, F. W. &

    Braat, D. D. M. (2007). Women's emotional adjustment to IVF: a systematic review

    of 25 years of research. *Human Reproduction Update, 13(1).* pp. 27–36

Table 1: Pooled within-groups correlations and standardised canonical discriminant function co-efficients between discriminating variables and the function discriminating between success and failure of IVF

	Pooled within group correlation	Standardised canonical co-efficients
Positive mental health T2	.461	.723
Mindfulness	.445	.446
Problem focused coping	.430	.119
Positive mental health T1	-.416	.408
Nurturance	-.358	.561
Negative mental health T2	-.334	.039
Social pressure	.244	-.195
Negative mental health T1	-.228	.391
Secure attachment	.204	.113
Self judgement	-.203	-.193
Self kindness	.163	-.280
Materialism	.163	.101
Common humanity	-.127	.158
Identity	-.113	.226
Anxious attachment	-.084	-.004
Avoidant attachment	.077	.012
Friend support	-.054	.635
Emotion focused coping	.050	.026
Over identified	.044	-.249
Family support	-.039	.036
Avoidance	-.017	-.286
Relationship	.017	-.069
Isolation	-.017	.016
Continuity	.017	-.091

Correlations above .30 considered significant

Table 2: Negative and Positive mental health as predictors of IVF outcome

	B	S.E.	Wald	df	P	Odds Ratio
Block 1						
Negative mental health T1	0.686	.400	2.935	1	.087	1.985
Positive mental health T1	2.314	.516	20.083	1	.001	10.118
Block 2						
Negative mental health T1	1.112	.672	2.737	1	.098	3.041
Positive mental health T1	3.026	.785	14.873	1	.001	20.625
Negative mental health T2	-0.360	.223	2.617	1	.106	0.697
Positive mental health T2	2.139	.327	42.896	1	.001	8.494

N=305: χ^2 (4) = 281.196, p<.001: Psuedo R^2 statistics: Cox & Snell R^2= .602: Nagelkerke = R^2.803

Table 3: Predictors of success versus failure of IVF from logistic regression

	B	S.E.	Wald	df	P	Odds Ratio
Family support	.333	.335	.985	1	.32	1.39
Friend support	.793	.360	4.838	1	.02	2.20
Continuity	-.219	.446	.240	1	.62	.80
Materialism	-.771	.472	2.670	1	.10	.46
Relationship	-.421	.498	.714	1	.39	.65
Identity	-.042	.370	.013	1	.91	.95
Social pressure	-1.031	.366	7.925	1	.01	.35
Nurturance	2.429	.520	21.785	1	.001	11.34
Self kindness	2.158	.841	6.577	1	.01	1.11
Self judgement	1.245	.723	2.962	1	.08	1.28
Common humanity	.035	.564	.004	1	.95	1.03
Isolation	.855	.426	4.026	1	.09	1.05
Mindfulness	2.924	.703	17.277	1	.001	18.61
Over identified	-.796	.439	3.293	1	.07	.45
Avoidant attachment	.316	.280	1.269	1	.26	1.37
Secure attachment	1.993	.510	15.257	1	.001	7.33
Anxious attachment	-.553	.262	4.464	1	.07	.73
Problem focused coping	2.960	.769	14.804	1	.001	19.29
Emotion focused coping	-.014	.473	.001	1	.97	.98
Avoidance coping	-1.753	.601	8.516	1	.01	.17

All variables used in the analysis are shown: N=305: χ^2 (8) = 34.64, p<.001:
Psuedo R2 statistics: Cox & Snell R^2= .659: Nagelkerke = R^2.878

Table 4: Predictors of positive mental health at both stages from regression analysis						
Variables measured at time 1	Positive mental health at time 1			Positive mental health at follow-up		
	B	SE B	β	B	SE B	β
Social pressure	-.158	.030	-.163***	-.194	.071	-.188**
Nurturance	.239	.030	.291***	.120	.053	.150*
Mindfulness	.137	.038	.150***	.165	.067	.186**
Problem focused coping	.297	.047	.253***	.388	.083	.343***
Secure attachment	.115	.036	.110***	.109	.047	.125*
Friend support	-.071	.027	-.085**	.114	.047	.140**
Self-kindness	.147	.065	.116*	.174	.070	.171**
***p<.001 **p<.01 *p<.05						