UNIVERSITY OF SOUTHAMPTON

FACULTY OF SOCIAL SCIENCES

Division of Social Work Studies

Applications of astrology to health psychology:

psychological and astrological factors and fertility treatment outcome

by

Pat Harris, MSc., D.F.Astrol.S.

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ABSTRACT
FACULTY OF SOCIAL SCIENCES
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Doctor of Philosophy

APPLICATIONS OF ASTROLOGY TO HEALTH PSYCHOLOGY: PSYCHOLOGICAL AND
ASTROLOGICAL FACTORS AND FERTILITY TREATMENT OUTCOME

By PAT HARRIS

In this research project, two studies were undertaken using two separate samples. The first sample, for Study 1, was collected from several countries in the public domain through advertisements, interviews and websites, and this sample formed the exploratory analysis group (n = 27 fertility treatment women). The second sample, for Study 2, was collected from three UK fertility treatment clinics (two NHS and one private) (n = 40 fertility treatment women) forming the group tested for replication of the results in the exploratory study. Psychological measures used in both studies were State/Trait Anxiety Questionnaire (STAI) where state anxiety was measured twice: before attempt to conceive (Measure 1) and after attempt but before outcome is known (Measure 2); the Beck Depression Inventory II (BDI-II); and a general data-gathering questionnaire designed for the study. Additional measures used in Study 1 were Multidimensional Health Locus of Control Questionnaire (MHLC), and Perceived Health Competence Scales (PHCS). State anxiety Measure 1 correlated significantly with depression (r = .788, p = .002) and there was a negative correlation with depression for PHCS (-.758, p = .003) for women having experienced fertility treatment (n = 13).

A dataset of 114 treatments experienced by 27 women in the UK, Europe, Australia and the USA was then explored for astrological patterns associated with fertility treatment outcome. The dataset was divided into two groups: successful outcome, where successful outcome is defined as "baby resulting from treatment" (n = 16) and failed outcome (n = 98). Contacts of Venus and Jupiter, associated in traditional astrology with fertility and childbirth, were compared for presence and absence at time of fertility treatment outcome for both groups. The secondary progression and transit systems were used, and it was found that major beneficial contacts, including conjunctions of Venus and/or Jupiter, were significantly more likely to be present at times of treatment resulting in the birth of a live baby (p = < 0.001). Astrological indicators of reproductive problems were then compared between a group of women with a history of fertility problems (n = 27) and a group of no known history (n = 17). Presence of the factors in the fertility group was significant at p = 0.0019.

Psychological, astrological and socio-demographic factors were then considered together in a series of different logistic regression models. It was found that the best model contained the factors: personal depression (p = .014), clinic location (p < .001), and astrological factors excluding angles (p < .001), and was the most effective (explanatory power 41%) at identifying treatment outcome for the sample in Study 1, identifying 54% of successes and 98% of failures with an overall percentage of 92%.

These exploratory findings were then tested again in Study 2, with the exception of clinic location because all the treatments took place in the UK.

In a blind test of 12 cases, using astrological factors alone, two out of three successes and eight out of nine failures were correctly identified (p = .064).

When the model was fitted to the clinic sample data, none of the factors was significant at the 5% level, though astrology was close at p = .058.

In Study 2, when comparing Study 2 fertility treatment women (n = 14) with Study 1 control group (n = 17 non-ft women with no reported history), the significant association found in Study 1 for medical astrology factors and presence of fertility treatment history was replicated (p = 0.0237).

Conclusion: In view of the close-to-significant result for astrology as a predictor of treatment outcome and the smallness of the samples studied, it is recommended that further research be undertaken on larger samples to gain a better insight into this phenomenon. Further research into medical astrology factors and presence of fertility treatment history, significant at the 5% level (p = 0.0237) in the replication, is also recommended with a larger sample and a new control group.

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Declaration of Authorship

I, Pat Harris, declare that the thesis entitled *Applications of astrology to health psychology: psychological and astrological factors and fertility treatment outcome* and the work presented in it are my own. I confirm that:

this work was done wholly or mainly while in candidature for a research degree at this University:

where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated:

where I have consulted the published work of others, this is always clearly attributed:

where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;

I have acknowledged all main sources of help;

Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

Part of this work has been published before submission as:

Astrology and individuality in chronic pain management (Correlation, Vol. 22(1) 2004 pp 5 – 23 and *Astrology at work in social science research* (Astrology and the Academy 2004 publishers Cinnabar Books, Bristol, UK pp 79 – 89)

Signed ...... █████████ ....

Date: ....3 0......April.....2 007..........................

Dedication

This doctoral thesis is dedicated to my advisor, colleague and dear friend, Mrs. Susan High, who supported and advised me throughout six years of researching and writing this project. Her constant presence during the negotiations of some very difficult and challenging times, helped to make the completion of this thesis possible and I will always be grateful to her for being my rock in some very stormy seas en route to completion of this research.

Acknowledgements

Chapter One:

Part One: a review of existing research on astrology and psychology, astrology and reproductive medicine, and astrology as a method for targeting effective times for fertility treatment for women

and

Part Two: a review of the existing research on anxiety and depression in relation to success and failure of treatment outcome

1.1 Introduction

The general topic area of the thesis is fertility treatment and astrological and psychological factors that may be associated with success and failure of treatment outcome. My interest in this field arose directly out of my professional training and experience as an astrologer and my personal experience of astrological consultation. As a professional astrologer, I found that the issues about which I was consulted most frequently related to marriage and likely parenthood, and so my interest in fertility and astrology continued.

Examination of astrological data drawn from my client files between 1990 and 1999 showed nine mothers with 11 children between them who experienced certain astrological contacts of Venus and Jupiter to their charts during the year of or the year preceding the birth of their child or children. Existing astrological literature asserts that Venus and Jupiter are important during the years when one is likely to have children and so the apparent relationship found in these clients' charts appeared to support these assertions.

My interest in astrology and health was further encouraged by my research into astrology and counselling in the rehabilitation of chronic pain patients in part contribution to a Master's Degree in Health Psychology. The University of Southampton awarded this degree in 1997. In the autumn of 1999, I was invited to undertake a doctorate at the University of Southampton in order to research the apparent association between astrology and fertility in the field of health psychology.

A client who had consulted me on business matters for several years heard of the intended research proposal in the autumn of 1999, and revealed to me that she had been a fertility treatment patient and had undergone seven unsuccessful attempts before the eighth, and final, attempt resulted in the birth of her daughter. Her case history was explored for significant astrological factors present in the year in which she gave birth to her daughter compared with the failed attempts that she had undertaken in the previous three years. The astrological analysis of her failures and the eighth final successful attempt that resulted in the birth of her daughter indicated a possible relationship between Venus and Jupiter and eventual successful treatment outcome.

This thesis presents the results of the research for the doctorate and looks at the success and failure rates of fertility treatment and whether or not certain astrological and psychological factors significantly correlate with fertility treatment outcome. In the following sections, existing research that suggests anxiety and depression may have a significant link with treatment failure is presented and discussed. Literature on traditional astrological observations that astrological factors, such as Venus and Jupiter, are likely to be significantly present in the years when women give birth compared to years when they do not is presented and discussed. In astro-psychology, Venus and Jupiter are associated with happiness and a sense of well being, while research in health psychology shows some evidence for an association between stress, impaired immune system function, and the function of the reproductive system. The literature for this association will also be presented and discussed, together with possible evidence for a relationship between medical and psychological astrology and reproductive function in women.

1.2 The scale of the problem

It is estimated that one in seven couples in the UK, approximately 3.5 million people, have difficulty conceiving, but it is impossible to say how many of the couples seeking help actually make the decision to have IVF treatment. However, the Human Fertilisation and Embryology Authority Annual Report 1998 shows that in 1996/97, 25,566 patients received IVF in the UK, and of the 33,520 treatment cycles given, 5,601 resulted in live births, indicating a success rate of 16.7% for all forms of treatment. The treatments are broken down into various types: ICSI (Intra-Cytoplasmic Sperm Injection) being the most successful at 22%, followed by normal IVF at 15.5% and IVF using frozen embryos, resulting in a 12% success rate.

There are several types of factor, medical and psychological, which have been associated with success and failure of treatment outcome. Research into these factors is reviewed here. For example, it has been suggested that psychological factors such as anxiety might have a bearing on conception rates (Demyttenaere, Nijo, Steeno and Koninckx 1988) and it is proposed that this could be a factor in the success and failure rates of IVF (Johnston 1985). However, this study will explore the potential of astrological factors in predicting treatment outcome where certain astrology contacts to the charts of women undergoing fertility treatment may identify the outcome of treatment undertaken at particular times.

Traditional Western astrology, going back to the time of Ptolemy, has associated Venus and Jupiter with fertility, and Saturn with barrenness (Ptolemy c. A.D. (100-178) 1980), and my experience with the use of these indicators in astrological consultation suggests that contacts of Jupiter and Saturn in a natal chart might have statistically significant connections to success and failure, respectively, in IVF and other forms of treatment for infertility (Jackson 1986, Millard

1993). Therefore, a study was designed that would enable the writer to test for any significance of association with astrological factors and timing of treatment that might have a bearing on the success and failure of treatment outcome. The first part of the study involved developing a model that could test for such associations and in each case could also control for psychological and other factors such as anxiety and depression, location of clinic, and the woman's fertility histories. In the second part of the study, Chapter 7, the model developed through exploratory analysis in Chapters 4 and 5 is then tested on a fresh sample of fertility treatment patients to see how it performs in replication.

As part of the overall approach to the presentation of the research presented in the following chapters, the development and administration of fertility treatment is considered together with the relevance of health psychology in the fertility treatment process and management of the well being of the patient undergoing this process.

Medical astrology is explored for its possible relevance to fertility treatment. The development of astrological psychology in the 20th Century is considered for its relevance to health psychology in the field of fertility treatment.

Finally, the possible relationship between fertility treatment, health psychology, and medical and astrological psychology is explored for its potential mutual value in the process of gaining a better understanding of the impact of the fertility treatment process on the women undergoing treatment and the implications that this may have for the ways in which future treatments are administered.

Part One:
Astrology, health psychology, and fertility treatment outcome

In Part One of this review, the findings of various forms of research into psychology, astrology and reproductive medicine and astrology as methods for increasing chances of successful conception are examined for possible relationships that might lead to further understanding of factors associated with the success and failure of various forms of fertility treatment.

In relation to astrology and psychology, for example, it may be that there is a link between psychology, timing of treatment and astrology, where psychology mediates for astrology, and where personality related to psychology and astrology is a mediator for psychology, i.e., relating anxiety and depression to personality types.

1.3 Astrology, psychology and personality

It has been asserted that astrological factors are associated with behavioural responses within populations as well as with individual personality traits. For example, in a study of the effect of the full moon on general practice consultation rates, Neal and Colledge (2000) found that there was a small but statistically significant effect associated with the lunar cycle and the demands made by its patients on a general practice. The study looked at data from the Royal College of General Practitioners Office of Population Censuses and Surveys, and the Department of Health, Morbidity Statistics from General Practice – 4th National Study 1991 – 1992, London, HMSD 1995 (n = 1374235 consultations from 60 practices). The data were split into two equal groups: consultations on ordinary weekdays (mean of 5276 consultations per day) and consultations on weekends and bank holidays (mean of 371 consultations per day). Groups were then split randomly into two sets, one set for model building and one to test the model. Number of consultations per day was transformed to a proportion of the daily mean for the year, and this was used as the dependent variable compared with independent variables: day of the week, month, and the lunar cycle. The model developed was a regression model and the lunar effect considered to be sinusoidal, and that any effect would be maximal at the time of the full moon and decline to the new moon, following a cosine curve (with a period of 29.54 days = mean length of lunar cycle). The best model was the one in which the maximal effect was observed six days after the full moon (R2 = 0.83). It was suggested that the delay may have been due to delays between the onset of moon-related problems and behaviours and accessing the GP. There was a small statistically significant effect of 1.8% of mean value (95% CI 0.9-2.7%). This indicated a difference between extremes of the lunar cycle of 3.6%, accounting for 190 (95% CI 95 – 285) more consultations on days at peak cycle compared with those days at the bottom of the cycle. When mental illness, anxiety and depression were factored into the model, no effect was found for these variables. No effect was found for weekend or bank holidays, but further research was recommended in order to understand better the small but significant rise in weekday consultations that occurred six days after the full moon.

Caplan and Jones (1975) found a significant association between work load and anxiety for Type A personality subjects in a study in which participants' anxiety and depression levels were measured for 73 males using a university computer system that was approaching a 23-day shut-down. Those subjects classed as Type A (hard driving, persistent, involved in work) were the most anxious as the shutdown was reached.

May (1977) defined anxiety as the apprehension triggered by a threat to some value that the individual holds essential to his or her existence as a person, and that a feeling of not being liked or able to win people's support and admiration can intensify one's anxiety, which is then expressed in terms of fear. The type of anxiety that women undergoing fertility treatment

experience might be described as reality anxiety, which is the most basic form of anxiety and is rooted in objective reality (Carver & Scheier 2000), i.e. fear of failed treatment outcome and possible subsequent rejection. This topic and its possible relevance to astrological factors and treatment outcome are further discussed in Chapter Six.

In an Australian-based study, Jorm, Christensen, Henderson, Scott, Jacomb, Korten and Rodgers (2000) attempted to replicate the findings of Gershuny and Sher (1998), who found that high neuroticism and low extraversion could predict anxiety and depression states in subjects three years later, and McFatter (1994), who detected a link between depression and the interaction effects of extraversion and neuroticism where negative affect and depression were greatest in the joint presence of high neuroticism and low extraversion. However, Jorm et al. (1998) used different measures: the Eysenck Personality Questionnaire – Revised (EPQ-R) (Eysenck, Eysenck & Barret 1985) and the Anxiety and Depression Scales (Goldberg, Bridges, Duncan-Jones & Grayson 1988), whereas Gershuny et al. (1998) used the Brief Symptom Inventory to measure anxiety and depression and McFatter (1994) used the Beck Depression Inventory.

Jorm et al. (2000) examined two samples. The first was taken from a cross-sectional survey of subjects aged between 18 and 79 years (total number of participants = 2,677 of which 52% were women) and included measures of neuroticism, extraversion, psychoticism, anxiety and depression. Hierarchical linear regression was used to test the data for the first sample, but family history of alcoholism included in the Gershuny and Sher (1998) study was left out and age was added. Significant associations were found between anxiety and neuroticism (B = .6102, SE .0174, p < .001) and with extraversion (B = .0592, SE = .0174, p < .001), and depression and neuroticism (B = .5463, SE = .0180, p < .001). The second sample was taken from a longitudinal study of elderly people ($\geq$ 70 years), who were assessed for neuroticism and extraversion at baseline and whose anxiety and depression levels were then reassessed three to four years later. There were 945 participants at the first stage and 674 at the second, 628 of whom provided full sets of data. In the sample of elderly people, for stage 1 males, depression was found to be significantly associated with neuroticism only (B = .3305, SE = .0756, p < .001), while for stage 1 females, depression was found to be significantly associated with neuroticism (B = .5001, SE = .0555, p < .001) and extraversion (B = -.1514, SE = .0501, p < .01). For stage 2, where scores were combined because a preliminary analysis showed no gender x personality interactions, significant associations were shown between anxiety and neuroticism (B = .1815, SE = .0553, p < .01) and depression and neuroticism (B = .2075, SE = .0565, p < .001). The study did not replicate the findings of Gershuny et al. (1998) and McFatter (1994), but this may have been due to some differences in design and sampling.

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If astrological factors can be shown to have significant associations with psychological traits such as anxiety and depression, and also to be significantly associated with timing of treatment, it might describe the link between anxiety, depression, timing of treatment, and treatment outcome, in that astrological factors associated with successful outcome may also be associated with absence or diminished levels of anxiety, and/or a personality type that is not prone to anxiety or depression. For example, if Venus and Jupiter are associated with a buoyant, optimistic personality or frame of mind, it might be that this is partly why treatments whose timings coincide with Venus and Jupiter contacts to the natal chart are more likely to succeed. At the time of experiencing such contacts, an individual might theoretically be expected to have low anxiety levels and an absence of depression or of factors, which encourage proneness to depression.

Much research has been undertaken into the possible relationship between astrology and psychology, both by academics and astrologers. Some studies support an association, while others do not. There is no theory that explains a possible link between planetary configurations and psychological traits, although some psychologists, such as Jung and Eysenck, have developed and researched ideas concerning the value of astrology in assessing psychological characteristics and identifying personality indicators. One of the major problems experienced in the evaluation of psychology as a tool for understanding human individuality is that it is impossible to find subjects who have not encountered astrological writings in some form or other, and who are therefore immune to fitting the profile of their particular sun sign to themselves rather than seeking to make an objective comparison. Then there is the argument of belief in astrology: if you believe in it, it will work for you.

A United States-based study compared subjects' acceptance of three different techniques, i.e. psychological projective technique, graphological technique, and astrological technique, and concluded that the extent to which a person may believe in the assessment procedure of astrological personality or individuality analysis correlates positively with the acceptance of the interpretation. This is to say that the greater the faith a client possesses in an astrologer the more ready they are to accept the astrologer's analysis of them (Snyder, Larsen & Bloom 1976). Such a degree of faith might result in an individual fitting their perception of themselves to the analysis rather than being able to make objective comparisons between their own view and the professional view. Techniques exist to help protect against the problems generated by an over-emphasis of client faith in the astrologer's skills or, indeed, the astrologer's over-emphasis of faith in their own skills to the extent to which they may overlook or even dismiss the client's personal experiences when they contradict a particular astrological interpretation (Rose 1982). Counselling training is advocated for astrologers who practice as general consultants, as the skills acquired through this discipline can be invaluable in this regard.

The relationship between astrological factors and personality was explored, using the Eysenck Personality Inventory, in a study involving 917 male adult and 1407 female adult subjects which tested for frequency of extraversion and introversion respectively against the positive signs of Aries, Gemini, Leo, Libra, Sagittarius and Aquarius and the negative signs of Taurus, Cancer, Virgo, Scorpio, Capricorn and Pisces. It was also postulated that elevated neuroticism scores would be found among those subjects born with the Sun in the water signs: Cancer, Scorpio and Pisces, which are traditionally linked with emotionality. The study showed that introversion and extraversion did correlate with the respective signs, and that elevated neuroticism scores were found in the expected water element signs of the Zodiac (Mayo, White & Eysenck 1978). These results were replicated in a study of 559 British university students, conducted by Smithers and Cooper (1978). However, in a comprehensive review of astrological research up to 1978, Kelly (1979) found that most research into astrology and its relationship to personality had not produced any results – the studies by Mayo et al. (1978) and Smithers et al. (1978) were the exceptions. A New Zealand study (N = 241) located in the southern hemisphere failed to replicate the results (Saklofske, Kelly & McKerracher 1982). Hentschel and Kiessling (1985), in their German study (n = 154), did not support the findings of Mayo et al. (1978) or Smithers et al. (1978), but acknowledged that their sample was small and that there were significant differences in their methodology. Rooij, Brak and Commandeur (1988) recommended that in one-factor studies large samples were needed in order to show any effects. Their study of introversion-extraversion and sun sign (n = 992) produced a close-to-significant result on the correlation between introversion and extraversion and the odd-even effect (i.e. Aries, Gemini, Leo etc. are considered numerically odd and Taurus, Cancer etc. numerically even, odd numbers being assigned to masculine (positive) signs and even numbers to feminine (negative) ones). Odd signs correlated with extraversion and even signs correlated with introversion. Unlike the earlier studies (Mayo et al. 1978 and Smithers et al. 1978, Eysenck and Nias (1982): 50-60), this study was designed so that self-attribution could not account for the effect.

Pawlik and Buse (1984) found significant associations between belief in astrology and self-attribution in a sample of 799 subjects, of which 68% were women. Subjects completed two questionnaires: German version of the Eysenck Personality Inventory and, also, Belief in and Familiarity with Astrology designed for the study. The results were analysed and compared, belief in astrology being treated as one of the independent variables. However, the means of recruiting the sample may have contributed towards results that indicated that believers in astrology show significant association with extraversion, and in the case of some women, with neuroticism, where this significance is not present for non-believers. A notice, described by the authors as being a neutral text, was placed in the editorial section of a big Hamburg daily newspaper in an effort to encourage as many readers as possible to take part in the experiment. It read: 'All readers are

invited to participate – supporters of astrology as well as opponents who wish to see "astrological interpretation" finally unmasked as hocus pocus.' Unfortunately, this is not a neutral text and would give rise to a sample consisting of extremes of those who believed and those who disbelieved. It is also somewhat weighted in the direction of non-believers, who might be better described as "disbelievers", and is presented as an experiment that will grant the wish of those who want to see astrology unmasked as hocus-pocus. Such a notice does not allow for the collection of a sample of people who are totally neutral – who neither believe nor disbelieve – and this has an important bearing on the way in which conclusions can be drawn from analysis of the results. The tone of the notice is therefore problematic for the type of sample gathered, as it cannot fail to create a bias in the sample that will have an effect on the results and their interpretation, and this should have been taken into account.

It would be helpful in further studies to collect samples with, initially, a truly neutral notice that simply invites readers to take part in a psychology-based experiment without indicating, at this first point of recruitment, that astrology is involved, particularly as the raw data from this study are no longer available[1].

Corroboration for a possible extraversion/introversion-odd/even signs phenomenon may be found in a study that examined the data of 2089 sports champions, 1409 famous actors and 3547 men of science, and found, as predicted, that Saturn was linked with introversion and Mars and Jupiter with extraversion (Gauquelin 1979). Ertel (1993) criticised the character trait hypothesis (Gauquelin, Gauquelin & Eysenck 1979), suggesting that selector bias of characteristics associated with planets had been responsible for a significance level that could not then be replicated in his study (Ertel 1993).

In a French study, twins were tested for introversion and extraversion according to their birth times (n = 238 pairs of twins in two groups of 135 pairs who were from 3 to 17 years old and 103 pairs who were aged between 2 months and 59 years). Members of the twins' families completed questionnaires from which the twins' status, e.g., "expansive" or "reserved" was determined and then matched with factors in the birth chart assigned to each of these categories. The definitions of "expansive" and "reserved" were chosen as alternatives, respectively, to extraversion and introversion because it was suggested by the authors that no equivalent for these terms could be found in the French language. The method for interpreting the effect of the ascendant on character was unusual and was called the "rocking ascendant" technique. In traditional astrological calculation, a difference of four minutes can be equal to one degree in the 360-degree circle of the Zodiac with regard to the ascendant (or degree of the Zodiac coming over

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[1] This was communicated to the author by Prof. Suitbert Ertel in an email dated 12th October 2003. Professor Ertel had requested the data from Professor Pawlik on behalf of the Research Group for the Critical Study of Astrology, Southampton, UK, but was told by him that he no longer had the data.

the horizon for the time of birth). The relationship of this point to the position of the planets in the birth chart is judged very important by astrologers in assessing character differences in individuals – a few minutes of difference between the ascendant point or rising degree of twins of any description has an important bearing on character interpretations. In the use of the rocking ascendant technique, if the first half of the sign ascended and there were no planets close to the ascendant, the traits associated with the ascendant sign would have influence. However, if the second half of the sign ascended then the following sign would have influence, e.g., a rising sign of Taurus could be typically Taurus or more Gemini. In traditional astrology, the sign ascending, no matter in what degree or how early or late, and not the following sign, is considered the sign of influence on the ascendant. The study showed that birth time was a statistically significant factor in accounting for the differences in character traits between twins (Fuzeau-Braesch 1992). Replications of the study are essential to gaining a better understanding of the value or otherwise of the very unusual rocking ascendant technique, which appears to have been created for this study alone.

Sociability and astrology were investigated in a study of 524 students with an average age of 22.09 years, the Eysenck and Wilson psychological test being used to measure introversion and extraversion. A significant association between the Sun in eleven of the Zodiac signs (Aries did not follow this pattern) and personality traits (where sun in an odd sign = extraversion and sun in an even sign = introversion) was found, where extraversion and introversion were categorised as levels of sociability. Significant associations were also found for Mars in the signs. This pattern remained when the data were analysed by month and by season (Fuzeau-Braesch 1997). However, the research was exploratory in nature, and further research with studies that might attempt to replicate these findings is therefore necessary before any conclusions on the findings can be confidently drawn.

Roberts and Greengrass (1994) investigated both similarities and differences in experiences and events between people (n = 126, born on six dates) born at the same or similar times on the same date and, in some cases, in locations very close to each other. Although they found no evidence of clear parallels, they did find a small group of subjects among the sample whom they called "close resemblers" – those born close together, i.e. at nearly the same time, and almost in the same location. Similarities in life events were more marked between these subjects: to some extent they did marry in the same year, have children in the same year, etc. Their general findings support Gauquelin's work on planets and personality, although it was advised that the apparent personality characteristics – or character traits – associated with certain planets in a sample of eminent professionals had yet to be replicated in a sample of non-eminent people (Gauquelin 1985). In an interview (Phillipson 2000), Professor Roberts discussed his model (Roberts 1990), proposing that only a small proportion of the population might have characteristics

described by their astrological birth charts. In theory, this may account for the findings in the time-twins research (Roberts et al. 1994) and the strong correlation with planets and occupations in the charts of high achievers in the Gauquelin data (Ertel & Irving1996).

In other research into personality and astrology (Roberts 1999), it was suggested that it is difficult to verify correlations between an indicator (planet, sign, house, etc.) and main characteristic of a group of matched types for large populations, and that using sensitive statistical tests is therefore essential, because the effect is so small. It was proposed that the underlying assumption about astrological effects and what should detect them are unsound. A radical change of thought in creating new constructs to fit the data coming to light would lead to the development of a better model. A study was designed to detect planetary characteristics in each individual using a specially created questionnaire comprising 100 questions. Responses were analysed using Eigen Vector Analysis to identify any clustering effect among the questions whereby particular questions relating to Mars, for example, were spread across the Questionnaire, e.g. questions nos. 3, 34, 66, 79 etc.) Predominance of "yes" or "no" responses showed a strong or weak effect, respectively, according to the planetary score assigned to each question. Those with a large Saturn score tended to have the planet Saturn in a Gauquelin sector of the birth chart, and similarly with Jupiter, Mars, Sun and moon. Low scores showed a tendency for that planet to be absent from the corresponding Gauquelin sector. Less clear results were obtained with Venus, Mercury, Uranus, Neptune and Pluto, and these results corresponded with the Gauquelin findings. Dean (1999/2000) suggested that the correlation of high scores for planetary questionnaire subjects who tend to have planets in the Gauquelin sectors may be an artefact of dividing 5 or less, by another small number, 16 or less, and not allowing for a "huge sampling error associated with such small numbers". Dean also criticised the use of Eigen Vector Analysis to produce reliable results for 78 subjects responding to a 100-item questionnaire and the reliability of a clustering effect to validate a character trait. However, Roberts (1999/2000) pointed out that the smallness of numbers was not a problem when the whole set of groups was considered. A chi-squared test had demonstrated that the results were significant, but the results of the chi-squared test had not been reported in the paper because the research was exploratory. Roberts (1999) suggested that more empirical observation of the planets Uranus, Neptune and Pluto was needed to understand better what psychological factors might be associated with them, and recommended further research into the Gauquelin results taking into consideration that a factor differentiating between "ordinary people" and what Roberts terms "starborn" people should be built into any such proposed research model.

In later research, Roberts (2002) suggested that conventional statistical analysis used in research into astrology was not appropriate and that new models should be considered using Bayesian methods, particularly when analysing the Gauquelin Character Trait Hypothesis findings, as such methods would take into account possible researcher bias. Willis and Curry (2004) put

forward an entirely different viewpoint: they suggested that astrology might be untestable in any scientific sense, and that to validate it and demonstrate its success might be to undermine its chief value, which is as a magical or mystical tool for divination.

Ertel (1990), in a report of a study carried out by four students under supervision at the University of Gottingen, found no evidence to support this association. However, Gauquelin and Tracz (1990), in a replication of Ertel's study (1990) carried out at the University of California, Fresno, confirmed Gauquelin's former positive results, contradicting Ertel's claim of a bias in Gauquelin's selection of terms. Gauquelin's replication used the same material as Ertel's, the extractions being made by two students who were under the author's supervision. Ertel (1993) contested these results, and the conclusion that the difference in results was due to careful selection in the Gauquelin replication and sloppy selection in the Ertel replication. Ertel (1993) concluded that since Gauquelin's basic planetary effect has continuously gained support, failures with Character Trait Hypothesis (CTH) are a challenge to find an explanation for the persistent main effect in entirely different terms (p2). However, in a non-astrological study of 39 US Presidents' biographies, Simonton (1988) showed that it was possible to develop a method that appeared to guarantee rater consistency when none of the raters had foreknowledge of the origin of the data being scrutinised.

However, the profession and eminence hypotheses (according to which certain planets occupy particular degree areas of the birth charts of well known and outstanding individuals in particular professions) remain to be explained. An attempt to replicate the Gauquelin Mars effect by the French sceptics (CFEPP) using a sample of 1,066 sports champions, which concluded that there was no effect, was robustly challenged by Ertel (1998/99) criticising the method used to carry out the examination of the data. Other criticisms of the effect have been made where it has been asserted that it is an artefact of "parental tampering" (Dean 2000) and could be due to parents deliberately altering their children's time of birth to avoid the midnight hour, because of superstitions associated with this time of night, for example. It is argued that some of the reasons why this could be so are superstition and fear on the part of parents who do not want their child to have an unlucky time or date of birth. This argument has also been refuted in a series of papers by Ertel (2000/2001, 2001/2002, 2002, 2002/2003), and in a response (Ertel 2006) to a comment by Dean (2006).

Douglas (1997) used the method of trait extraction described by Simonton (1998) on a small sample of US Presidents (n = 19) whose birth data (time, date and place of birth) were judged to be reliable to test a possible correlation between the four factors determined in Simonton's study: charismatic, interpersonal, deliberative and creative with, respectively, Jupiter, moon/Venus, Saturn and Mars, and found evidence that confirmed the Gauquelin effect for Jupiter

and Saturn. It was acknowledged that the sample was small and that it would be extremely difficult to test all of the Gauquelin data in this way, but it was suggested that because the approach used parametric statistics, small samples of the Gauquelin data could be tested. This would allow a reliable method of trait extraction to be applied, which "may resolve the present impasse over CTH by a more objective control of trait extraction, and by subsequent use of Factor Analysis" rather than the simple Chi-squared test "to derive the structure of trait space" (p 56). In relation to CTH, a detailed discussion of semantic space and its implications for trait space analysis is contained within Douglas's study. Douglas has further investigated the Gauquelin findings in relation to astrology and personality and has found that phases of the Sun and moon are important when identifying planets occupying key sectors and describing particular characteristics. He followed rules of the ancient astrologer, Paulus Alexandrinus, c. 560 CE, (1993), who wrote that planetary influences were stronger when in certain relationships to the Sun and moon, and he used this as a basis for a model to predict which planets would be associated with which professions and how well the characteristics of those planets would serve such professions. For example, Mars is associated with valour and combat, and so should be strong for soldiers. He tested various associations across various professions using these criteria, and altogether 14 out of 18 tests are in the predicted direction (p = about 0.01). This supports the validity of the CTH theory[2].

Roberts (1999) suggests that the eminent professionals shown in the Gauquelin research as having a character trait association with particular planets are different from the normal population and can be categorised as "enhancers" or "starborn" types – people whose astrological birth charts are frequently dominated by key angular planets. It is further suggested that if these people exist, then it is to be expected that "ordinary" people will not show this association in their charts. Evidence from questionnaire research is presented in support of this theory. In a study that looked at six patients on a chronic pain management programme (Harris 2004), astrological counselling was found to be an effective way of understanding patients' difficulties in completing the rehabilitation programme and of helping patients to develop better coping strategies for dealing with their chronic pain. Astrological reports were drawn up based upon two one-and-a-half-hour interviews with each patient about the onset and subsequent history of their condition. The reports explored the personalities in terms of the birth charts, and were found to be favourably comparable with profiles developed from psychological interviewing techniques. In one case, astrological counselling revealed post-traumatic stress disorder, a condition in the patient that had gone undiagnosed for several years.

If there is a valid relationship between astrology and psychology then it might be a useful technique in helping women with fertility problems who experience depression and anxiety to

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[2] This was conveyed in a personal email to the author from Graham Douglas on 10th August 2005.

explore ways in which effective coping strategies particularly suited to their individual psychology will help them manage their experience of infertility with minimum stress. This topic is revisited in the final discussion in Chapter Eight.

1.4 Summary

From the review of astrology and psychology in terms of character and personality presented here, it would appear that there are a number of studies that have produced significant findings in support of an association between certain astrological factors and possible personality traits. However, there have been virtually no successful replications of these results, and so no firm conclusions can be drawn from them. Those studies that have found no associations often have flawed methodology, whereby such problems as in-built bias might affect the reliability of the findings. In their review of 37 published and unpublished studies on the moon and human behaviour and human belief, Kelly, Rotton and Culver (1998) advise that there are two main issues to address when researching any possible associations between lunar variables and human behaviour. They state firstly, that reliability has to be established and that this should be done through replicating findings by independent investigators and secondly, that the relationship should not be "a trivial one" (p32) because, in their view, a weak relationship would have little or no predictive value in practical application to everyday life. These observations, although made strictly with regard to research into lunar phenomena, also apply to astrological research in general, and echo Roberts' (1997) suggestions in particular.

Blackmore and Seebold (2000/2001) suggest that astrological and psychological correspondences can mostly be explained through the participants having knowledge of their astrological type before taking part in the research and therefore being apt to make themselves fit their astrological profile. This is a very difficult argument to defend, as it could also be argued that the participants look for confirmation in their astrological profiles of what they already independently believe to be true of themselves in terms of personality traits. The study examined the effect of horoscopes on the relationships of undergraduate women (n = 46) studying psychology, humanities or nursing at the University of West England, UK, mean age 26 years (Blackmore and Seebold (2000/2001)). Subjects were required to complete questionnaires designed for the study, i.e., Awareness of Astrology Questionnaire and Relationship Assessment Questionnaire. The researchers adopted the method of concealing the purpose of their research into belief in astrology and its impact on human behaviour in their study of women's relationships. Each participant completed the Relationship questionnaire twice: once before she received her astrological analysis on her romantic prospects, and again after the horoscope had been received and read. One form of advice was considered positive love advice and the other neutral. Relationship scores on the questionnaire were unchanged for those receiving the neutral advice and were slightly, though not significantly, raised for those receiving the positive love advice. All

participants knew their sun sign. 13% said they would consult an astrologer before getting married or settling down, with only 15% saying they would alter their behaviour due to material they had read in their horoscopes. Results showed that women with a higher belief in and knowledge of astrology would be more likely to be affected by the material that they had read in their horoscopes ($r = 0.39$, $n = 24$, $p = 0.03$ 1-tailed).

This design was later criticised by Brockbank (2004), who attempted a replication of part of their experiment with a group of employees ($n = 60$) and shareholders ($n = 4$) from a small service company in the North of England. The average age of the female participants was 45 years (range 22 – 78 years), and the males' average age was 40 years (range 24 – 59 years); only two of the participants had received higher education. The construction of the Relationship Questionnaire was criticised as being fundamentally flawed in the way that it collected information at Phases 1 and 2 and the differences in responses interpreted in an astrologically inappropriate way, e.g., financial problems arising in the period between completion of the questionnaire at Phases 1 and 2 might indicate an increase in partnership stress but might not be linked to the astrological advice received between the two phases. Because of such perceived design flaws, Brockbank, in his attempted replication, chose only to test whether or not the general findings for the undergraduate group, i.e., level of awareness of astrology and influence of astrology on behaviour, would be similar to those of a very different group. This was because he suspected that the results of the Blackmore & Seebold (2000/2001) group might be a product of the characteristics of the group. Some small changes were made to the questionnaire format to clarify the questionnaire itself; in several instances, the option of "don't know" was included along with "yes" and "no". The omission of "don't know" from some of the questions in the original study formed a significant part of the criticism of the design, because it was believed that this could have an impact on the assessment of the results, and this third option should have been included for the responders wherever possible. Using this amended version of the Awareness of Astrology Questionnaire, Brockbank (2004) found that the female participants in his group ($n = 45$) showed a greater level of scepticism of astrology on all questions, with only 40% of women believing that astrology is not just superstition compared with 72% in the earlier study. Only one result was confirmed in the original study and this was that the vast majority of people know their sun sign. Belief in astrology and its possible influence on treatment outcome is further discussed in Chapter Six, within the context of the research undertaken for Study One Parts Two and Three and its findings.

These two papers illustrate the major problems facing researchers in astrology. Astrology is a very complex subject. A study design must address the objectives of the study as completely as possible and tests used must be appropriate. However, it is crucial to the validity of the results to determine exactly what is being tested before the design is done, in order to ensure good quality research, which should then produce sound results.

These are important points that still remain to be adequately addressed in future research and which have been problematic for most of the studies, for and against, presented in this literature review of astrology and psychology to date.

1.5 Astrology and medicine

The power of belief in a symbolic system to influence outcome of disease was suggested in a study that examined the deaths of 28,169 adult Chinese-Americans and 412,632 randomly selected, matched controls coded "white" on the death certificate (Phillips, Ruth & Wagner (1993). Fifteen independent tests of the same hypothesis were carried out. The study concluded that deaths from various diseases among Chinese Americans occurred significantly earlier than among the white controls where Chinese American individuals possessed a combination of weakness to disease and particular birth year according to Chinese Astrology. However, six possible alternative explanations were offered for these findings: 1. refusal to change unhealthy habits because of fated outlook; 2. medical evidence related to one of the diseases suggests behaviour cannot completely account for the findings; 3. Chinese healers may give up on patients born in a "fated" year; 4. several disease conditions may contribute to early demise; 5. married patients live longer, and 6. hidden longevity cycle. It was concluded that the results were partly from psychosomatic processes (i.e., due to their beliefs) and not a product of astrological effect. Rotton and Kelly (1983) outline the difficulties of developing methodology which avoids errors in conclusions drawn from astrological studies, and that in this respect it is important to base such conclusions upon accurate data and correctly computed statistics.

Several study designs have been employed by different researchers such as Hughes (1990), who found no correspondence between the sun in the sign of Libra and susceptibility to renal disease; van Rooij (1993), who failed to find significant correspondences between the sun in a particular element (i.e. fire, earth, air or water) and Jung's theories on sensing, intuition, thinking and feeling; and Silverman & Whitmer 1974), who failed to find significant correspondence between astrological indicators of personality (i.e. sun, moon and ascendant) and descriptions of subjects by self and friend. These are just a few of the many studies that might have been helped by a model that aids correct identification of astrological factors with characteristics (Dean 1993). Davidson (1973a) discusses in detail his empirical findings on correspondences between various diseases and planetary relationships in the chart and indicates that Saturn in Aries or Libra will signify poor function in the kidneys if this relationship is sufficiently supported by other planetary factors. This may account for Hughes' failure to find a link between only one factor – the Sun in Libra – and renal disease. Ridder-Patrick (1990) cites the planet Venus as a significator of the kidneys and a difficult angular relationship between Venus and Saturn as indicative of poor kidney function. The sign of Libra itself is traditionally shown as ruling kidney disease (Lehman 1992).

Ancient astrologers wrote about planetary influences and fertility, and there is a considerable amount of material on this aspect of astrology, although there is virtually no scientific research into it.

Sellars (2001) summed up some aspects of astrology used in relation to fertility and reproductive health in an article on traditional indications of fertility. The signs of Taurus, Cancer, Virgo, Scorpio, Capricorn and Pisces were judged fruitful or fertile signs, while Aries, Gemini, Leo, Libra, Sagittarius and Aquarius were judged barren or infertile signs, with Cancer, Scorpio and especially Pisces being the most fertile. She further reported that large families are likely when the moon, Venus or Jupiter is placed natally in the 5th house (the part of the birth chart governing pregnancy and children), and that these planets are generally associated with fertility while the Sun, Mars, Saturn and Uranus are associated with infertility. Ptolemy, C.E. 100-170, (1980) associated Saturn with barrenness and Venus with fruitfulness. Lilly (1985), writing in 1647, gave detailed advice on a variety of astrological factors to consider when assessing whether or not a person would have, or indeed be capable of having, children. Ridder-Patrick (1990) gives astrological indicators of reproductive problems associated with these planets when found in particular locations, and angular relationships with other planets, within a person's birth chart. These associations are discussed further in Chapters 5, 6 and 8, in terms of their relevance to the research findings in this thesis.

McGillion (2002b) has argued that impact of light on the pineal gland at time of birth and location (e.g., light intensity and day length vary according to latitude) can influence both the biological and psychological development of a neonate in later life, and this would justify taking into account a person's time, date and place of birth when assessing their disposition and reproductive health in adulthood.

The moon has been associated with childbirth since ancient times, and in her book *The Moon and Childbirth*, Margaret Millard (1999) considers astrology and fertility in relation to conception and birth, heredity, choosing the sex of the child, and accurately predicting the date and time of birth. She also presents a number of case histories from her personal client files to illustrate her theories and the ancient theories of the Trutine of Hermes (part of a collection of writings that emerged in 15th Century Florence, and attributed to the god-priest Hermes Trismegistus). He states that the ascendant at birth of a child gives the position of the moon at time of conception. In relation to fertility treatment and astrology, Millard gives five examples of embryo implant times resulting in successful outcomes in relation to lunar influences, but "fortunate" Jupiter conditions were present in all five examples. In two failed treatment outcomes (Millard 1993), the Moon was linked with Saturn, a planet associated with barrenness.

A modern astrological method of identifying fertile points in a woman's life was developed by Dr. Eugen Jonas from his reading of astrological texts from ancient Egypt, Greece and India (Rubin 1967). Ancient astrologers asserted that a woman could achieve conception only at certain phases of the moon, and these phases must match exactly the phase of the moon at the time when the woman was born. So, for example, if a woman was born when the moon was 180 degrees distant from the sun, during her reproductive life she would be able to conceive only when the moon occupied the same angular relationship on any given day in her menstrual cycle. Maximum fertility was reached when the angular relationship matched that at the time of the woman's birth to the degree and minute of arc with a margin of two days before exactitude, when conception was increasingly likely, even during menstruation. Jonas also claimed that if the moon at time of conception was in a positive sign of the Zodiac, i.e. Aries, Gemini, Leo, Libra, Sagittarius or Aquarius, the child would be a boy, and if any of the remaining, negative, signs, the child would be female. This theory has been strongly rejected by astrologers (Millard 1999, Addey 1981) as being too simplistic[3]. If this were to be so, taken together with the ascendant/moon rule of Hermes Trismegistus, this would mean that there could be no boys born with negative signs rising and no girls born with positive signs rising, and common experience denies this. Jonas calculated retrospectively the gender of 250 babies born at a maternity clinic in Pozsony in Czechoslovakia and claims to have been correct in 217 cases, so this would refute the rule of Hermes Trismegistus. March (2002) reports that many couples used these indicators of conception as a form of contraception, i.e., days when this phase angle was not present for the woman were treated as safe sex days; but this did not turn out to be the case! The angular relationship between sun and moon was presented by March (2002) as a means of successfully achieving conception for non-fertility-treatment couples, with a window of 16 hours before exactitude, but with a recommendation that coitus should take place as soon as possible after the time of exactitude of the sun-moon contact to ensure a better likelihood of success. She also gives astrological indicators for further ensuring a successful outcome, with the sun-moon phase taken into consideration. March claimed around a 70% success rate for this method.

Nicky Allsop[4], a South African astrologer investigating a potential relationship between astrology and infertility, is researching a possible link between stars (rather than planets) and the birth charts of women undergoing fertility treatment in relation to successful outcome. She believes that certain stars are associated with fertility, and that if they are configured with the

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[3] John Addey, an eminent English astrologer-mathematician in the 20th century, suggested in personal correspondence with the author during October 1981 that there was some evidence that the father's radical moon (moon position at time of birth) may indicate a tendency to have sons, but that this was linked to the degree areas of particular groups of signs. The tendency was believed to be stronger in the middle degrees of cardinal signs: Aries, Cancer, Libra and Capricorn. He wrote: "However, this has not held up very well and in any case it was only a tendency".

[4] Nicky Allsop exchanged a number of emails with the author during the period August 2004 to June 2005 in which she discussed her research into astrology and infertility.

woman's birth chart in particular ways this may be an indicator of successful treatment outcome. She also believes that clinic location may be governed by this relationship as the position of the stars changes their angular relationship to the woman's birth chart planets. Her research is still ongoing, but if such a relationship were significantly established it would indicate that some clinic locations were more favourable for successful treatment outcomes than others, other factors controlled.

In the second section of this literature review, psychological and biological factors are considered in relation to treatment outcome.

Part 2: Fertility treatment and the role of psychology and other factors in relation to treatment outcome

1. 6 A brief history of fertility treatment in the UK.

The birth of Louise Brown on 25th July, 1978 was the first successful outcome resulting from implantation of an embryo into the patient's uterus (Steptoe, Edwards 1978). Since then, hundreds of thousands of babies resulting from fertility treatment have been born in the UK. Figures for 1999 alone, for example, show that 595,000 babies were born in the UK, 8,337 (1.4%) of which were the result of fertility treatments (HFEA 2000).

Since the basic IVF method developed by Steptoe and Edwards (1978) of fertilising an egg with sperm in a petri dish and replacing the resultant embryo into the potential mother's uterus, a range of assisted reproductive techniques has been developed. In 1984, the first baby resulting from the Frozen Embryo Transfer method was born and subsequently reported in detail by Patrick Steptoe at the Annual General Meeting of the European Society for Human Reproduction and Embryology in Cambridge, UK (Steptoe 1986). This technique proposed the freezing of embryos developed from fresh eggs that are not used for an implant; the eggs are then frozen and stored so that they can be thawed and used at a later date. A further development was the discovery that babies could be successfully developed from eggs which had previously been frozen. Success rates for treatments using FET are lower than those for embryo implants developed from fresh eggs (HFEA 2003). The technique of GIFT (gamete intra-fallopian transfer, where egg and sperm are placed into the fallopian tube for fertilisation) was first carried out in 1989. A variation on this procedure, ZIFT (zygote intra-fallopian transfer) was also developed, whereby eggs are fertilised in the laboratory and at the zygote stage are introduced back into the woman's fallopian tube.

The real breakthrough for male fertility problems came with the development of the technique known as ICSI (Intra-Cytoplasmic Sperm Injection) in 1992 by Dr. Jean-Pierre Palermo

at the Brussels Free University in Belgium, whereby a single prepared egg is injected with a single prepared sperm and the resulting embryo is implanted in the woman's uterus. Pre-implantation genetic diagnosis (PGD) was developed in 1990, and this procedure enabled the detection of chromosomal abnormalities connected with X-linked diseases (Griffin, Wilkin, Handyside, Winston & Delhanty 1992) in early developing embryos, with far-reaching implications for fertility treatment which continue to be energetically debated and which have been recently addressed by the HFEA (Review of the Human Fertilisation and Embryology Act 2005). The development and uses of PGD are discussed later in this review.

In 1998, the HFEA expressed concern about the number of multiple births resulting from assisted reproduction techniques. It was found that 32.2% of treatments involving three embryo transfers resulted in multiple births, compared to 22.4% resulting from treatments limited to two embryos. This figure dropped to 1.5% when only one embryo was transferred. These statistics led to a change in practice whereby nearly all UK fertility treatment centres limited the number of embryos transferred at any single treatment to no more than two. This created general concern that success rates for patients would decrease.

Gerris (2005), in a review of the results of fertility treatment procedures carried out in such countries as Belgium, Finland, Scandinavia, Holland, Italy and the UK looked at treatment outcome for single-embryo transplants compared with two-or-more-embryo transplants, and concluded that selective use of single-embryo transplant should not result in a significant difference in success rates between single-embryo and double-embryo transplant. The recommended conditions for single embryo transplants are that the woman should be below 36 years of age, in her first or second IVF/ICSI trial, and that only embryos with a high putative implantation potential should be used and these should be implanted on the third or fifth day of their development. It is recognised, however, that aspects of preparing for IVF, e.g. ovarian stimulation, optimised laboratory conditions and oocyte retrieval (number of eggs collected) and embryo transfer, transfer technique and endometrial receptivity (the degree to which the lining of the uterus has developed in readiness to receive the embryo) all play a part in increasing the chances of a successful treatment outcome.

In the UK, the first successful treatment using a thawed frozen egg was carried out by Dr. Mohamed Taranissi at the Assisted Reproduction and Gynaecology centre in London, UK in 2001. As few as thirty babies, worldwide, have been born from this very new technique.

1.7 Factors to consider in the achievement of a successful fertility treatment outcome

The goal of every couple undertaking fertility treatment is to obtain a healthy baby of their own. The journey can be an extremely stressful one, both psychologically and physically.

Many problems face couples who have decided to undergo IVF and other forms of assisted reproduction techniques in the hope of having a healthy child. All are stressful procedures, with IVF being probably the most invasive of all the techniques. Any method that can be implemented to increase likelihood of success is therefore welcomed, and the success rate of a particular clinic is likely to be an important consideration, together with ways in which a couple can maximise their own personal chances of success.

In Study 1 of this thesis, in which an exploratory analysis was undertaken on a sample of fertility treatment women (n = 27), sixteen women had UK-based treatments, ten had USA-based treatments and one had treatments in Australia. Of the fifteen live births whose location of treatment was given, six live births resulted from UK-based treatments, eight from the USA, and one from Australia.

1.7 (i) Success rates

A comparison of success rates between the UK and the USA resulting from fresh or frozen embryo transfers for ages below 35 and 35 to 37, showed that overall success rates were higher for USA-based treatments than for UK-based treatments for the year 2002 (see Appendix (ii), Table 1.1)

Success rates for UK and USA women over 37 years are not directly comparable, since the categories differ. The USA live birth rate resulting from fresh embryo transfer in women aged between 38 and 40 is 26.4%, whereas for UK women aged between 38 and 39 it is 21.3%. The increased likelihood of success in the USA women is 5.1% greater, even though this group includes 40-year-old women and fertility is known to decline sharply after the age of 34. However, USA women aged between 41 and 42 experience a 12% success rate compared with their UK sisters' experience of 14.7% for women aged between 40 and 42. The slightly different age spread in the two samples may explain part of the difference in the success rates.

It is difficult to make any real quantitative comparisons between the USA and the UK, as the monitoring body for fertility treatment in the UK, the Human Fertilisation & Embryology Authority (HFEA) does not keep detailed records that would enable fair comparisons. The HFEA advises that factors that may affect the statistics that are available via the HFEA relating to treatment outcome depend on various reasons. Some clinics may treat only patients who are younger and so have a greater likelihood of achieving pregnancy. Other clinics treat only patients who are older, but details of these statistics are not provided by the HFEA, which provides details only of patients who have babies as a result of fertility treatment using the unit of measure where

successful outcome = live birth[5]. Individual clinics' details are presented in the Guide, but there are no detailed comparative analyses of the figures.

USA research (CDC website 2005) shows that age is not a factor when donor eggs are used for embryo transplant, as the quality of the egg is good. Where fresh embryos are used, US women experience a 50% success rate compared with the UK success rate of 24.8%, and where frozen embryos are thawed and used for implant, the US live birth success rate is 28.8% compared with the UK figure of 16.7%.

A USA review of trends in fertility treatment success considered from 1985 to 1999 (n = 647,208 treatment cycles) showed that 155,661 clinical pregnancies had resulted in 128,608 births and that 177,745 babies were born (twins and triplets, etc. count as one birth). The development of increasingly effective techniques led to increases in success rates (Toner 2002).

USA fertility treatment centres are not required to register with a monitoring body in order to carry out fertility treatments and are not licensed by such a body (Deonandan, Campbell, Ostbye & Tummon 2000). However, they can report their data voluntarily to the special interests group, now known as the Society for Assisted Reproductive Technology, whose Registry Committee keeps track of fertility clinic practices and results in the USA [3], whereas UK fertility treatment clinics must register with the HFEA for IVF procedures and must follow strict guidelines (HFEA Fertility Guide 2005/06). This means that some procedures offered by USA clinics are not available in the UK.

The HFEA Code of Practice 2004 restricts the number of embryos implanted to two embryos per treatment cycle for women under forty and no more than three for women of forty and over. No such restrictions are imposed on USA Clinics (Adamson 2002).

In a review of reproductive health care policies around the world, Deonandan et al. (2000) observed that North American fertility clinics could misreport their success rates, giving an impression of a better treatment outcome rate than is actually the case when successful outcome is measured in terms of a healthy baby. Some clinics may reject patients with a bad prognosis, treating only those with a good prognosis. Some clinics will operate an age cut-off whereby women over a certain age are denied treatment; clinics specialising in offering healthy donor gametes will tend to have better success rates than those clinics attempting to work only with the patients' own gametes. IUI patients may be offered IVF, mid-term, when they are hyper-fertile because of the drug regime for IUI, so this may also increase a clinic's success rates where both

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[5] Information provided in an email to the researcher dated 19 August 2005 from Joyce Chia, Communication Assistant at the HFEA.

forms of fertility treatment are offered. Insurance cover for assisted reproductive procedures in the USA is available only in Arkansas, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, Rhode Island and Texas, and this can result in a socio-economic bias in uninsured states where patients' health may be generally poorer (insured patients having to meet stringent conditions in order to claim for treatment). Cost per treatment may be around $8000, so financial considerations are important. A greater number of private clinics in the USA may be encouraging vague, ambiguous or minimalist success reporting in order to enhance rates to attract more patients – resulting in a "market forces" factor which may skew the reported data of the clinics nationally and indicate a better national success rate than is actually the case.

1.7 (ii) The "physician" factor

The difference in clinic success rates, either within or between countries, may be due in part to the skills of the physician, and to some extent this may account for the huge differences in success rates. In the UK, the Assisted Reproduction & Gynaecology Centre, London, UK has very high success rates for IVF and ICSI fresh embryo transfers using own eggs for every category of age compared with other clinics within the UK. For example, for women below 35, the success rate is 59% compared with the average UK success rate of 22% (HFEA Guide to Infertility 2005/6) and this may be due to the fact the Director of the Clinic is Dr. Mohammed Taranissi, who was the first consultant in the UK to carry out the first embryo implant from a thawed frozen egg and whose skills and expertise are generally well known and highly regarded.

A good deal of research has been undertaken over the past ten years into the so-called "physician factor" where it is believed that a high success rate may depend upon the particular skills of the physician who carries out the IVF/ICSI procedure. A large amount of this research has been undertaken in the USA, where there is considerable focus on clinic success rates and the factors that might contribute to these.

A US study of 3 physicians and 500 consecutive IVF embryo implant cycles compared two different groups, where Group 1 (n = 60 couples) had their egg retrieval (ER) and embryo transplant (ET) done by different physicians and Group 2 (n = 290 couples) by the same physician. Groups were matched for number of embryos and fertility diagnosis. Success was defined as a foetal heartbeat detectable by ultrasound in early pregnancy (PR = pregnancy rate). The same physician for ER and ET had a success rate of 28.3% compared with the success rate of 15% for different physicians, giving a p value of <0.05. The study concluded that continuity of care improves pregnancy rate (McInnes, Bayer, Friedman, Ranoux & Harrington 1997).

A further US study compared the success rates of 4 different physician practices. Individual cycles were analysed using logistic regression, 2-sample t-test, chi-square, and Kruskal-

Wallis tests for patient age, days of stimulation, stimulation protocol, number of follicles > 10mm and follicles > 17mm at time of HCG, E2 at HCG, infertility history, oocyte retrieval, ICSI-assisted hatching (AZH), embryos replaced, fertilisation rate and pregnancy rate. It was found that maternal age was significant as an explanation for pregnancy rate differences between different practices using the same laboratory and laboratory personnel, where Practice 1 = 2 physicians, Practice 2 = 1 physician, Practice 3 = 2 physicians, and Practice 4 = 5 physicians (Wood, Batzer, Gutmann, Gocial, Go & Corson 2000).

To test for variations in physician success rates when individual physician rates were compared, with the use of uniform laboratory and treatment protocols, a retrospective analysis looked at IVF success rates for Boston, USA in 1999 (n = 2242 IVF cycles) for patients aged < 38 and 38-40 years. An ideal patient group – in which demographics were uniform – showed no significant difference between physician success rates (divided into two categories as clinical pregnancy and live birth: p = >.8) Demographics controlled for were embryo laboratory and staff (all physicians used the same resources), number of embryos transplanted, random assignment of those performing embryo transplant and lack of financial burden (state legislated insurance cover). There were no significant differences in the success rates for the "ideal patient" group in which variables such as age, gonadotrophin dosage and egg number were eliminated because of the patient profile required for this group. Comparison between groups divided by patient age (<38 compared with 38-40 years) showed clinical pregnancy rates for the <38-year-olds ranged from 20.5% to 35.1% (p = .019) and live births from 17.8% to 31.1% (p =.045). In the 38-40-year-olds group, clinical pregnancy rates ranged from 10.6% to 29.8% (p = .043) and live births from 7% to 25.5% (p = .028). The study concluded that the results suggest that a variety of demographic factors influencing patient selection by some physicians, perhaps to secure a better outcome, and therefore leading to overall better results, might account for difference in success rates between physicians (Lalwani, Timmreck, Friedman, Penzias, Alper, & Reindollar, 2004).

A total of 2,062 IVF cycle starts, with 1,800 oocyte retrievals and 1,572 embryo transfers, were analysed in a USA study (Penzias, Harris, Barrett, Alper, Berger, Oskowitz, Reindollar & Thompson (1997) to evaluate the impact on pregnancy outcome of changes made in IVF programmes. The study used logistic regression analysis controlling for patient age at cycle start, gravidity, parity, number of prior abortions and ectopic pregnancies, total amount of GnRH (Gonadotrophin-Releasing Hormone) used, total units of gonadotrophin administered, number of embryos transferred, the catheter type (for introduction of embryo into the uterus), peak levels of estradiol and Luteinising Hormone (LH), and sperm concentration, motility and morphology. It was found that only three variables had statistically significant associations with the achievement of pregnancy: the patient's age at cycle start (p = .0002), number of embryos transferred (p <0.0001) and type of embryo transfer catheter used (p = .0023). This supports, partly, the

demographics argument for explaining different success rates between physicians, i.e., patient age is a significant factor in treatment outcome.

A recent USA review of 2,705 IVF cycles (n = 1,263 women) experienced by women aged 40 years and over also revealed evidence showing that age was a crucial factor in the likelihood of successful fertility treatment outcome (Klipstein, Regan, Ryley, Goldman, Alper and Beindollar 2005). Data were drawn from the Boston IVF database kept annually for Disease Control from January 1999 to June 2002 and were subjected to two analyses. Treatment type, age at start of treatment, cycle day 3 Follicle Stimulating Hormone (FSH), gravidity, parity, number of oocytes retrieved, number of embryos transferred, presence and number of embryos frozen, number of gestational sacs and foetal heart beats on initial ultrasound, and pregnancy outcome were considered for both groups in Analyses 1 and 2. Embryos were generally implanted three days after oocyte retrieval. Pregnancies were followed to delivery and the live birth rate per cycle start was the primary outcome measure. Repeated measures logistic regression models were used to account for multiple cycles per patient using generalized estimating equations. Number of embryos transferred was categorised as 1, 2, 3, 4+, and cycle day 3 FSH was categorised as <8, 8 to <10, 10 to <12, and $\geq$12 mIU/mL, category for missing data was also used. Two-sided tests were used to obtain p values.

The first analysis included a retrospective review of the 2,705 IVF and ICSI cycles for women $\geq$40 years. Only fresh non-donor IVF and ICSI cycles were included. Four hundred and thirty-three women had undergone treatments before reaching 40 years of age and were excluded from the analysis. Groups were separated by one-year intervals (e.g. age 40, 41, 42, etc.) and their data compared. The overall live birth rate per cycle start for all women was 9.7%. Cancellation of treatment cycles ranged from 16.4% in the youngest women (age 40) to as high as 19.4% for those aged 46 years and over. Earlier age at cycle start was significantly associated (p < .001) with an increased live birth rate per cycle start and also per embryo transfer. Live birth rate at age 40 was significantly higher than that at ages 41 to 43 (p < .02), although there was no significant difference in success rates between groups aged 41 to 43, but by age 44 years live birth rate per cycle start was significantly lower than for those aged between 40 to 43 years (p < .01). Live birth rates per cycle for women aged 45 (n = 22 women) to 46 (n = 9 women) was extremely low (0-2.6%) with only one live birth in the 45-year-old group.

The second analysis examined a subset of 830 women whose first IVF or ICSI cycle was experienced after their fortieth birthday (n =1,915 fresh cycles). The average number of cycles per woman was 2.3 and the age at start of first treatment ranged from 40 to 48.4 years (mean 42 years). Only one woman succeeded in achieving more than one live birth. Of 830 women, 148 achieved delivery from conception with the first three fertility treatments. The cumulative live

birth rate was significantly lower for women undergoing their first treatment at age 43 (p < .02) or 44 (p < .01) compared with those aged 40 to 42.

For the entire group (n =1,263), increased number of embryos transferred was significantly associated (p < .001) with increased live birth rate in women below the age of 45 years, even after adjusting for age at start of treatment. Out of 262 live births, forty women over 40 years of age (15.3%) had a live-born multiple birth. The study concluded that fertility treatment (i.e., IVF/ICSI using non-donor fresh oocytes) has a reasonable chance of success (>5%) until the end of the forty-third year. This study also supports the importance of age as a primary factor when considering likelihood of successful outcome for fertility treatment. Age as a factor in treatment outcome is discussed further in Chapter 6 of this thesis.

In a USA-based two-phase study, 1850 IVF cycles performed between August 1995 and June 1997 were evaluated for physician performance. In Phase 1, pregnancy and implantation rates were analysed and those physicians with lower success rates in Phase 1 underwent strict supervision from July 1996 to 1997 in Phase 2 of the study. A variety of embryo transfer catheters were used in Phase 1 but only one type was used in Phase 2. In Phase 1, out of 610 embryo transfers, there were 138 clinical pregnancies (22.6%) with an implantation rate of 7.9% (202 gestational sacs for 2570 embryos transferred). In Phase 2, there were 242 clinical pregnancies out of 698 embryo transfers with an implantation rate of 14.5% (415 gestational sacs for 2858 embryos transferred. A statistical comparison of the results from the two phases showed the pregnancy rate (p<.0001 95% CI .43 – 0.70) and implantation rate (p< .0001 95% CI 0.43 – 0.61) for Phase 2 as being significantly higher than those for Phase 1. Data were available for comparison of success rates for 11 of the 15 physicians taking part. Different physicians had varying individual success rates in both phases, with some doing better in one phase than in the other. Constant supervision in Phase 2 was significantly associated with improved success rates of the physicians, possibly explained by development of better techniques where actual implantation of the embryo via the catheter was carried out. Type of catheter was cited as a significant factor in achievement of pregnancy in the study by Penzias et al. (1997) cited above. After analysing for such factors as administration of gonadotrophin, duration of stimulation, cancellation rates, frozen embryos and failed fertilisation, there was no statistically significant difference for these factors between patients, and none of the physicians treated older patients, so age also was not a factor for consideration. The study concluded that the performance of individual physicians should be considered in relation to success rates, although patient selection in relation to physician may also be part of the explanation (Vishvanath, Karande, Morris, Chapman, Rinehart & Gleicher 1999). This was not supported by an Amsterdam-based study, which looked at 977 embryo transfers performed by 6 physicians between March 2000 and March 2001. Transfers were carried out on Day 2 or 3 after follicular aspiration, and the transfer procedure was standardised for all embryo

transfers. Assignment of patient to physician was essentially random. ANOVA and logistic regression were used in analysis of the data. Number of embryos, percentage of oocytes fertilised, type of treatment (IVF/ICSI), duration of infertility, female patient age, male factor subfertility, idiopathic subfertility, embryo quality and dummy variables for the physicians were entered into the model and controlled. This last physician variable was excluded from the final analysis. No statistically significant differences were found between the success rates for the physicians, who were all equally experienced. The study concluded that there were so many confounding variables affecting the ability of an embryo to implant and develop into a live healthy baby that it is very difficult to identify single factors that may account for this (van Weering, Schats, McDonnel & Hompes 2005).

Although the number of treatment cycles considered in each of the studies presented here relating to the "physician factor" is large, the number of actual physicians in each study is small and further research with larger numbers of physicians controlling for a wide range of variables might yield better a better understanding of this apparent phenomenon.

1.7 (iii) Fertility treatment method

One of the major factors that may contribute to the difference between UK and USA success rates is the procedure known as pre-implantation genetic diagnosis (PGD). Research into the relationship of PGD with treatment outcome is presented here and further discussed in Chapter 8 for a comparison of the implications of the two studies presented in this thesis.

Pre-implantation genetic diagnosis (PGD) is a procedure that enables the identification of 3-day-old embryos that have some form of chromosomal abnormality, and this procedure can help in ruling out gender-based or X-linked diseases (Wells 2004). Its implementation is not regulated in the USA, although public discussion and legislation for future regulation are encouraged (Pre-implantation Genetic Diagnosis 2005).

In the UK, PGD is used to check for serious genetic diseases such as haemophilia and cystic fibrosis (HFEA Guide to Infertility 2005/6), and clinics are licensed to carry it out when checking for cancer predisposition in the family, autosomal dominant disorders such as Huntington's disease, autosomal recessive diseases (these include cystic fibrosis and spinal muscular atrophy), sickle cell disease, gonadal mosaicism, chromosomal abnormalities and gender typing for gender-related disease only (e.g. X-linked conditions such as haemophilias where males are affected, so only female embryos are replaced). These defective embryos are less likely to result in a full-term pregnancy, so screening for them in order to avoid implanting them and reducing the risk of miscarriage results in increased success rates for IVF/ICSI fertility treatments (Wells 2004).

PGD is available on the National Health Service. It is not offered for sex selection in the UK and may be used only for medical reasons. One UK clinic offers sex selection using PGD through a clinic in Spain, and has treated 49 couples over a 3-year period at a cost of £6,000 to £7,000 each. Sixty per cent of the couples were seeking sons, which suggested that sex selection might not have been used entirely for medical reasons (Parliamentary Office of Science and Technology postnote 2003)

In the UK, only eight out of 85 clinics are licensed to offer PGD to their patients (HFEA Guide to Infertility 2005/06). None of the clinics in the studies for this thesis offers this technique as part of the assisted reproductive process.

In the USA, patients at risk of having babies with chromosomal abnormalities such as Down's Syndrome and sickle cell anaemia, women with a history of recurrent miscarriage, women who suffer repeated failed IVF attempts, women of advanced reproductive age, and women with a family history of cancer are offered pre-implantation genetic diagnosis as part of their treatment. PGD is also offered as a means of tissue matching a potential child with an existing sibling in order to provide that child with a means of recovery (Wells 2004).

In the UK, PGD is offered to women who have had several terminations due to a genetic disease of the foetus (Huntingdon's Korea or sickle cell anaemia, for example), or to couples who have one child with a genetic disease and have a high risk of a second child being affected (HFEA Infertility Guide 2005/6). Thus, embryos which might be affected in this way may be screened out, leaving only healthy embryos for implant selection.

In the UK, PGS, also known as aneuploidy screening (HFEA Fertility Guide 2005/6), can be used to test for Down's syndrome (HFEA Fertility Guide 2005/6). Aneuploidy describes the condition whereby a chromosome is missing or an extra one is present. It is offered to women over 35 who have a high risk of having a baby with chromosomal abnormalities such as Down's syndrome or with a family history of chromosome problems, history of recurrent miscarriages or have undergone several failed IVF treatments (HFEA Fertility Guide 2005/6). A technique called FISH (fluorescent in situ hybridisation, or PCR) is used when one or two blastomeres (cells) that have been removed from an 8-cell stage embryo after IVF are analysed for defects (Munne, Marquez, Magli, Morton & Morrison 1998). PGS using FISH improves outcomes of IVF because it can detect aneuploidy in early development embryos (Wells 2004). The procedure for carrying out PGS is the same as that for PGD (HFEA Infertility Guide 2005/6). FISH is also used in PGD to test for gender-linked diseases (Hardy et al. 2002), unlike PCR, which is not a reliable test for detecting sex chromosomes in early stage embryos.

A further development designed to address ethical issues surrounding PGD is the technique Pre-embryonic Diagnosis for Genetic Disorders (Verlinsky, Rechitsky, Verlinsky, Ivakhmenko, Strom, & Kuliev 2000). Oocytes are tested for mutation factors and only those oocytes free of such factors are cultured into cleaving embryos. Fourteen oocytes from a patient at risk of having a sickle cell child were tested. Six oocytes were identified as normal, of which five developed into cleaving embryos and were transferred to the patient across two cycles, resulting in the birth of a healthy child. The research concluded that this technique was viable for identification of single gene disorders without having to destroy cultivated embryos, as is the case with PCR and FISH procedures used in PGD and PGS.

In a USA-based study, PGD has been shown to be helpful in increasing the likelihood of successful fertility treatment outcome for women age 35 years and older who have experienced recurrent miscarriage, successful outcome being defined as presence of a gestational sac after implantation (Munne, Chen, Fischer, Colls, Zheng, Stevens, Escudero, Oter, Schoolcraft, Simpson & Cohen 2005). This study looked at 58 women who had suffered three or more miscarriages. In the whole recurrent miscarriage group the a priori expected losses were 36.5%, but after PGD the loss rate was 16.7% (5/30 p = .028). In the recurrent miscarriage subgroup, age $\geq$ 35 years, the expected loss rate for the next pregnancy was 44.5%, but the observed loss after PGD was 12% (2/16): p = .007). There were no significant differences in observed and expected outcome for the group under 35 years of age. The study concluded that PGD made no significant difference to likelihood of successful outcome for women under 35 years of age, but that as women of 35 years or over are at greater risk of producing chromosomally abnormal embryos which are then likely to be rejected after implant, PGD selection for this age group reduces the number of embryos by screening out such abnormalities and increases the likelihood of successful outcome, in terms of a pregnancy resulting from embryo implant. It was recommended, however, that randomised clinical trials should be carried out to show that live-born rates are increased and to identify more clearly those types of patients most likely to benefit from PGD.

1.7 (iv) UK availability and restrictions compared with USA practices

Hardy et al. (2002) note that accurate and reliable diagnosis through PGD can be hampered by amplification failure when using the polymerase chain reaction (PCR) technique to identify gender differences in embryos, i.e., X and Y chromosome embryos to screen out Y chromosome embryos in Y-chromosome-linked diseases such as haemophilia. The technique may identify only one allele, the X chromosome, and not detect that a Y chromosome is present (this is called the 'allele drop out' or ADO). There is also the risk of contamination in the process interfering with its ability to perform, so research is continuing into new and better genetic screening strategies such as FISH (fluorescent in situ hybridisation), which is much more reliable.

Whole genome amplification may be a better route for research, and the technique for clinics to use in the future, as it is easier to administer. FISH is a complicated procedure for embryologists to implement in fertility clinics, and using micro-array techniques which will correctly identify the details of gene expression or chromosome copy number will help to remove mistakes in the identification of X and Y chromosomes to which other techniques, PCR in particular, are prone (Wells 2004).

1.7 (v) Differences in UK and USA success rates: summary

From a review of the literature in this section on successful outcome and differences in practices between the UK and the USA, it may be that there are three main factors that could account in large part for the differences in the reported national success rates.

1.   Patient selection. Insurance cover, where it is available in the USA, favours women with a good prognosis, so those women are encouraged to seek treatment because the financial burden of it will be borne by their insurance companies. There is no equivalent to the National Health Service in the USA. In the UK, 25% of fertility treatments are carried out through the NHS, and patient selection with regard to prognosis is not a factor. In fact, recent government legislation advised that all women referred to fertility treatment clinics by their GPs should receive their first fertility treatment free (HFEA Infertility Guide 2005).

2.   Clinics within the USA may compete for patients to some extent, because all treatments are fee-paying, whereas in the UK they are not. This would lead to a "market forces" effect whereby the amount of income a clinic can generate encourages the clinic to interpret its statistical data relating to treatment outcome in the most advantageous way. The more a clinic appears to be successful, the more business it will attract.

3.   Pre-implantation genetic diagnosis (PGD) is freely available to all clinics in the USA. It was not available in any clinics in the UK until 2002. In 2005, only eight clinics were licensed to provide this technology. Research has shown that PGD is associated with an increase in successful outcomes for IVF/ICSI treatments.

1.8 Physical health issues to be considered in the pursuit of successful treatment outcome

There are various conditions which affect a woman's ability to conceive naturally and which may impact on successful treatment outcome in IVF. Those that relate specifically to female reproduction function are ovarian function problems, blocked fallopian tubes and uterine abnormalities, although some problems with fertility may be due to lifestyle, e.g. smoking (Gustafson, Nylund & Carlston 1996).

1.8 (i) Polycystic Ovary Syndrome (PCOS) and ovarian failure

Drugs administered to help women succeed in the fertility treatment process can have unpleasant side effects. Women suffering from polycystic ovary syndrome (PCOS) may experience ovarian hyper-stimulation syndrome (OHSS) when receiving follicle stimulation hormone (FSH) to encourage ova production in a given fertility treatment cycle. This means, literally, that more eggs are produced, so more embryos can be treated, and this leads to an increased likelihood of good embryo selection for embryo transfer, which, in turn, increases the likelihood of successful pregnancy and birth. However, OHSS is a very serious condition – women can experience weight gain of more than 1lb per day, decreased urine output, shortness of breath, abdominal or pelvic pain, nausea, and bloating and swelling of the abdominal area. FSH can also result in multiple pregnancies, and there is a risk of ovarian cancer, because pure FSH can promote the growth of this type of tumour (Aronson et al. 2001). In a Korean study of 64 patients undergoing 94 treatment cycles at a university-affiliated hospital where patients suffered from PCOS, immature oocytes were retrieved from these patients who had not been stimulated. The normal oocytes were matured *in vitro* after culture for 48 hours. ICSI was performed and 85 embryo transfers were carried out, resulting in 23 pregnancies (27.1%) and 20 births. The study concluded that this approach was a feasible alternative for treatment of PCOS women, as it avoided risks associated with FSH (Cha, Han, Chung, Choi, Lim, Lee, Ko & Yoon 2000).

Stimulation of ovaries for good egg production is achieved through the use of clomiphene citrate, or Clomid, a drug that promotes the release of follicle stimulating hormone (FSH). It is taken in pill form, once a day, and can result in heavy weight gain, mood swings, nausea, and heavy periods, among other symptoms. More seriously, prolonged use (over a year) results in a small increase in the risk of developing ovarian cancer (HFEA Guide to Infertility 2005/6).

1.8 (ii) Septate or bicornate uterus

Septate uterus is a congenital condition whereby the uterus has failed to develop properly and may have a full or partial division, or septate, present, which can obstruct pregnancy. Corrective surgery, however, can be a useful measure in counteracting this. Pabuccu and Gomel (2003) found that of 61 women (≤ 35 years) suffering from this condition, 18 went on to have live births after receiving hysteriscopic metroplasty to correct the problem, and it was concluded that this operation would be of help to other sufferers in their desire to have their own children. A link between septate uterus and infertility has not yet been established: the problem lies not in conceiving but in bringing a pregnancy to a viable birth in women with unexplained infertility, who also had septate uteri. Where corrective surgery was carried out, risk of subsequent miscarriage following fertility treatment was reduced, thereby in effect increasing the number of prognoses of successful treatment outcome, where success is defined as a pregnancy resulting in a

live birth. Generally speaking, about 80% of women carry their pregnancies successfully after surgical treatment (Aronson 2001).

1.8 (iii) Endometriosis

Endometriosis is a condition whereby the lining of the uterus can be found outside the organ, and on the ovaries, fallopian tubes, bladder, intestine and pelvic sidewalls, and in rare cases in the lungs, abdominal wall muscles, and in the brain. This lining, wherever it is found, bleeds during menstruation. It can seriously threaten the function of the ovaries as well as causing severe pain. It may impact on fertility levels and implantation rates (Cahill 2002) when the endometrium is found on the ovaries, causing the formation of black or "chocolate" cysts which can reduce the number of oocytes produced by the ovaries in any treatment cycle, with attendant implications in the form of reduced success in formation of embryos and subsequent transplants (Aronson 2001). Cahill (2002), in a review of several studies, suggested that even though corrective treatment for endometriosis improved fertility treatment outcome, whether endometriosis alone or its presence together with other factors was problematic for fertility treatment success is not clear. However, he concluded that management of endometriosis nevertheless does improve fertility.

Mahutte and Arici (2002) noted that in the absence of tubal distortion, there is considerable evidence to suggest four principle factors associated with endometriosis and consequent sub-fertility: impaired folliculogenesis (poor ability to produce eggs), decreased fertilization, inflammatory factors in follicular, peritoneal and reproductive tract fluid, and implantation defects probably associated with poor quality eggs. Poor quality eggs also affect fertilization success rates, together with effects on endometriosis sufferers' follicular fluid on the ability of the spermatozoa's abilities to fuse with the ova. A large retrospective analysis of 980 ICSI cycles showed no significant associations with failed outcomes for women with endometriosis, suggesting that ICSI may be useful in helping some women suffering from this condition (Minguez, Rubio, Bernal, Gaitan, Remohi, Simon & Pellicer 1997).

1.8 (iv) Fallopian tubes

The fallopian tubes are simply described as two hollow tubes that transport ova from the ovaries to the uterus. In normal conception, a sperm will meet an egg in one of these tubes (ampulla) for fertilisation (Aronson et al. 2001). When the tubes are blocked, IVF can be used to create an embryo outside the body, which can then be transported, via a catheter, directly into the uterus for implantation.

For women whose fallopian tubes are viable, another technique, ZIFT (zygote intrafallopian tube transfer) may be more effective than IVF in achieving a successful fertility treatment outcome. An Israeli study (Levran, Mashiach, Dor, Levron & Farhi 1998) of 70 patients

who underwent 92 ZIFT cycles showed significantly higher pregnancy and implantation rates than the control group: 34.2% (24/70) and 8.7% (29/333) compared with 17.1% (12/70) and 4.4% (13/289) respectively (p = 0.002 and p = 0.04, chi-square. Fisher's exact test and student's t-test, as appropriate, were used for analysis). All patients had experienced repeated IVF embryo transfer failure. Groups were matched for age and diagnosis of infertility and patients were randomly selected to each group. The study concluded that ZIFT would be of benefit to women with at least one healthy fallopian tube who had a high IVF/embryo transfer failure.

Habana and Palter (2001) challenged this finding in a meta-analysis comparing the results with data available on the Society for Assisted Reproductive Technology (SART) database. In a study of 24 reports on ZIFT & IVF/embryo transfer (ET) success rates, findings from published randomised trials from various countries, including those in Europe and the far East, were grouped together and analysed and compared with the successful treatment outcome rates for ZIFT and other assisted reproductive techniques, as presented in SART statistical reports on success rates for participating USA clinics for the years 1996 to 1998. The study conducted by Levran et al. (1998) was excluded from the meta-analysis because it was considered non-randomised in its design. Habana and Palter (2001) concluded from their analysis of the data and comparison with the SART figures that there was no significant difference in success rates between ZIFT and other techniques. However, they reported that "not all trials included in the meta-analysis evaluated each of the outcome variables given. Thus, each outcome analysis was based on a variable number of studies" (p287). Such variations occurring in meta-analysis can be problematic for the reliability of the results, and it is preferable to conduct studies with large patient samples using sound methodology and replication to explore possible significant associations between different factors and treatment outcome, as Levran (2002) sought to do, in relation to the findings presented in Levran et al. (1998).

Levran, Farhi, Hehum, Royburt, Glezerman and Weissman (2002) found in their prospective, randomised Israel-based study that there was a significant difference between success rates for ZIFT and IVF/ET. ZIFT transfer was compared with extended culture blastocyst stage transfer (n = 64 patients). Implantation, clinical pregnancy and live birth rate were all significantly higher for the ZIFT group compared with the blastocyst transfer group (15/32 vs 4/32 respectively) and supported the earlier findings of Levran et al. (1998) that pro-nuclear oocytes (zygotes) are more effectively implanted into the uterine endometrium when the zygote is transported naturally to the uterus via the fallopian tubes.

1.8 (v) Use of drugs to aid better fertility treatment outcomes

In a retrospective cohort study of assisted reproductive technique (ART) centres (the equivalent of fertility treatment clinics in the UK) in the USA, the outcomes of 19,682 ART

procedures across 135 clinics in 1999 were analysed for clinical pregnancy and live birth delivery compared follicle stimulating hormone (FSH) and Estradiol (E(2)) levels across different age groups. It was found that FSH levels increased linearly with decreasing pregnancy (p <0.001) and live birth rates (p <0.001) for women < 35 and for women > 35yrs, controlling for diagnosis (fertility history), number of embryos transferred, previous births, previous ART therapy and use of GIFT, ZIFT, ICSI or assisted hatching (where the zona pellucida, the outer shell of the ovum, is pierced to encourage cell division). Frozen embryo transfer was not included in this analysis, and it was not possible to factor in individual patients, so only the treatments and the results were analysed. Multivariate logistic regression and 2-tailed statistics tests were used. The significant association of decrease in pregnancy rates with increase in FSH and E(2) levels appeared to be a good independent predictor of success independent of age and other clinical prognostic factors, suggesting that careful control of these levels was necessary to increase the likelihood of a successful outcome (Frazier, Grainger, Schieve & Toner 2004).

A Korean prospective, randomised, double-blinded placebo-controlled clinical study (Moon, Park, Lee, Kim and Joo 2004) was carried out to test the effectiveness of the drug piroxicam for priming the uterus in order to increase successful implantation and pregnancy rates from IVF and frozen-thawed embryo transfers. One hundred and eighty-eight fresh and 78 cycles of frozen embryo transfers were analysed in a group of patients suffering from tubal, male infertility, unexplained, or endometriosis factors. Statistical analysis was carried out using the unpaired student's t-test and chi-square test. A p value of <.05 was considered statistically significant. Mean age of the controls was 32.7 (+/-4.3) years compared with the piroxicam treatment group mean of 33.0 (+/-4.8) years. Mean number of retrieved oocytes was 10 for the controls and 11 for those undergoing the treatment. There were no significant differences between groups for age, parity, ovarian reserve or E2 level on the date of hCG administration, egg retrieval, embryos transferred or quality of embryo. Mean number of embryos transferred in each group was four. Implantation and clinical pregnancy rates were 8.6% and 27.6% respectively for the controls and 18.7% and 46.8% respectively for the treatment group. Both rates were significantly higher in the piroxicam treatment group compared with the controls (p<.05). Although piroxicam improved success rates for women under 40, it did not appear to have significant benefits for those of forty years of age or over. The authors suggested that piroxicam might have a calming effect on uterine contractility or improve blood flow to the uterus, resulting in better implantation success rates, but recommended that further research should be carried out in order to understand what mechanisms might be responsible for this result.

1.8 (vi) Complementary medicine therapy

Addressing the overall approach to fertility treatment (Deonandan, Campbell, Ostbuye & Tummon 2000) could also help to optimise treatment outcome and reduce the number of treatment

cycles. Dr. Julian Kenyon[6] of The Dove Clinic, Twyford, Hampshire, UK, who along with George Lewith was a founder of complementary medicine clinics in the UK in the 1980s, explained that traditional Chinese medicine was used to target organs in the treatment of fertility problems. In Chinese medicine, the spleen, kidneys, and most importantly the liver, are all considered to be strongly connected with fertility. Minerals, especially zinc, are also given to aid healthy fertility, particularly in men. The Dove Clinic provides this service to its patients, who are seeking help in achieving better treatment outcomes. In Dr. Kenyon's experience, those patients receiving treatment from clinics with a success rate of between 19% and 25% would, after receiving complementary medicine treatments related to reproductive health at the Dove Clinic, expect to increase the likelihood of success to between 35% and 40%.

Reducing the number of treatment cycles is a primary concern in health issues for women undergoing fertility treatment, and in particular IVF, as the process is invasive and the drug regime can result in very distressing experiences such as ovarian hyper-stimulation (EF), and 50% of treatment cycles started do not result in conception (Heijnen, Macklon & Fauser 2004).

A review of future developments in assisted reproduction in humans (Hardy, Wright, Tachataki, Roberts, Morgan, Spanos & Taylor 2002) reports that results of blastocyst transfer have been variable, with implantation and pregnancy rates ranging from 45 to 65% across clinics. However, a prospective randomised study (n = 1299 patients) indicated pregnancy rates of 25% and 28% on day 3 and day 5, respectively, for all embryos implanted. Day 5 implants had a higher success rate, showing 26% compared with 18% for 8-cell embryos implanted on Day 3, although this significant difference appeared to be due to a good morphologic appearance in the 5-day embryos compared with those chosen for implant on Day 3: culture conditions and media were not controlled, and so may or may not have had some effect on outcomes (Huisman, Fauser, Eijkemans & Pieters 2000).

European data show that up to 25% of patients who undergo a first IVF cycle do not continue with further treatment (Heijnen, Macklon & Fauser 2004). The reasons given are stress and side effects, e.g., hyper-stimulation of ovaries, as well as cost and poor prognoses (Wells 2004).

Heijnen et al. (2004) recommend improving treatment procedures using shorter patient-friendly stimulation protocols instead of conventional stimulation protocols, which latter can result in hyperstimulation, a condition that develops in the process of encouraging the ovaries to produce many follicles, resulting in a good egg harvest. Ovarian hyperstimulation is very painful for the

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[6] The use of Chinese medicine in assisting fertility treatment patients was discussed with Dr. Kenyon by the researcher in a personal telephone conversation on 11th August 2005 (4:40-4:45 p.m.).

patient, with the Follicle Stimulating Hormone (FSH) drug in its pure form being associated with a risk of the development of cancer (Frazier, Grainger, Schieve & Toner 2004), and women, understandably, can be deterred from continuing with further treatment cycles. It is recommended that a less aggressive approach would lead to greater eventual success, even if a greater number of treatment cycles per patient were necessary. This would also have important implications for the future well being of the patient undergoing IVF.

1.9 Reducing failure rates

In a review of reproductive health care policies around the world, it was noted that successes are measured using cycle numbers when risk factor modelling is undertaken, and the individual patient is not considered as a factor in the analysis. This element should be built into this kind of logistic or multiple regression analytic approach when considering what factors are associated with a successful outcome. Such a consideration is important because, it is suggested, the degree of risk of failure is associated with number or cycles attempted prior to achieving success, where each successive treatment failure increases the likelihood of no eventual successful outcomes (Deonandan et al. 2000).

The HFEA Code of Practice 2004 restricts the number of embryos implanted to 2 embryos per treatment cycle for women under forty and no more than three for women of forty and over. No such restrictions are enforced for fertility treatment clinics in the USA (Adamson 2002).

Average pregnancy rates after IVF and embryo transfer are <25%, even after transfer of several embryos (Hardy et a. 2002), and 27% of these pregnancies are multiple gestations (HFEA 2000b).

Extending embryo culture to the blastocyst stage in order to increase the chance of a successful embryo implant can increase the likelihood of the embryo's developing into monozygotic twins (Behr and Wang 2004). Twins are at higher risk of morbidity in general (Russel, Petrini, Damus, Mattison and Schwartz 2003).

PGD selects embryos with the best chance of implanting, so that a reduced number of embryos can be implanted without lowering the chance of succeeding (Wells 2004).

Heijnen, Macklon & Fauser (2004) argue that if patients are to be persuaded that the chance of success will not be compromised by elective singleton embryo transfer they would then be more receptive to it.

A preliminary definition of unexplained infertility, and one which still applies today, was suggested by Taylor & Collins (1992, p8) in the following way "unexplained infertility can be said

to exist when all tests of the reproductive processes which are reliable in identifying those conditions that can be shown to impair fertility are normal". Unexplained infertility is what is left when everything else has been accounted for, but as research progresses and it is possible to find increasing explanations for previously inexplicable fertility barriers, it may be possible to dispense with the term altogether.

A European study of 108 females (age range 17 to 43, mean age 27.5 years) categorised them into groups of diagnosed polycystic ovaries (n = 16), polycystic ova syndrome (PCO) (n = 20), endometriosis (E) (n = 38), and chronic anovulation, luteal phase insufficiency, subfertility or unexplained infertility (INF) (n = 34). They were then compared with a control group (age range 17 to 43 years, mean age 31 years) of 392 women. Autoimmune reaction in PCOS and endometriosis together with unexplained infertility showed significantly different levels of autoantibodies compared with the control group (p < 0.005), indicating high autoimmune reaction in women with reproductive failure due to PCO, PCOS, E and INF (Reiman, Talja, Metskula, Kadastk, Matt & Uibo 2001). This suggests that autoimmune response is an important consideration when seeking to treat unexplained infertility and to increase likelihood of successful treatment outcome.

Natural killer cells are linked with recurrent spontaneous abortion and endometrial abnormalities. Levels detected at embryo implant sites suggest some sort of association. This may explain "unexplained" infertility to some extent. PGD helps screen out abnormal embryos. It may be that future research could answer the question: does use of PGD result in the elimination of embryos from implant selection that are likely to stimulate negative response in the immune system, leading to rejection?

1.10 Biological and non-biological issues

Many biological and non-biological issues have been of concern when assessing how various factors might affect fertility treatment outcome. Issues specific to IVF/GIFT procedures (i.e. side effects, surgery, anaesthesia, insufficient information, pain, recovery, finances, missing, and live birth delivery) were evaluated in a prospective study carried out in seven centres in Southern California, USA, between 1993 and 1998 (Klonoff-Cohen & Natarajan 2004). One hundred and fifty-one women completed the "Concerns during assisted reproductive technologies" (CART) scale and pregnancy outcomes questionnaires prior to undergoing fertility treatment. The results were compared with number of eggs harvested and fertilised, number of embryos transferred, pregnancy rates and live birth delivery rates. Logistic regression models were used to control for various demographics. It was found that women who were moderately concerned about missing work were significantly more at risk of not achieving a pregnancy compared with their unconcerned counterparts (OR = 2.83, 95%CI = [1.04, 7.71], p = .04). Women who were

very concerned about their finances were also significantly at risk of not having a successful live birth delivery compared with those who were indifferent (adjusted OR = 11.62, 95% CI [1.84, 73.59], p = .009). The analyses were repeatedly adjusted for such possible confounding variables as female age, ethnicity, education, smoking status, type of procedure, parity, number of previous attempts, type of infertility, and clinic site. However, other possible concerns that patients may have had such as cancer risks (from hormonal stimulation), possibility of multiple births, miscarriages, birth defects, premature labour and delivery, selective reductions on number of embryos, and advanced age (during pregnancy and motherhood) were not addressed in the questionnaire, and the study recommended further research to consider these factors. Counselling for the identified areas of concern was recommended as a means to reduce stress in the treatment process with the possible consequence of improving treatment outcome.

In the last twenty years, research into stress and fertility treatment outcome has provided an increasing body of evidence for a significant association between raised anxiety levels and failed fertility treatment outcome. Particularly stressful forms of treatment, i.e. intracytoplasmic sperm injection (ICSI), microsurgical epididymal sperm aspiration (MESA) and testicular sperm extraction (TESE) were excluded in order to ensure that the women interviewed reflected an average fertility treatment population. There were significant differences between the fertility treatment women and the controls for depressed mood (SD 0.27, P <0.001) and anxiety/fears (SD 0.28, p <0.001), showing that fertility treatment women experienced significantly higher levels of depression and anxiety than their controls. A self-administered questionnaire-based survey using the Women's Health Questionnaire (Hunter 1992) and involving 281 patients in Belgium, the Netherlands and France awaiting fertility treatment, was carried out to assess psychological stress in fertility treatment women compared with 289 women who already had one child of their own and no history of fertility treatment. The Questionnaire investigated depressed mood, somatic symptoms, anxiety/fears, sleep problems, memory/concentration and attractiveness. Significant differences between the groups, where patients' experiences were higher, were surprise, shock, shame, embarrassment, wished it was not true, anger, "Why me?", isolation, guilt, felt hurt, thought it was part of life, thought it was just normal, felt depressed, felt inadequate (all at p <0.001). However, the authors admit that the responses from each of the groups were based on recollections of experiences over a period of between 2 to 16 years, and that there may consequently have been some distortion in the reporting due to the time that had elapsed. In addition, the authors suggested, women who ultimately sought fertility treatment may have exaggerated the negative feelings during the time when they were trying and failing to conceive leading up to seeking help, whereas those in the control group may have had a diminished recollection of negative feelings, because of their eventual spontaneous conception.

There is some evidence to suggest a significant association between proneness to and experience of depression and a negative fertility treatment result. Nearly 77.9% of patients admitted to feelings of depression when trying to conceive a child, compared with 11% of women in the control group (p <0.001). When feelings of depression expressed by patients were applied to detect depressive disorders, according to the methodology described by Hunter (1992), one in four patients was classified as having such a disorder. Current subjective well-being scores at the time of the survey, i.e., when the fertility treatment patients were awaiting treatment, indicated significant differences between the groups for depressed mood, memory/concentration, anxiety/fears and attractiveness (all p <0.001). The study found, however, that there was no significant difference between the numbers of women with anxiety disorders present in each group. The retrospective nature of the study design (especially for the control group response measures) meant that it was not possible to establish satisfactorily the nature of the association of depression and anxiety, i.e., does failure of treatment outcome lead to increased anxiety/fears and/or depression or does increased anxiety/fears and/or depression lead to failed treatment outcome? (Oddens, Tonkelaar & Nieuwenhuyse 1999.)

Some research has indicated that psychological morbidity (to which anxiety may contribute) increases in women with the number of failed treatment cycles that they experience. In a Spanish study carried out by Guerra, Llobera & Barri (1998), 110 infertile patients (n = 38 men and 72 women who were all high- or middle-class and white) were interviewed using the structural clinical interview for diagnosis (axis 1) as advised by the Diagnostic and Statistical Manual for Mental Disorders to assess psychiatric morbidity. The sample was divided into two groups and the findings for each group were compared. Group 1 consisted of patients who had been referred to the psychosomatic medicine service by the physician in charge because of clinically perceived anxiety or emotional distress (n = 56, 14 men and 42 women), and group 2 consisted of non-referred patients (n = 54, 24 men and 30 women). No significant differences between the groups were found for age, type of infertility, duration of infertility, previous miscarriages or previous pregnancies, although significant differences were found between groups for IVF treatment, where more women underwent IVF in the non-referred group (66.7%) than those in the referred group (38.1%), (p < 0.02), and for number of treatment cycles (p < 0.001). In the group referred for psychosomatic assessment, psychiatric disorders were diagnosed in 39 of 56 patients, compared with 13 of 54 in the non-referred group. Fourteen of 21 women in the referred group who had adjustment disorders also suffered from anxiety, compared with only one woman in the non-referred group. Psychiatric morbidity was significantly associated with number of treatment cycles and gender, i.e., women, rather than men, in the whole study population (p <0.0001 in the referred group and in the non-referred group: p <0. 0010) and length or duration of infertility in both females (p < 0.042) and males (p < 0.037) in the non-referred group. The study noted that there was a high level of psychiatric morbidity among patients in the non-referred group compared

with the general population, and this may have been because not all patients needing psychological intervention were identified or the physicians selecting them were not sufficiently trained to make such identifying diagnoses. Also, patients' anxiety levels before infertility had not been assessed, so it was not possible to assess the impact of infertility on trait anxiety levels. Based upon the findings, however, psychological counselling to reduce stress and combat possible pre-psychiatric morbidity in fertility treatment patients was advised.

Marital stress was found to be a primary concern for fertility treatment couples in a prospective cohort exploratory study of 2250 patients (n = 1169 women and 1081 men, of which 1069 couples had both partners participating) conducted in Denmark. To assess demand for psychosocial services, questionnaires were given to infertile couples newly attending five different fertility clinics (Schmidt, Holstein, Boivin, Sangren, Tjornhoj-Thomsen, Blaabjerg, Hald, Andersen & Rasmussen 2003). The questionnaire, which collected data on female reproductive history, psychosocial aspects of treatment including motivation and expectation, fertility problem stress, communication, social relations, ways of coping, sense of coherence, and health and well being, was first pilot-tested on 122 infertile people (54 men and 68 women); a few subsequent necessary reformulations were carried out. Multivariate analyses of variance (MANOVA) and univariate F-tests were used to determine fertility problem stress differences between men and women. Logistic regression was used to identify predictors for importance ratings and intention to use professional services. Predictor variables were age, years together, the couple having no child together, years infertile, clinic, personal, social and marital stress, and marital benefit. Odds ratios were used to calculate significant p values where an odds ratio of 1.15 accumulates to a total change of 2.35 if the stress subscale has 10 units.

There were three main findings:

1. Fertility problem stress for both men and women, specifically personal and marital stress, were associated with the importance of providing patient-centred care, with only one type of distress, higher marital stress for men, predicting higher importance ratings for discussions about adoption with medical staff;

2. Marital benefit, i.e. that infertility had strengthened the partnership and brought the partners closer together, was a predictor of higher importance ratings for patient-centred care for men and women;

3. Importance ratings decreased with increasing age for most of the services, and not having a child together was in many cases associated with rating medical and patient-centred care as important.

All measures of fertility problem stress were significant in the prediction of importance ratings attached to psychosocial services for women (p < 0.10). It was found that the main predictor of perceived importance of patient-centred and professional psychosocial services for

both sexes was infertility-related marital, personal or social stress. The study concluded that psychosocial services, although perceived as important only by a minority of patients (women 8%, men 4.1%), should be available in all fertility clinics, but especially for those couples suffering from marital stress.

In a prospective longitudinal study of men and women (n = 818 couples) undergoing fertility treatment, Boivin and Schmidt (2005) explored the impact of stress on treatment outcome. Participants completed a Fertility Problems Questionnaire at the start of a designated twelve-month period, and the measures were compared with successful pregnancies and failures of the treatments experienced by each couple during the twelve-month study period. It was found that women suffered more from marital stress than men, and women who reported more marital distress needed more treatment cycles to conceive compared with women reporting less marital distress (odds ratio = 1.20: Model chi-square (3) = 77.21 $p < .001$). After controlling for age and period of infertility, level of stress at the start of infertility treatment was found to affect outcome significantly. Women who had experienced intense stress in their marriages as a result of infertility were less likely to be successful with treatment, although the failure may have been due to a tendency for such couples to drop out of the fertility treatment programme, discontinuing with future treatment cycles. The study design measured stress levels at the start of treatment, so negative feedback in the treatment process (e.g. poor fertility prognosis) could not have contributed to stress levels. In an earlier study by Verhaak, Smeenk, Eugster, van Minnent, Kremer and Kraaimaat (2001), marital stress in couples was found to increase with each failed treatment cycle, whereas stress levels in terms of depression decreased in women who became pregnant. The trend increased with each failed cycle, indicating a need for the implementation of stress management programmes for IVF and ICSI patients in the course of several treatment cycles in order to increase likelihood of successful treatment outcome.

A possible relationship between distress and poor pregnancy rates was explored in a study of 42 women undergoing fertility treatment. It was hypothesised that treatment distress would be related to IVF failure in women who did not respond well to this kind of medical intervention (Boivin, Hemmings & Takefman 1995). Women provided daily self-reports on their distress for one cycle, and the women were divided into four groups according to the levels of distress that they reported. Comparisons between groups showed that greater distress during treatment was associated with poorer pregnancy rates, regardless of biological vulnerability ($p < .05$). Boivin & Takefman (1996), in a study of 20 women who completed a daily symptom checklist for one complete menstrual cycle without treatment and one with treatment, found that distress levels were higher during IVF than during a menstrual cycle during which no treatment was given.

1.11 Anxiety and depression related to FT outcome

1.11 (i) *Anxiety*

Raised anxiety levels were found to be significantly associated with spontaneous abortions in pregnancies resulting from donor insemination (Demyttenaere, Nijs, Steeno, Koninckx & Evers-Keibooms 1988). A group of 116 Dutch women were assessed using a translated version of the STAI anxiety scales (Spielberger 1993), which they completed immediately before the first donor insemination procedure. Duration of infertility, woman's age, female fertility status and husband's infertile status were controlled for. Sixty women conceived after attempts ranging from 1 to 7; twelve of them experienced spontaneous abortions. The sixty women were divided into seven groups, reflecting number of attempts experienced before achieving pregnancy. Trait anxiety levels for each of these groups were compared and a significant association between increasing levels of trait anxiety and number of attempts was shown (F-value 3.01: $p < 0.01$). It was also found that women with early spontaneous abortions were initially more anxiety-prone than those women whose pregnancies went to full term ($p < 0.02$). Further, it was found that women with high trait anxiety levels underwent more treatment cycles before achieving conception ($p < 0.008$).

A significant relationship between state anxiety and negative treatment outcome was found in a Dutch study of 237 women undergoing embryo transfer (Smeenk, Verhaak, Eugster, van Minnen, Zielhuis. & Braat 2001). The study used a logistic regression model to control for age, duration of infertility, number of previous pregnancies and infertility diagnosis. Only the biomedical variables age and lower number of previous pregnancies correlated with poor outcome. Anxiety was measured using the Dutch version of the State Trait Anxiety questionnaires. Using composite scores in the model, a significant relationship with treatment outcome ($p = 0.01$) was found whereby pregnancy rate was influenced by raised anxiety level. Composite depression scores, obtained using the Dutch version of the Beck Depression Inventory, were considered within the model, and this produced a significant association slightly less strong than state anxiety ($p = .03$), indicating that state anxiety alone is a better predictor of pregnancy than depression.

Episodic anxiety, rather than state or trait anxiety, was found to correlate significantly with poor treatment outcome in an exploratory study in the Netherlands of 47 female fertility treatment patients undergoing a second IVF cycle, where successful treatment outcome was defined as detection of foetal heartbeat by ultra sound at seven weeks' gestation (Eugster, Vingerhoets, van Heck & Merkus 2004). The definition "no pregnancy as a result of treatment" included no embryo transfer. Anxiety measures were taken before beginning IVF procedure and two weeks after a failed IVF/ICSI treatment. Episodic anxiety was defined by using a scoring variation on the state anxiety scales whereby patients who scored ≥ 36 on the first and second state anxiety measures were categorised as experiencing episodic anxiety (n = 20). Those patients who scored <36 on

both measures (n = 13), and ≥36 on Measure 1 and <36 on Measure 2 (n = 5), and those who scored <36 on Measure 1 and >36 on Measure (n =5), were all categorised as non episodic (total n = 10). Those patients who did not belong to the episodic anxiety group but who scored ≥36 on only one of both measures were categorised as experiencing acute anxiety. Greater number of follicles (indicating better egg production) and number of embryos implanted were significantly associated with successful treatment outcome. A logistic regression analysis with a forward stepwise method was performed, with biomedical variables to identify factors associated with successful treatment outcome, and it was found that the higher the number of embryos produced in the laboratory, the greater the likelihood of a successful outcome. An analysis was then carried out on the psychological factors acute, episodic or general anxiety. Episodic anxiety was shown to be a strong predictor of a negative outcome and stronger than the biomedical variable, number of embryos. The study advised further research, however, as the samples in each group were small.

The challenge of effectively addressing the problem of raised anxiety levels in fertility treatment women was addressed in a study in which participants attended weekly sessions over a ten-week Behavioural Medicine Programme for Infertility, which included relaxation response training, stress management, cognitive restructuring, nutritional education, and gentle stretching exercises, together with a half hour of group support provided before each session. This was optional but was attended by almost all patients (n = 41). STAI anxiety measures were scored for each patient before and after attending the programme, and comparisons showed significant decreases in both state (p < 0.0037) and trait anxiety levels (p < 0.0001. In the following six months, thirty-nine women were able to undergo fertility treatment, from which 16 pregnancies resulted. There was no control group, so it was not possible to know whether or not the reduction in anxiety levels had resulted in an increased pregnancy rate; but the significant difference in anxiety scores before and after attending the Behavioural Medicine Programme suggests that this approach may be of value in reducing anxiety levels in fertility treatment women in general, with the possible consequence of improved successful outcomes (Domar, Zuttermeister, Seibel & Benson 1992). However, Boivin, Scanlan and Walker (1999) found that women undergoing fertility treatment (n = 94) were more likely to seek support from their partner and family when experiencing distress rather than seeking formal help, e.g., through different forms of psychosocial counselling. This would suggest that patients need to be actively encouraged to seek out some form of professional counselling that might help alleviate anxiety, with possible positive effects on treatment outcome. Counsellors are available through some UK fertility clinics.

The relationship between anxiety levels and treatment outcome presented here is explored in detail in Chapters 3, 6 and 7 of this thesis.

1.11 (ii) Depression

Depressed women achieved a lower pregnancy rate for first treatment cycles than non-depressed women in a study of 330 women, 113 of whom were first-time participants and 217 repeat cycle women (Theiring, Beaurepaire, Jones, Saunders and Tennant 1993).

Concern that depression may be drug-induced was investigated in a preliminary study by Toren, Dor, Mester, Mozes, Blumensohn, Rehavi and Weizman (1996) which looked at 29 women due to undergo IVF treatment. It was found that pre-treatment with gonadotrophin-releasing hormone (GnRH) is associated with a substantial increase in depression level, although none of the women developed full-blown depression. However, the study recommended further investigation using a double-blind, placebo-controlled design in order to gain a better understanding of this association.

Increased levels of depression were found among women undergoing IVF treatment in a USA-based study of 338 infertile women and 39 healthy women (Domar, Broome, Zuttermeister, Seibel & Friedman 1992). Participants were invited to complete the Beck Depression Inventory while they waited for a scheduled appointment with their consultant. The control group subjects had to be married, healthy, and of reproductive age, with no history of infertility, and were attending either a hospital-based gynaecology unit or an internal medicine practice awaiting a routine gynaecological examination. There were no significant differences between the groups for age, education, day of menstrual cycle, history of miscarriage or ectopic pregnancy, or history of psychotherapy. Thirty-seven percent of the infertile women scored in the "depressed" range on the BDI, compared with 18% of the control subjects (p <0.025). Infertility patients' mean BDI scores were significantly higher than those of their non-fertility controls (p < 0.0006). Women undergoing fertility treatment who had a history of infertility-related surgery had significantly higher depression scores than women who had not had surgery (p < 0.03), and those women who had a history of psychotherapy or had received it before experiencing infertility had significantly higher depression scores than women who had never received psychotherapy (p < 0.008 and 0.00001 respectively). No such significant association was found for the women in the control group. It was noted that infertile women who had suffered the condition for 2 to 3 years had significantly higher BDI scores than women with durations of <1 year and >6 years (p < 0.011) women with unexplained or undiagnosed infertility, while women whose cause of infertility had been diagnosed had significantly higher BDI scores (p < 0.03) than those suffering from undiagnosed or unexplained infertility. The third year of trying to conceive was associated with the highest depressive scores, although this may have been due to a "drop out" factor whereby highly depressed women left the programme and discontinued treatment. The research concluded that depression in women undergoing fertility treatment should be treated in order to reduce

depressive symptoms, especially in the case of women with a 2- to 3-year history of infertility, infertility-related surgery and/or a prior history of psychotherapy.

The period between receiving embryo implant and receiving pregnancy test result was identified as the most stressful period for women undergoing IVF (n = 37), with the time of the pregnancy test being the most stressful time of all (Yong, Martin and Thong 2000). Levels of stress were measured using the Mean Affect Adjective Check List before treatment, before embryo transfer, and before pregnancy test. It was found that hostility, depression, and state anxiety scores for pregnancy test were higher than the corresponding scores for pre-treatment and pre-embryo transfer (p < 0.001), with the exception of anxiety scores for pre-embryo transfer. The study recommended that psychological counselling should be offered to women after embryo transfer and leading up to pregnancy test, in order to combat increased stress levels. The implications of a relationship between depression and treatment outcome are further explored and discussed in Chapters 3, 6, 7 and 8 of this thesis.

1.12 The biological and psychological relationship and its implications for Fertility Treatment

Indications of the association of prolactin with anxiety were found in a study of 15 fertility treatment couples (O'Moore, O'Moore, Harrison, Murphy & Carruthers 1983). There was a significant reduction of prolactin levels relative to decreased anxiety scores following fertility treatment. This is an important consideration, as prolactin is a hormone that stimulates the production of breast milk during pregnancy and will inhibit the production of eggs by the ovaries (Aronson et al. 2001) with attendant consequences for the IVF treatment process.

Psychological and hormonal responses in a group of fertility treatment women (n = 30) exposed to a video film on treatment of infertility, pregnancy and delivery were measured. It was found that levels of prolactin, cortisol and testosterone varied with the trait anxiety levels, and research was recommended when investigating the phenomenon of "psychological" infertility (Demyttenaere, Nijs, Evers-Kiebooms & Koninckx 1989). The relationship of anxiety with success and failure of treatment outcome was explored in a study of 85 women in Israel; state anxiety levels were measured in four phases of fertility treatment and the scores compared between the group who successfully conceived (n = 23) following treatment and the group that did not (Merari, Feldberg, Elizur, Goldman & Modan 1992). Prolactin and cortisol hormone levels were also measured, and it was found that for the measure taken after embryo transplant but before treatment outcome was known, there was a significant negative correlation between state anxiety levels and levels of these hormones in the women who successfully conceived while there was no change in levels in those who were unsuccessful. The researchers concluded from this that in a state of anxiety, the central nervous system may contain a mediating factor, such as endogenous opiates, that has a mediating role between mental state and hormonal secretion, perhaps explaining

reduced levels of state anxiety and also depression in women who conceived successfully compared with those who did not.

However, in another study, cortisol levels and other stress markers measured in urine samples taken for 61 treatment cycles and compared with treatment outcome did not support an association between stress and poor pregnancy rates (Lovely, Roddenberry, Ekstrom, Golden & Meyer 1997). The hormone adrenaline was a factor that appeared to have a significant correlation with treatment outcome in a study undertaken by Smeenk, Verhaak, Vingerhoets, Sweep, Merkus, Willemsen, van Minnen, Straatman and Braat (2005), who aimed to examine the association between urinary levels of the stress hormones adrenaline, noradrenaline and cortisol during treatment of self-reported stress, so that earlier observations of anxiety and depression with negative treatment outcome could be further assessed. The study looked at 168 women who were undergoing their first treatment cycle of IVF. Pre-treatment urine samples were collected at three stages: pre-treatment, before oocyte retrieval and before embryo transfer, to assess the hormonal concentrations. Each woman also completed questionnaires on anxiety and depression before beginning her treatment cycle. Lower adrenaline and noradrenaline concentrations were found in women experiencing successful treatments and the study concluded that there was a significant positive association of adrenaline concentration with pregnancy and with depression.

The findings on thirteen women who took part in an Australian-based study that sought to test whether or not stress levels were significantly different in months when conception was achieved compared with those when it was not, showed that women reported significantly more favourable mood states during the month of conception than during previous non-conception cycles and felt less "hassled". However, the adrenaline, noradrenaline and cortisol levels did not significantly differ between conception and non-conception months and there was no evidence for increased sexual activity that might have accounted for success or that increased sexual activity was associated with decreased levels of stress (Sanders and Bruce 1997).

Psycho-biological stress was measured in 49 women undergoing IVF and embryo transfer treatment (Facchinetti, Matteo, Artini, Volpe and Genazzani 1997). Each patient, on the day of egg retrieval, underwent a Stroop Color and Word test to gauge their ability to cope with a cognitive stressor. Their blood pressure and heart rate were also measured before the test, during it, and ten minutes after the test was completed. The results for each of the women were then grouped according to a successful or failed treatment outcome, where success was defined as evidence of a biochemical pregnancy twelve days after embryo transfer. On this basis, it was concluded that major cardiovascular vulnerability to stress was a factor associated with poor treatment outcome. However, only eight full-term pregnancies resulting in healthy deliveries were

eventually achieved from the sixteen bio-chemical pregnancies, and this should be borne in mind when considering the value of these findings.

Immune system function was found to be associated with poor treatment outcome in a study of 40 IVF patients in Italy (Gallinelli, Roncaglia, Matteo, Ciaccio, Volpe & Facchinetti 2001), where it was found that prolonged periods of stress and high state anxiety are significantly associated with increased T-cells during fertility treatment which significantly reduces the successful outcome for embryo implant. Further, higher implantation rate is directly correlated with a successful adaptation to stress.

In a US-based study, Magdy, Klock, Moses and Chatterton (1997) found no evidence to suggest that psychological stress markers such as cortisol, prolactin and progesterone were present in significantly increased levels in women who achieved a full-term pregnancy and those who did not. Women underwent psychological and hormonal testing during early pregnancy, on days 13, 20 and 27 after embryo transfer. Eighteen out of forty experienced live births, while 22 pregnancies were only biochemical, resulted in miscarriages, vanishing triplet to twin, or vanishing triplet to singleton, in a group of women (n = 40) who had undergone embryo transfer and received a positive result and who underwent psychological (assessed using STAI measures) and hormonal (cortisol, prolactin and progesterone) testing during early pregnancy on day 13, day 20 and day 27 after embryo transfer. This study suggests that after a positive result has been achieved from embryo transfer, raised anxiety levels and increased stress are not significantly associated with subsequent loss of foetus.

The phases of the moon at time of embryo transplant (n = 721 transplants) over a period of thirteen years from 1990-2002 were studied in relation to success or failure of treatment outcome in a study based in the Reproductive Medicine Unit of the Liverpool Women's Hospital (Das, Dodd, Lewis-Jones, Patel, Drakeley, Kingsland, & Gazvan 2005). The study was an attempt to replicate the findings of Weigert, Kaali, Kulin, & Feichtinger (2002), where a small positive influence during the moon's perigee at time of implant was found to correlate with a positive outcome. Biochemical pregnancy test result after embryo transfer was used as the outcome measure. Age of women, number of embryos implanted, and procedure (IVF/ICSI) were compared. Forward Stepwise logistic regression was performed to determine variables that were significant predictors of pregnancy. Embryo transfer times were divided into four groups: those that took place at new moon (n = 186), those at first quarter (n = 175), those at full moon (n = 203), and those at last quarter (n = 157). Age and treatment type were similar for all phase groups and positive pregnancy test results were comparable. Women who did not become

pregnant were, on average, one year older (mean (SD) 34.3 (4.17)) than those who did (Mean SD 33.3 (3.45) p = 0.007). Significant variables in the logistic regression model were age and number of embryos transferred, where chances of pregnancy increased nearly three times for 2-embryo transfers (OR 2.9, 95%CI 136-6.48). No significant association was found between treatment outcome and lunar phase. However, it was noted that this study took place over thirteen years compared with one that took place over seven, which might have introduced a nullifying effect on apogee and perigee findings because the complete apogee-perigee cycle is nine years.

The month and the season in which a woman is born can also influence the age at which she reaches menopause (Cagnacci, Pansini, Bacchi-Modena, Giulini, Mollica, De Aloysio, Vadora, Volpe 2005). Research on 2822 post-menopausal women showed that menopause occurred earlier for women born in the spring (age 49.04±0.15 years) than in the autumn (49.97±0.14 years). Earliest onset occurred for those born in March (48.9±0.25 years), while the latest onset occurred in those born in October (50.3±0.25 years). This effect remained after controlling for age at menarche, body mass index, smoking habit, level of education, and type of job. The study concluded that possible influential factors existing in the pre-natal period were associated with reproductive functioning later in life. These considerations may be of value when offering fertility treatment to women over 34 years of age regarding remaining and quality of fertility years for individual patients.

Some studies have suggested a possible relationship between exposure to light and the functioning of the reproductive cycle in women. Cook, cited in Altschule, 1975-74, found that Inuit women ceased menstruating in the long Arctic winter nights. Another study undertaken on data gathered between the years of 1961 to 1964 (Timonen & Carpen 1968) found numbers of conceptions varied in northern Finland according to length of day, where increased conception rate was correlated with increased day length. Numbers of multiple pregnancies also increased and decreased according to day length, indicating a possible association with levels of fertility and time of year.

McGillion (2002a) argues that melatonin is a key factor in reproduction function in humans and that reproduction function and development in later life may be influenced by exposure to particular forms of light intensity at time of birth that influence the production of melatonin via the light stimulation of the pituitary gland.

Kennaway (2004) suggests that circadian rhythmicity should be considered in relation to fertility treatment outcome as this may have a bearing on success rates, because shifts in normal diurnal/nocturnal biological mechanisms in women may contribute towards reproductive failure.

For example, women who work night shifts will establish changes in their normal circadian rhythms that may affect their ovulation times. He also argues that *in vitro* fertilisation and other assisted reproductive techniques resulting in embryo transfers do not consider the possibility that such transfers may be undertaken out of phase with the mother.

Such considerations may have an impact on successful treatment outcome, and future research in human circadian rhythms and reproduction is recommended. There may be some unexplained link between these factors and the use of astrology for identifying optimum times for treatment success, as discussed in Part 1 of this literature review chapter.

The research presented in the chapters that follow in this thesis is intended to explore the different themes of investigation presented in this chapter of psychology and fertility, astrology and fertility and medical astrology in relation to fertility treatment outcome. Psychological factors and astrological factors will therefore be considered together, for any significant association with success and failure of treatment outcome. Medical astrology will also be considered as a possible means of identifying reproductive health problems in women seeking fertility treatment.

There is a low success rate in IVF treatment, and given the physical and emotional consequence of undergoing such treatment, finding factors that contribute to a positive outcome would seem to be of immense value. There is some evidence that psychological factors may contribute to the success of treatment, although the precise nature of cause has not yet been determined. There is also some theoretical suggestion that astrological factors may be related, and this may possibly be linked to data showing that timing of implant may be related to outcome and that personality may be a mediating factor. Therefore, this thesis seeks to explore the potential role of psychology and astrology as predictors of success and failure in fertility treatment outcome.

1.13 Overall plan of the analyses for Study One, Chapters Three to Five

The methodology described and presented in Chapter Two explains the choices for the approach undertaken to obtain the data that gave rise to the results of the research presented in Study One in Chapters Three, Four and Five. The results section is presented in three chapters. The first chapter explores the data for associations of psychological factors with treatment outcome. The second chapter explores the data for associations of astrological factors with treatment outcome.

This approach provides further insight into possible psychological and astrological factors and their significant association with treatment outcome through exploratory analysis in the first phase of this research project. No firm conclusions can be drawn from the first phase, because of its exploratory nature. The findings of this first phase must then be tested on a new set of data, the data collected in the second phase. The results obtained from the second phase data, using the first phase model, may then provide more reliable insight into the potential value of that model in predicting treatment outcome when certain psychological and astrological factors are considered.

Chapter Two: Methodology

2.1 Introduction

This chapter presents the reasons and designs for undertaking research into astrology, psychology and fertility. The research design is a two-phase study; the methods described here are those used in the first phase. Two perspectives are considered: the psychological and the astrological. From the psychological perspective, possible relationships between anxiety, depression, health values and perceived health competence are explored for a significant relationship between them and fertility treatment outcome. The point of view of astrology relates to timing of treatment and fertility treatment outcome: is there a good time, astrologically, in a woman's child-bearing years in which to undergo fertility treatment to maximise success and minimise failure of treatment outcome? The first phase is referred to as Study One and the second phase as Study Two. A full report of Study Two is given in Chapter Seven.

Study One is presented in three parts: Part One looks at the differences in psychological profiles between three groups of women: women experiencing fertility treatment (group one), women who are already pregnant without fertility treatment at the time of joining the study (group two) and women who are hoping to become pregnant without fertility treatment at the time of participating in the research (group three). Parts Two and Three of this first phase (Study One) look only at the fertility treatment group, group one. Part Two looks at this group in order to explore possible significant associations between timing of treatment and presence or absence of astrological factors associated with success and failure of fertility treatment outcome. Part Three further explores the results of Parts One (relating only to the fertility group one) and Two, combining psychological factors with astrological factors to create a model based on those significant associations that can correctly identify successful and failed treatment outcome based on the combined results of Parts One and Two. The second phase of the study (Study Two) tests out the reliability of the model developed in Study One.

Figure 2.1: Diagram showing how Stage One proceeds to Study Two

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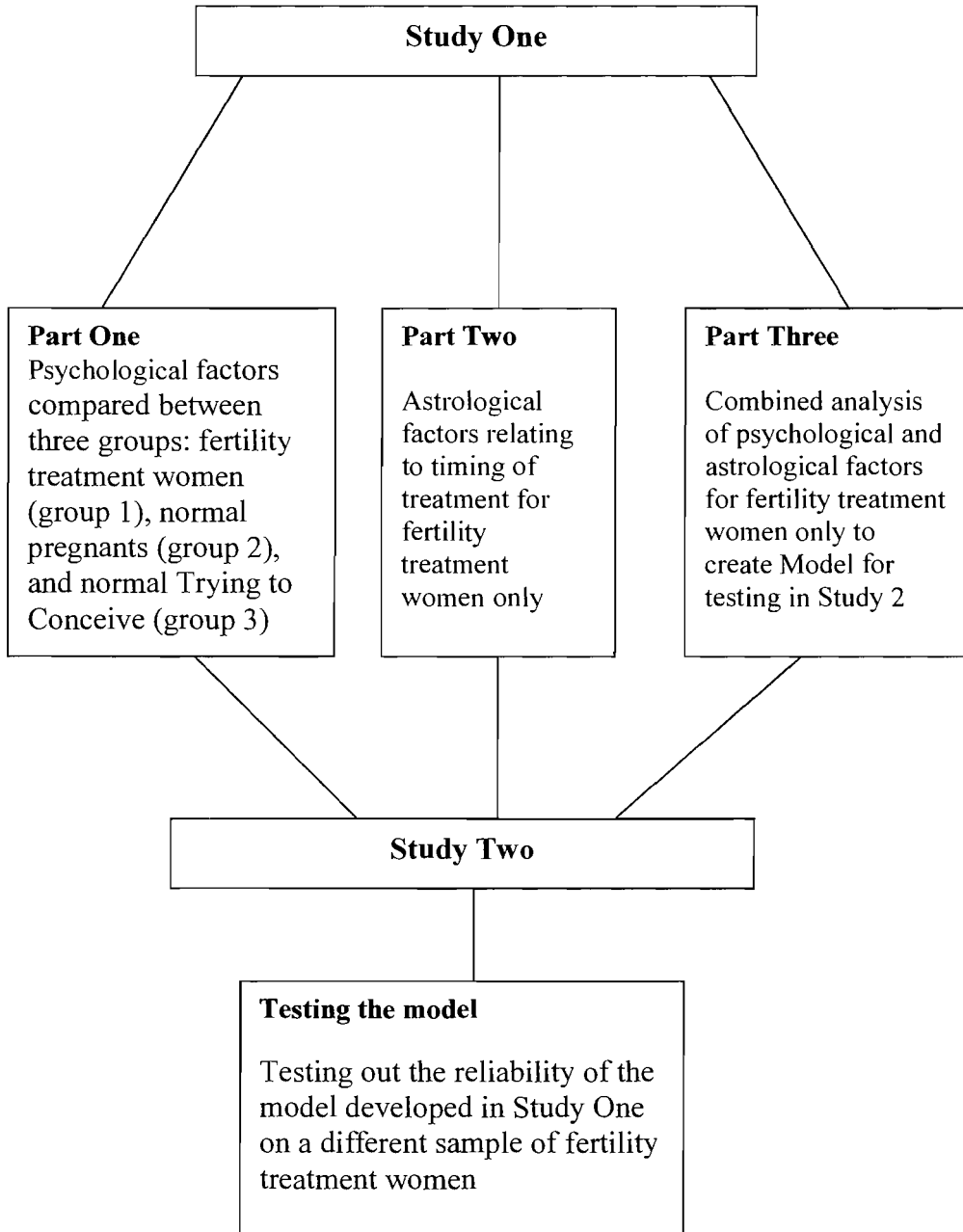
2.2 Epistemological viewpoint

The philosophical approach of the researcher towards understanding astrology and its possible applications in the social sciences does not rest upon a belief in astrology in the sense that it is some esoteric language that only a privileged few can understand and use. Rather, it is the opinion of this author that its value rests upon its apparent potential when applied to different fields of study in order to assess its power as a viable, predictive tool, and in the case of medical astrology, the effectiveness of its diagnostic abilities. The research in this thesis concerns itself mainly with testing certain applications of astrology related to the reliability of astrological forecasts to match a specific outcome. The research approach focuses on what Sean Lovatt[7] has called the "utility" of astrology and what the researcher sees as its practical potential in social science research, particularly in the field of health psychology. The research presented in Chapters 3 to 7 seeks to answer questions such as: "can a forecast using certain configurations of Jupiter help to pinpoint, with enhanced accuracy, successful times for carrying out embryo implants or intra-uterine insemination, to increase the likelihood of a successful pregnancy resulting in a healthy baby?" It has been claimed that it is possible to identify beforehand the times in a woman's life when her children are going to be born. The researcher wanted to test this claim to see whether there were significant associations between "certain configurations of Jupiter" and fertility treatments that resulted in the birth of a healthy baby.

Lengthy discussion and debate continue about the nature of astrology, and whether or not positivism can be used as a method of investigation to increase the understanding of it. As yet, from the perspective of the positivistic scientific approach, a proper understanding of astrology's mechanisms remains elusive. For the time being, researchers and practitioners on both sides of the divide, i.e. science and astrology, may have to content themselves with an understanding of its presence or nature that is limited by the scope of their observational abilities. This is the case with quantum physics, where it can be deduced that a "thing" is present by observation of its apparent behaviour in a given environment, as with the wave-particle duality concept for example (Zohar, 1990). An understanding has gradually developed of this duality by continuing to explore its apparent paradoxes. This could be the case with the development of an increased understanding of astrology.

If this approach is adopted, a comprehensive account of how astrology might work is not needed in order to explore it usefully, as such carefully considered investigations will contribute towards the development of further understanding. In the researcher's view, no research has been carried out to date that either proves or disproves astrological claims.

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[7] Sean Lovatt is a British astrologer who is well known for his application of astrology to financial and meteorological analysis.

Researchers should always be aware of the limits of their understanding of "the bigger astrological picture" when designing research to investigate astrological associations and their apparent effects. One should always be aware that such investigations are limited in their conclusions about astrological phenomena by the very methods that have been chosen to investigate them. For example, it is not possible to make any irrevocable judgements about astrology employing a study design that sets out to test the competence of astrologers by measuring their abilities to match birth charts with natives (McGrew and McFall 1992) when such astrologers fail to produce a significant level of accuracy. This may simply be due to the astrologers concerned not knowing their astrology well enough. A study design would have to take into account many factors in order to allow for this and other possibilities, and what implications these may have for the conclusions that may be drawn from such a study.

One would have to test for a specific hypothesis relating to those established interpretive meanings in existing astrological literature, in order to draw any conclusions about these meanings. Even after testing a particular hypothesis about whether Jupiter is associated with fertility, for example, when drawing any conclusions about this association the limitations of the experimental methods have to be taken into account.

It cannot be concluded, for example, that "astrology doesn't work", as does Ivan Kelly (1998) in his article which includes that assertion in the title. He concludes this because – in his view – no piece of research into various aspects of astrology has produced significant results under positivistic scientific analysis. In fact, scientists as researchers can conclude *only* that these specific tests have shown no significant results, and must continue to refine and develop their methods while the underlying rationale of astrological phenomena remains unexplained, much as Paul Feyerabend (1975) observes in his book "Against Method". Therefore, Kelly's conclusion that "astrology doesn't work" is premature because many other ways of exploring it exist.

With appropriate methods and tests, it is possible to address astrological phenomena and gain a better understanding of them.

Addressing this need for refinement and development of appropriate methodology – whatever phenomenon one wishes to investigate – was a primary concern when developing a study design and methodological approach to research presented in this thesis. The proper use of scientific method entails open-mindedness and objectivity – categorical statements being the exception rather than the rule. It is not possible to make absolute assumptions about the nature of a thing. Historically, later research is apt to demand some sort of revision regarding the assumptions contained in earlier research. If assumptions are to be made, scientists have to be

prepared to check and revise such assumptions continually as the process of research and accumulation of knowledge continues (Popper 1983).

The following account represents the process of refutation that is central to the philosophical viewpoint of Karl Popper and how valuable knowledge is acquired and understanding developed through experimentation and empirical observation and measurement, some of the methods that have been adopted for the research undertaken for this thesis.

An example of the problems that arise from categorical statements being made by scientists has been shown on the *BBC World News*, a television news service that during 2003 ran a series of small video clips under the collective heading "Just a moment". One of these clips deals with the greenhouse effect and global warming. In it, Professor Reid Bryson of the University of Wisconsin confidently stated in 1974 that the earth would get cooler because of the drier climatic conditions in certain countries that resulted in increasing dust levels in the air, which would rise into the atmosphere and block out the sun. This was known as The Cooling Theory.

In the years that followed, another climatic scientist and prolific writer on the subject, Dr. Stephen Schneider (Head of Interdisciplinary Climate Systems at the National Center for Atmospheric Research in Boulder, Colorado, and author of the book *Global Warming*, published in 1990) observed that the cooling effect was only regional and that the assumptions made in the 1970s were wrong because they had neglected the stratosphere CO^2 – which gave rise to *the greenhouse effect* – and this neglect had the effect of making the calculations out by 50% at the time. Schneider's categorical statement in the 1990s therefore directly contradicts Bryson's in the 1970s.

Observations should always be expressed not as confident assumptions but as circumspect observations, which may (in the future) be improved upon, or indeed, completely overturned by subsequent investigation. This is the process that Karl Popper (1983) called the process of revision: that is, "refutation".

There are in existence some challenging theories and models for testing astrological applications. John Addey's theory of Harmonics (1976) is one example that has been around for many decades. John Addey advocated that it was not so much the signs of the zodiac that should be researched but rather degree areas within signs, because more insight may be gained through apparent correspondences. Using the theory of Harmonics, he apparently showed how particular degree areas might correspond to particular meanings. He provided an example using a small group of six eminent astrologers, and appeared to demonstrate how, using the theory of Harmonics, the Sun, Moon, Ascendant and Jupiter in the astrologers' charts were distributed

around certain areas in the 360-degree circle of the Zodiac. He then proposed that these degree areas were likely to be prominent in the charts of astrologers, but more so in the charts of eminent ones such as Charles Carter, and, as it later transpired, Charles Harvey (Addey 1996: p 115). Most social science research into astrology has focused on studies utilising signs of the zodiac. Research into degree areas, using John Addey's approach, might yield more information about apparent astrological correspondences.

Michel Gauquelin's research may be understood under the Harmonics theory microscope (Addey 1981). Gauquelin identified zones or areas in the diurnal cycle that corresponded with certain professions when specific planets were found there. These findings are consistent with his character trait hypothesis research (CTH), which is widely known (Gauquelin 1985). However, Dean (1997/98) concluded that the significant results of Gauquelin's CTH research were due largely to artefacts involving, among other things, selector bias, and that when Addey's Harmonics theory was applied in analysis of the Gauquelin data there were problems such as ineffective criteria for selecting amplitudes, non-independence of traits and sector bias together with the sample size being too small and sampling errors too large, which he argued constitute weaknesses fatal to the theory, rendering the results effectively meaningless.

A tremendous amount of information was generated in the application of the Harmonics theory to Gauquelin's CTH data, and this presented a further problem because, Dean suggested, it would be impossible to recognise any valid patterns due to the vast amount of "noise" that was potentially present. However, Kevin Hawley (2000) proposes that it is possible to construct an approach using certain existing statistical tests that will take this problem into account and make possible the recognition of valid patterns in large amounts of data. Hence, future studies involving the use of Harmonics applied to the analysis of Gauquelin data might usefully take this factor into account.

It must be noted that although most of Gauquelin's research results have been strongly and perhaps plausibly disputed over many years in many publications, "The Tenacious Mars effect" (Ertel and Irving 1996) remains to be explained. It may very well be that future research into degree areas of the ecliptic may provide us with a clearer insight into the origins of meaning associated with particular signs, although with our present state of knowledge on this it is a matter for conjecture and philosophy regarding the past history and development of such associations.

However, researchers such as Kevin Hawley and Graham Douglas may help shed further light on this area. Hawley[8] suggested that with a thousand, or even as few as a hundred, pieces of

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[8] Kevin Hawley proposed that he would undertake such a study if the data could be provided for him (personal communication, July 2003).

data from astrologers who had reliable knowledge of their own birth times, it might be possible to conduct a further study of the sample of six astrologers and the apparent phenomenon of the "astrologer's degree" cited by John Addey. Hawley suggests that the use of appropriate methodology and statistical tests may help us to better understand the validity or otherwise of what the association or pattern described by Addey might be.

Why did astrologers of the Near East and Hellenistic world associate a particular meaning with a particular sign? This is a huge question, requiring a literature review of the history and development of astrology in different cultures, and one that the remit of this thesis does not permit space to answer, although a brief history of medical astrology has been presented in an earlier section. However, Addey's work on a mathematical model for astrology – Harmonics – has enabled researchers in astrology to add to the empirical observations that traditionally exist, as shown in the example of astrologers and the "astrologers' degrees". He made an observation that could be tested in the positivistic scientific framework of critical realism advocated by Karl Popper (1983) by identifying a phenomenon in a small group of astrologers and hypothesising about its meaning.

To some extent, that is the approach adopted for the research undertaken for this thesis into empirical observation associating Jupiter with fertility and Saturn with barrenness. The researcher looked at a sample of women who were undergoing fertility treatment, separated the treatments into successful and unsuccessful groups, and looked for astrological factors present in one group that were not present in the other. From this, she then developed a hypothesis based upon what she had found. This is a process of investigation called "analytic induction" (Robson 1993).

First, contacts of Jupiter to a woman's astrological birth map, at the time of successful and unsuccessful treatments, were considered. Jupiter was chosen because of the claims made for it being associated with fertility in astrological literature dating back to the time of Ptolemy (1980) and beyond. Claims for Venus, made by the 17th-Century astrologer, William Lilly (1985), were similarly considered and any significant differences between two treatment outcome groups of success and failure were built into a model and tested on a second fresh sample of women and their treatments.

From the researcher's earlier investigations into astrology (Harris 2004) for a Master's degree in Health Psychology, it would appear that astrology is not mythical in the sense that it is imagined and has no reality in a world that tests, measures and compares in order to understand. It has many attested successful practical applications, and the results of these applications – either as

an adjunct to counselling, for example, or as a forecasting model in potentially identifying the best times for fertility treatment – can be gainfully explored in order to add to the body of knowledge that is social science. The current level of scientific knowledge may not show why or how these phenomena exist, but they should be explored and whatever means and methods are appropriate should be used in order to broaden and deepen the understanding of them. In this way, it may be possible, eventually, to understand the nature of the apparent workings of astrology, by which is meant, here, what it is and the reasons for its apparent phenomena.

Feyerabend was interested in astrological phenomena, and the sometimes passionate dismissal shown it by members of the scientific establishment (*Objections to Astrology* 1975). Modern science, Feyerabend (1975) believed, replaced the more holistic and rounded views of the Middle Ages and earlier, with very narrow theories that made it difficult to build on existing knowledge through genuine creative and experimental enquiry. He believed in the value and need for revolutionary thinking and quoted Augustus Comte (1836), sometimes seen as the founder of sociology and the inventor of the term, writing about astrology and medicine: *"In the early stages of the human mind these connecting links between astronomy and biology were studied from a very different point of view, but at least they were studied and not left out of sight, as is the common tendency in our own time, under the restricting influence of a nascent and incomplete positivism. Beneath the chimerical belief of the old philosophy in the physiological influence of the stars, there lay a strong, though confused recognition of the truth that the facts of life were in some way dependent on the solar system. Like all primitive inspirations of man's intelligence this feeling needed rectification by positive science, but not destruction; though unhappily in science, as in politics, it is often hard to reorganize without some brief period of overthrow."*

In the study design for the research carried out for this thesis, the researcher has tried to address all the points raised here, and as closely as is practically possible, to meet the challenges that research into astrological phenomena has to face.

The epistemological viewpoint expressed here, is that astrology and health psychology cannot be described or defined through one particular epistemological approach. Further, it is possible to take two apparently opposite viewpoints and use them in a complementary way in the research designs adopted for this thesis. The views of Feyerabend (1984) on epistemological anarchy, or pluralism as it can also be known, that no one doctrine possesses the truth, together with the use of methodological pluralism (or the utilisation of the methodological spectrum) are the philosophical and methodological approaches that have been utilised as the most appropriate context for the research undertaken for this doctorate, and the justification for this has been discussed in the preceding paragraphs. The positivistic approach adopted in this doctorate

provides some insight into the research question, but as with all methods of measurement, the extent of such understanding is determined by the limits of the measurements, themselves.

The positivistic approach for Study Two is built upon empirical observation used in Study One, in which analytic induction (Robson 1995) and inductive logic are used to construct a hypothesis for further testing rather than starting with a theory that gives rise to a hypothesis in advance of examining the data. However, with this approach, it is necessary to test the findings on a fresh sample, after such a hypothesis has been developed. This is in line with the falsifiability and refutation approach advocated by Popper (1983). It should be noted that Popper did not coin the term "falsification" and attributes this to one of his erstwhile students, Thomas Kuhn (Popper 1983). Popper himself asserts that all knowledge remains fallible and conjectural (Popper 1983) and this allows for the utilisation of methodological pluralism advocated by Feyerabend (1984).

2.3 Methods

Methodological pluralism (Feyerabend 1984), whereby two or more different research methods are used instead of one single method, is adopted in this research. Feyerabend (1984) argued that there was no universal scientific method that could explain everything in scientific terms. He rejected Popper's falsification/refutation approach, which favoured the formulation of a theory based on "natural" social assumptions (Popper 1994) and from that theory, the development of a hypothesis that could then be scientifically tested. Such theories were then subject to refutation, either in part or totally, if evidence arose to contradict the assumption expressed in the hypothesis being tested. Feyerabend believed that it was not sound to have such a rigid methodological approach, preferring the "anything goes"[9] (Feyerabend 1978) view in order that as many possibilities may be considered and a hypothesis not rejected on what might be a single non-representative case. It might be said of Popper that his methods supported the view that "one has to start somewhere" as long as it is recognised that such an approach must allow for revision when further knowledge comes to light that requires an adjustment or total rejection of previous understanding. Both approaches have value in scientific research and are not necessarily in conflict.

The present writer has taken into account both these scientific viewpoints, in that no theory has been formed in advance of exploring the initial data. The null and alternative hypotheses are derived from an exploratory analysis using analytic induction in Study One – allowing the data to speak for themselves. Replications of the patterns suggested in the data through this exploratory analysis procedure are then searched for in the second set of data in Study Two. Therefore, the data in Study One inform the development of hypotheses for which there is

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[9] Feyerabend used the phrase "anything goes" as the only description that could be used, of his account of tradition and research practices given in his book *Science and a Free Society*, by a rationalist when talking about science "and about any other interesting activity" (p 40).

no pre-existing theory. The criteria of these hypotheses are then tested for possible falsification in the data collected in Study Two.

2.4 Post-positivism

The design combines two apparently opposing research methods used in the analysis of data gathered for the research in this thesis, i.e., analytic induction and comparative method, with the resulting findings further tested within a positivistic framework.

This two-stage approach takes positivism one step further and so might, therefore, possibly be viewed as a post-positivistic approach wherein it is recognised that exploratory analysis of the data in order to learn about the patterns that might lie within them, rather than making an assertion and then seeking to refute it, forms a practical precursor to the subsequent use of falsifiability in the second stage of the research, in which a fresh sample is examined to see whether the hypothesis arising from the exploration of the data in the first sample is then falsified and therefore refuted. This is similar to carrying out a replication, but the difference is that the hypothesis was developed from findings in the first stage, whereas a replication in positivistic terms involves re-testing a hypothesis formed, initially, in the accepted positivistic manner, i.e., derived from theory before any data are examined.

2.5 Preparation for carrying out the analysis

Empirical observation is the method often cited for describing how a particular meaning has become associated with an astrological factor. The research presented in this thesis is designed to test the associations in astrological literature that are believed to exist, based upon empirical observation, between the planets and fertility and barrenness in women. Analytic induction (May 1997, Robson 1993) and inductive logic are used in an exploratory analysis of data obtained from a series of empirical observations on a group of women (n = 15) who had experienced successful fertility treatment resulting in the birth of a child or children (n = 16) to identify how many astrological factors of a similar type were associated with the greatest number of successful fertility treatment births in that group. The rationale of Comparative Method (Mills 1888) is applied where, using method of agreement, if A is the only similarly occurring antecedent when X is the outcome, A may be the cause. In this case, A is the astrological pattern and X is the treatment outcome. But it is important to note that while this method may indicate a probable correlation, it cannot provide an explanation for an apparently significant association.

When a pattern had been identified in the group of successful fertility treatment births, a search for the absence or presence of factors in the pattern in unsuccessful treatments was carried out and the results compared with those found for the successful treatments to see whether there was a significant association between absence of factors and **failure and presence of factors and**

success. The findings were then to be tested on a further group in Study 2, using the positivistic method of formulating a hypothesis a priori which had been informed by the findings in Study 1, and then testing this hypothesis on the data collected in Study 2 to see if the results found in Study 1 were replicated in the Study 2 group.

This approach to the astrological research component part of the study is favoured because of its scientific rigour. The level of academic rigour aimed for here has tended to be absent from much social science research into astrology in the past, giving rise to results that in whichever direction they are found, are at best unreliable.

Surveys carried out by questionnaire have their origins in the positivistic tradition. The information on psychological factors and their possible relationship with fertility treatment outcome was collected through different questionnaire measures. Descriptions of types and administration of questionnaires used in the studies conducted as part of this thesis are described later in this chapter. As with the analysis for astrological factors and treatment outcome, comparative method was used to explore the possible relationship between psychological factors and treatment outcome.

2.6 Demographics on Studies One and Two

The demographic descriptions for the sample in Study 1 are described in Chapter 3, while those for Study 2 are given in Chapter 7, where the report of the research for that study is provided in full.

2.6 (i) *Collection of data*

Data for Study One were collected throughout the period from Spring of 2000 until January 2004, after a period of two months during which the questionnaire for the study was pilot-tested by 12 volunteers and their critical comment taken into account for its revision and refinement before circulating to volunteers taking part in the study.

2.6(ii) *Non-random sampling of populations*

The sample for the preliminary analysis consisted of volunteers who responded to notices, articles and interviews about the research in various publications, websites and media.

2.6 (iii) *Sources for data collection*

Different media were used to request volunteers from the general public, i.e., radio, television, newspapers and websites. Where notices appeared in various publications, copies of these notices are included in full in Appendix (v).

The various sources for collecting data are listed as follows:

CHILDchat, the magazine for the National Infertility Support Network "CHILD"

Our Baby magazine

IVF speak website

IVF.com

Trying to Conceive website (ww.ttc.com)

Jonathan Cainer's astrology website September and October 2001.

Fertile Thoughts website February 2001

Television interview with BBC South September 2001

Southampton Sunday free sheet (article) February 2001

Bradford Telegraph & Argus (article) 25 January 2001.

Practical Parenting: Complete Guide to Pregnancy Issue no.1 October 2001

Word of mouth from volunteers already in the study.

2.6 (iv) *Types of data collected*

Data were collected for three different groups. Group One was made up of women who had experienced or were continuing to experience fertility treatment. Group Two was made up of women who were pregnant without fertility treatment at the time of participating in the study. Group Three was made up of women who had no apparent fertility treatment problems and were attempting to conceive normally.

2.7 Initial exploratory analysis for astrological factors associated with success and failure of treatment outcomes

An initial exploratory analysis was conducted in order to find out what astrological patterns might be associated with a successful treatment outcome that resulted in the birth of a live baby.

This initial exploratory analysis of 15 of the 27 fertility treatment women on the study, who had experienced successful fertility treatments resulting in a live birth (n = 16), suggested that Venus, as well as Jupiter, should also be examined for a possible correlation with successful treatment outcome, and to conclude that Saturn has no bearing on the outcome according to the tests and methodology chosen to examine its associations with treatment outcome. Existing astrological literature suggests that the Sun, Moon, Venus and Jupiter are indicators of fertility and that Saturn is an indicator of barrenness (Lilly 1985), so patterns supporting these statements were searched for among the 16 successful births. The patterns identified indicated that only Venus and Jupiter had strong associations and that absence of Saturn was not associated with success.

2.8 The design for Study One

The basic questionnaire design was constructed to allow for the collection of qualitative data with the intention that the additional information might provide further insight and understanding into the responses in the psychology measures used in Studies One and Two. These additional data will be explored at a later date in separate studies as an adjunct to the research that is completed in this thesis.

All participants received a questionnaire pack and consent form with instructions on how to complete each of the questionnaires. Stamped addressed envelopes were enclosed for the return of the completed forms to the researcher. Completed packs together with signed consent forms were then returned to the researcher for analysis. Participants provided full contact details that enabled the researcher to maintain contact with the participants throughout the study and where necessary to follow up on any information missing from the general questionnaires designed for the study, e.g. accuracy of time of birth.

Participants were able to contact the researcher for news of progress on the research and advice on counselling support throughout the duration of the study.

Participants in Group One (the fertility treatment group) were asked to complete the Problems Relating to Fertility Questionnaire, Spielberger Trait anxiety measure Y2, MHLOC (Multi-dimensional Health Locus of Control Questionnaire), PHC (Perceived Health Competence questionnaire), Beck Depression Inventory II Questionnaire, and the short form Marteau & Bekker Y6 State Anxiety measure: the first time on receipt of the questionnaire pack and the second time just after embryo implant or insemination but before outcome was known.

Participants in Group Two (the normally pregnant group) were asked to complete the Pregnancy and Birth Experiences Questionnaire, Spielberger Trait Anxiety Y2, MHLOC, PHCS, Beck Depression Inventory II questionnaires, and the short form Marteau & Bekker Y6 State Anxiety measure upon entering the study. There was no second Y6 measure for this group as they had already achieved conception.

Participants in Group Three (the group who were trying to conceive normally) were asked to complete the Pregnancy and Birth Experiences questionnaire, Spielberger Trait anxiety measure Y2, MHLC (Multi-dimensional Health Locus of Control Questionnaire), PHCS (Perceived Health Competence Scales questionnaire), Beck Depression Inventory II Questionnaire, and State Anxiety measures (Appendices (ix), (xv), (xii), (xiv), (xiii) and (xv), respectively): the first time on receipt of the questionnaire pack, and the second time just after attempting to conceive naturally but before the outcome was known.

A separate stamped and addressed envelope for second state measure for Groups One and Three was included in the questionnaire pack, so that this measure could be returned separately at a later date, with details of the outcome of the attempt, when known, included on it.

2.9 Objectives of the study

State/Trait Speilberger measures, with Marteau-Bekker Y6 short form version state replacing long form Y1, and BDI –II for depression levels are compared between fertility treatment and non-fertility treatment sample groups to see whether there is a significant difference between scores. Multi-dimensional health locus of control and Perceived Health Competence Scales scores are also compared, together with results from sections of the questionnaires designed for the study which gather information on self-perceived anxiety and self-perceived depression across groups. These specially designed questionnaires are described in more detail later in this chapter under the heading "Questionnaires designed for the study".

Differences in first- and second-state anxiety levels within groups and between groups were then compared. There were no second measures for Group Two as the women in this group were already pregnant when taking part in the study and the objective of the two measures was to see whether or not state anxiety increased while a woman waited to find out whether she had achieved pregnancy, and if so whether this was significant and whether there was a significant difference in increase between fertility treatment women and normal 'trying to conceive' women. In other words, were fertility treatment women more anxious than women trying to conceive normally when both groups were attempting to become pregnant? The results are presented in Chapter Three Study One, Part One and discussed in Chapter Six.

Absence and presence of astrological factors at time of success and failure of fertility treatment outcome are compared in exploratory analysis to test for a significant relationship between these factors.

2.10 Measures used

Perceived Health Competence Scales (PHCS), Multi-dimensional Health Locus of Control Form A (MHLC), Spielberger Trait Anxiety with Marteau & Becker short form Y6 State measure, Beck Depression Inventory II (BDI-II), two Questionnaires (designed for the study). Full copies of these measures and the specially designed questionnaires are included in Appendices (xiv), (xii), (xv), (xiii), (viii) and (ix), respectively.

These measures are often used and highly regarded in research in psychology, and were chosen as possible indicators of psychological factors that may be significantly associated with

treatment outcome. There is an extensive bank of published research into anxiety and treatment outcome, with evidence both for and against a significant association with success and failure of treatment. There is less evidence for depression. For a greater understanding of the psychological profiles of women undergoing fertility treatment, possible relationships between anxiety (Trait and State) and depression (BDI-II) and health beliefs (MHLC) and one's ability to take responsibility for one's own health (PHCS) are explored in Study One.

2.10 (i) *The Perceived Health Competence Scales (PHCS)*

The PHCS were developed by Martha Shelton Smith (1989), a doctoral student of Dr. Kenneth Wallston, who wanted a heath-specific measure of perceived competence (i.e., perceived control of health) to use in her doctoral dissertation. Shelton took a generalised perceived competence measure (which was still unpublished) that Wallston had developed, and turned it into the PHCS. This was then used in a number of different studies (including a longitudinal study of persons with rheumatoid arthritis), and Wallston "gave" it to a number of other investigators to use in their studies. He also included it as part of a larger measure that he was developing (called the Health Hardiness Inventory) as part of the health control dimension of that instrument. Recently, he has taken the PHCS and made it even more condition-specific. He calls this new version the Perceived Medical Condition Self Management Scale[10].

The PHCS is a domain-specific measure for gauging the degree to which a person may feel competent and efficient in their ability to manage their own health outcomes. Five studies were carried out using different sample groups: students, adults and persons with a chronic illness, the results of which showed good internal consistency and test-retest reliability (Smith, Wallston, Smith 1995).

The scales comprise eight belief statements designed to gather data on the respondents' perceptions of different health issues (see Appendix (xiv)). For each statement, respondents must choose a number on a scale of 1 to 5, ranging from 1 = strongly disagree to 5 = strongly agree. High scores are associated with high levels of competence.

2.10 (ii) *The Multi-dimensional Health Locus of Control Scales (MHLC)*

The Multidimensional Health Locus of Control Scales (MHLC) are based upon the earlier general Health Locus of Control scale which was developed from Rotter's (1966) Social Learning Theory. There are two classifications: external and internal, where the former type believe forces outside of their control affect the way in which events happen to them and the latter believe that they are responsible for events which happen to them and that they can control the way in which

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[10] This was communicated to the author in a personal email from Kenneth Wallston, dated 28th October 2004.

these events happen (Rotter 1966). People may fall into either of these categories or somewhere between on a scale measurement of I-E. Locus of Control Scales are intended to measure the extent to which people believe their actions control or influence events in their lives (Wallston, Wallston & DeVellis 1978). The MHLOC developed by Kenneth Wallston, Barbara Strudler Wallston and Robert De Vellis used in this research is divided into three sub-types: Internal Health Locus of Control (IHLC) where the patient feels in control of what happens to them regarding health matters, Chance Health Locus of Control (CHLC) where the patient believes everything is up to fate, and Powerful Other Health Locus of Control (PHLC) where the patient believes that the person in charge of their health, e.g. their doctor or consultant, has responsibility for their health and what happens to them in this regard. There are, currently, three different Health Locus of Control Scale forms, A, B and C.

Multi-dimensional Health Locus of Control Scales Form A was used in Study 1 because it is designed to measure health beliefs in people without a serious health condition and who lead relatively normal lives. Eighteen belief statements designed to provide data on three different types of locus of control (Internal, Chance, and Powerful Other) are presented. The respondent must select one of six options, numbered from one to six (Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree) (See Appendix (xii)). People with high internal scores tend to perceive themselves as being in control of their health, those with high chance scores see their health as being largely the result of good or bad fortune and those high with powerful-other scores tend to believe that the fate of their health lies with their doctor or health care professional.

2.10 (iii) *The State/Trait Anxiety measures*

The State/Trait Anxiety Inventory (Spielberger 1983) provides measures of 'state' anxiety – levels of anxiety experienced at a particular time in the subject's life, and 'trait' anxiety – levels of anxiety which the subject experiences generally. The State/Trait Anxiety Inventory for Adults (Spielberger 1983) comprises two self-report scales. The state anxiety scale (STAI Form Y1) contains twenty statements that measure how a person is feeling at the time of completing the form. The trait anxiety scale, which also has 20 statements, but they measure how a person feels generally. The measures can be used for assessing levels of state and trait anxiety in both clinical and normal populations.

As with the Multidimensional Health Locus of Control (MHLC) (Wallston, Wallston & De Vellis 1978) scales, these measures were designed to provide a means of contributing towards understanding and predicting health behaviours in the patient.

The use of State/Trait Anxiety measures with Locus of Control measures has been explored by Archer (1979), who in an extensive review of studies on the possible relationship between these measures, advised caution in identifying the causes of apparent relationships because of the correlational basis of the data. He recommended more detailed research into the situational context in which State Anxiety is measured and suggested that Internal Locus of Control and Trait Anxiety might be constructively viewed as potentially interactive, influenced by a range of phenomena and sharing various causative factors, a view supported by Wallston, Wallston and De Vellis (1978) in a presentation of work which tested the initial internal consistency and validity of the MHLC scales.

2.10 (iv) *The short form Y6 State measure*

In the two studies included in this thesis, the Y6 Marteau & Bekker (1992) State anxiety measure, was used. The decision to use the Y6 item questionnaire instead of the Y20 State Anxiety measure was made because the measure was repeated in the study, and the short-form version was considered to be less of a burden to the respondent. In the research design for the studies contained in this thesis, the measure was to be used twice to compare anxiety levels before and after embryo implant or insemination. The six items on the Y6 short form state anxiety measure were extracted from the long Y20 state measure. In tests, the Y6 showed levels of rater reliability very similar to those of the long form Y1. The short form's six items are designed to measure levels of state anxiety at the time the measure is completed (see Appendix (xv)). Scores are then pro-rated (private correspondence with Theresa Marteau 2004) for comparison with trait measure Y2. Internal consistency and validity are sound (Marteau & Bekker 1992).

Any distinction between state and trait anxiety should be correlated in a population. This is to say that high levels of state anxiety are normally expected to match high levels of trait anxiety. However, if a group of individuals were tested in a particularly stressful situation, their state anxiety scores might be significantly different from their trait anxiety scores. To test for this possibility the anxiety state measures were taken twice in the studies conducted as part of this thesis. The first measure was intended to reflect normal anxiety state levels at the time of taking part in the studies, and the second measure to reflect anxiety state levels in particularly stressful circumstances, i.e., waiting for the outcome of an attempt to become pregnant.

2.10 (v) *The Beck Depression Inventory Mark II (BDI-II)*

The Beck Depression Inventory – 2nd Edition (BDI-II) is a 21-item self-report questionnaire for measuring severity of depression for persons aged 13 and upward. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders – 4th Edition (DSM-IV 1994) provides the criteria for diagnosing depressive disorders upon which the development of the questionnaire was based. The BDI-II is a revised version of the BDI and a

modernisation of the BDI-1A (Beck, Rush, Shaw & Emery, 1979) based upon 35 years of experience using the measure in psychological research into depression. The BDI-II is a major revision of the BDI, unlike the interim amended version, the BDI-1A. The revision was carried out in order to identify symptoms typical of severe depression or depression warranting hospitalisation, but is widely used for detecting patients' severe depression and possible depression in the normal population (Archer, Maruish, Imhof and Piotrowski, 1991; Piotrowski & Keller 1992, Piotrowski, Sherry & Keller, 1985). The BDI-II was developed as a measure for assessing levels of depression in accordance with the criteria in the DSM-IV (1994) and not as a means of clinically diagnosing depression in an individual, so it should not be used as the sole diagnostic measure. The BDI-II may simply reflect the degree of depression and not the diagnosis of it. Test validation is a continuing process.

The 21 items are labelled: sadness, pessimism, past failure, loss of pleasure, guilty feelings, punishment feelings, self-dislike, self-criticalness, suicidal thoughts or wishes, crying, agitation, loss of interest, indecisiveness, worthlessness, loss of energy, changes of sleeping pattern, irritability, changes in appetite, concentration difficulty, tiredness or fatigue, loss of interest in sex. Each item has a number of options ranging from an indication of no problem to severe problem, and each option has a score. The respondent must choose one option for each category. The scores, which can range from 0 to 63, are then added up and categorised, for example: 0-13 = minimal, 14-19 = mild, 20-28 = moderate, 29-63 = severe. These ranges can be altered to change the sensitivity of the measure.

In a study design similar to that chosen for the studies in this thesis, a multi-centre study was conducted by Smeenk, Verhaak, Eugster, van Minnen, Zielhuis and Braat (2001) on 291 women undergoing *in vitro* fertilisation (IVF) with intra-cytoplasmic sperm injection (ICSI) from three hospitals in the Netherlands. 237 of these women achieved embryo implant stage. The main objective of the study was to clarify the effect of pre-existing anxiety and depression on IVF/ICSI results, controlling for known predictors. Spielberger State/Trait Anxiety measures were used, together with the Beck Depression Inventory (BDI) questionnaire. Both types of measure were translated into Dutch for administration to the patients. A multiple logistic regression analysis in SPSS was carried out on two sets of variables. Only the treatments actually undertaken at the time of the study were considered, so it was not possible to consider number of prior treatments as a variable in the model. The state anxiety measure was taken only once, at the time when the women first offered to take part in the study and before they had begun any preparation for the treatment. The first set considered only biological factors: age, number of previous pregnancies, duration of infertility, diagnosis of either female or male condition or combined female and male diagnosed condition, diagnosis unknown (i.e. unexplained). The first model produced significant p values at the 5% level for age (p = 0.02) and previous pregnancies (p = 0.04). The model was

then run for both biological and psychological factors, but anxiety and depression scores were entered separately into the model as these scores were highly correlated. When the model was run with state anxiety it produced significant p values at the 5% level for age (p = 0.01), number of previous pregnancies (p = 0.02) and state anxiety (p = 0.01). When the model was run with depression scores it produced a significant p value of 0.03 at the 5% level. This suggests that state anxiety is a better predictor than depression of pregnancy as a treatment outcome.

A smaller Swedish-based study compared 22 normally menstruating women entering fertility treatment with 22 fertile women who served as controls. State anxiety was examined as part of a number of measures to determine possible differences in the psychological profiles of the two groups. There was a trend towards higher state anxiety levels (p < 0.06) among women who did not succeed in becoming pregnant after IVF treatment, and the study concluded that psychological stress may affect the outcome of treatment because of these raised state anxiety levels (Csemiczky, Landigren and Collins 2000).

The difference in levels of significance may be due, in part, to the huge difference in numbers of participants in the studies.

There is little evidence in psychological research into infertility of the use of the MHLC with the PHCS. These measures relate to the health beliefs and self-perceived ability to cope with management of one's own health. It was thought that use of these measures in this research might provide some insight on ways in which anxiety experienced by fertility treatment women might be positively and constructively managed in order to reduce possibly high levels. Relationships between these measures and anxiety were explored in Study One. The results (reported in Chapter Three) indicated a significant correlation (p = 0.003, n = 12 fertility treatment women) where one's feeling of being in control of one's own health (PHCS) increased as one's sense of state anxiety (Y6 Measure 1) decreased.

2.10 (vi) *The questionnaires designed specially for the study*

Two questionnaires were been specially designed for the study (See Appendix (viii) and (ix)). They incorporate sections on astrology, and gather information on birth data and knowledge of astrology. These questionnaires are "Problems Relating to Fertility Questionnaire" and "Pregnancy and Birth Experiences" Questionnaire.

Both types of questionnaire contained both closed and open questions. Standardisation was achieved in various sections, where possible.

The first of these questionnaires, "Problems relating to Fertility", was also adapted for women who had completed their families and were no longer undergoing fertility treatment. The data on their past successes and failures were useful for inclusion in Study One, Part Two, where astrological factors and treatment outcome were explored for possible significant correlations between certain astrological factors and success and failure of a particular treatment.

The second questionnaire, "Pregnancy and Birth Experiences", was designed to provide data on women in Groups Two and Three.

The questionnaires were sent out to twelve women who acted as pilot subjects and provided critical comment, which helped to refine the design further before circulating the questionnaires to participants on the study. These twelve pilots contacted the researcher in response to the general notices that requested volunteers for the study.

The Problems with Fertility Questionnaire for both those participants who were no longer continuing with fertility treatments and those who were still continuing carried a section on treatment processes and the amount of control the participant had in these processes. Participants were asked if they had children before treatment or had children born as a result of fertility treatment in the past. They were invited, through open questions, to describe their experiences and their feelings about their experiences. They were also asked to provide information on the type of treatment they had undergone and were undergoing, the dates for these treatments and outcomes where known, and whether or not their treatment was paid for privately.

The Problems with Fertility Questionnaire had to be modified for each of the clinics in Study Two, and the modifications are discussed in Chapter Seven in the Methodology section for that study.

The Pregnancy and Birth Questionnaire for Groups Two and Three, in addition to those sections described in the first paragraph, also carried questions seeking information on whether or not this was a first pregnancy, or if they were still attempting to become pregnant, how long had they been trying to achieve this, medical history, if any, relating to reproductive health, whether or not any medication or treatment was prescribed to help the participant become pregnant, and if they were still hoping to become pregnant and had been prescribed some form of medication, was this still being taken.

Both questionnaire designs sought information on the participant's experience of depression, attitude towards and understanding of astrology, whether or not a professional astrologer had been consulted, belief in astrology to help self-understanding, whether or not the

participant perceived herself as an anxious type, details of time, date and place of birth and source for this information for both partner and self.

In order to test for a possible relationship between a belief in astrology having an influence on outcome, and actual outcome, a question was included in the questionnaires that were designed for the study, as follows:

2.10 (vii) *Question on astrology and outcome*

What are your expectations from taking part in this study relating to Astrology? Please tick your choice:

a.	Astrology will probably have no effect.	....
b.	Astrology may or may not have an effect, I do not know.	....
c.	Astrological factors will help predict success and failure rates.	....

At the request of the consultant for Clinic A in Study Two, this question was later adapted for the short-form clinic-study-designed questionnaire as follows:

Do you think using astrology to choose the time to have treatment will increase chances of success? Please tick your choice.

a. Yes   ....
b. No   ....
c. Don't know   ....

In the two versions, the first set of options corresponds to the second set as follows. Option (a) corresponds to (b), (b) to (c), and (c) to (a). That is, responding by ticking (a) to the first question "What are your expectations from taking part in this study relating to Astrology?" means the same as responding (b) to the second question "Do you think using astrology to choose the time to have treatment will increase chances of success?" That is to say, both responses indicate that the respondent does not believe that astrology will have an effect on treatment outcome. All responses were uniformly coded as 'yes', 'no' and 'don't know', for the purpose of applying the final model design from Study One to the data in Study Two.

The response to astrology's impact on treatment outcome was included as part of the research process because existing literature indicates that belief in astrology may account for its apparent significant association with a person's perceptions and experiences in life, and so an association between belief and outcome was explored as part of the research process.

Also, the notices requesting volunteers for the study in Study 1 and the posters in the clinics in Study 2 indicated that astrology and its possible relationship with treatment outcome were components of the research, and so it was prudent to incorporate some sort of measure that would give an indication of whether or not belief in the ability of astrology to influence treatment outcome would, in fact, correlate with treatment outcome.

2.10 (viii) Subjective indicators of anxiety and depression

Self-perceived anxiety and self-perceived depression were measured by responses to the following questions shown below, which are drawn from the questionnaires designed for the study. Self-perceived anxiety and depression, therefore, are indicators only of women's perceptions of themselves and their experience of depression and anxiety

If a respondent answered 'yes' to either (a) or (b), the answer was categorised as experience of personal anxiety

2.10 (ix) Question on subjective perception of anxiety:

Would you consider yourself to be an anxious person (please tick your choice):

a. Generally   ....
b. only related to specific issues   .... (please give examples, e.g. about punctuality, flying, travelling alone, speaking in public, doing well in exams, the safety of one's family etc.)
c. No, I am fairly relaxed about most things in life   ....

If a respondent answered 'yes' to experience of depression, whether clinically diagnosed or not, the respondent's answer was counted as experience of personal depression.

2.10 (x) Question on subjective perception of depression

Have you suffered from depression at any time in your life? If yes, please give details: dates of duration of depression and reasons believed to be the cause of it.

Was the depression diagnosed as clinical, at any time (i.e. confirmed by a doctor)?
Yes ....   No ....
If yes, please give date (or approximate date if known) of confirmation.
....

Fertility treatment women were also asked to provide information about whether or not they had a history of fertility problems and, if so, to give details on them. They were also asked to provide similar information about their husbands. Their responses were categorised into 'yes' or 'no' for both questions, where yes = present and no = absent, and these responses were tested in the final logistic regression model in Study 1, Part 3. Women's fertility history showed a significant association with treatment outcome (see Chapters 5 and 6 for full results and discussion).

2.11 Ethical considerations

Consent letters (see Appendix (x)) were provided, copies of which were signed by the volunteers and returned to the researcher with the completed questionnaires.

Contact addresses of websites providing counselling support for women undergoing or coming to terms with fertility treatment and outcome were provided. The researcher has training in counselling skills, and provided support and counselling to volunteers by telephone, post or email, as appropriate, throughout the length of the study.

All data were secured in anonymous form on a protected database. No names were kept on electronic files. Hard copy data were kept in a locked filing cabinet in the private office of the researcher, to which the researcher alone had access.

Ethical guidelines advised by the School of Social Sciences at the University of Southampton were met.

2.12 Types of fertility treatment considered

Eight different types of treatment were considered in this study: IVF, ICSI, GIFT, ZIFT, Blastocyst, FET, IUI and DI. Full definitions are provided in Appendix (vi).

2.13 The null and revised hypotheses

The null hypothesis is that astrological factors will have no link to success or failure in treatment for infertility, after levels of state and trait anxiety and perceived health competence have been controlled for.

Based upon the findings in the exploratory analysis of the preliminary model the original null hypothesis set out in the research proposal was revised as follows:

The revised hypothesis is that astrological factors will have no link to success or failure in treatment for infertility, after levels of state and trait anxiety, subjective report of experience of personal depression, and women's history of fertility problems have been controlled for.

2.14 Summary

The research for this thesis is conducted in two phases: Study One and Study Two. Full details of Study Two are given in Chapter Seven. Figure 2.2 below shows the framework for the study.

Figure 2.2: Diagram of framework for Study One Part One
Psychological factors and conception attempts compared between three different groups of women: fertility treatment women, women normally pregnant at time of taking part in the study, and women trying to conceive normally.

n = 13 fertility treatment (FT) women drawn from the 27 FT women who took part in the exploratory stage of Study One.	N = 16 normally pregnant women drawn from 19 normally pregnant women volunteers (women pregnant at time of taking part in Study One)	N = 13 normally trying to conceive drawn from 51 women volunteers (TTC women: women attempting normal conception at time of taking part in the study).
Group One	**Group Two**	**Group Three**

All three groups were tested for significant correlations between self-perceived anxiety and self-reported episodic depression with levels indicated by psychological measures

Differences compared between all three groups:
STAI STATE AND TRAIT ANXIETY
BDI-II DEPRESSION LEVELS
MHLC (MULTI-DIMENSIONAL HEALTH LOCUS OF CONTROL) SCORES
PHCS (PERCEIVED HEALTH COMPETENCE SCORES)

Differences compared between two groups.
Groups 1 and 3 only:
STAI STATE ANXIETY
SECOND MEASURE
Taken after conception attempt but before outcome is known

These tests were carried out to see whether fertility treatment women's experience of anxiety, depression and feelings of control over their health issues differed significantly from normal groups of women either pregnant or hoping to become pregnant.

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In Study One, discussed in detail in this chapter, three groups of women are considered for psychological differences within and between groups. The groups are: those undergoing or who have undergone fertility treatment, those who were pregnant without fertility treatment at the time of taking part in the study, and those who were attempting to become pregnant and who had no known fertility treatment problems. The psychological measures used are: multi-dimensional health locus of control scales (MHLC), Perceived Health Competence scales (PHCS), Speilberger Trait Anxiety measure with Marteau & Bekker short-form State anxiety measure (STAI) before attempting to become pregnant and while awaiting outcome of attempt (second measure considered for groups 1 and 3 only), Beck depression Inventory II (BDI-II), and specially designed questionnaires for the study which provide further insight on the psychological profiles of the participants.

The objectives of Study One are concerned with the exploration of the data to see whether there is a significant difference in anxiety (STAI) and depression (BDI-II) scores between all three groups, and to answer two questions: whether there was a significant difference in state anxiety relating to attempt to become pregnant and that experienced while waiting to learn whether or not pregnancy had been achieved, and whether there was a significant difference in anxiety levels between the fertility treatment group and the group hoping to conceive normally. Additional information on psychological profiles is sought through the use of the MHLC and PHCS. The data are further explored for any possible associations between these scores and anxiety and depression. Astrological factors where also explored for a significant association with presence and absence of certain factors and success and failure of treatment outcome.

In the next chapter, Study One, Part One examines psychological factors across the three different groups and the results of this examination are presented in detail there.

Chapter Three
Study One, Part One – Psychology and fertility: results of analysis

3.1 Introduction

This chapter presents the results of tests used to explore data relating to psychological states in three different sample groups. Demographic descriptions are given for each group. Tests were carried out to see whether there were differences in state and trait anxiety levels between fertility treatment women hoping to become pregnant and two groups of women with no history of fertility problems: women who were already pregnant, and women who were hoping to conceive naturally. Levels of state anxiety were measured twice for the fertility treatment group and the normal-trying-to-conceive group. The first measure was taken before an attempt to become pregnant and the second measure taken after the attempt but before outcome was known. (Second-state measures were not available for the already-pregnant group). The subsequent scores were then compared for significant differences within and between groups. Relationships between anxiety and depression were also explored for all three groups. Finally, a series of simple linear regression tests was carried out on the fertility treatment group to test for possible relationships between health beliefs, health perceptions and various demographic factors, i.e. age, time spent trying to conceive, medical condition of woman and/or partner, and prior successful treatments.

3.2 Plan of Analysis

3.2 (i) Comparisons of state/trait anxiety and depression scores between groups

Levels of state and trait anxiety and proneness to depression were compared between the three groups of women taking part in the preliminary analysis stage of this study: the fertility treatment women (n = 13), the normally pregnant women (n = 16), and the group hoping to become pregnant without fertility treatment, the normal-trying-to-conceive women (normal TTC) (n = 13).

3.2 (ii) Trait and first- and second-state anxiety scores compared within groups

Anxiety state and trait levels were also compared within the fertility-treatment and normal TTC groups where a second-state anxiety measure had been completed during the time after implant and before the result is known, and after normal attempt and before the result is known, respectively. Second-state anxiety measures were not applicable to the normal-pregnants group.

3.2 (iii) Perceived Health Competence Scales (PCHS) and Multi-dimensional Health Locus of Control (MHLC) with state and trait anxiety

Levels of perceived ability to control one's state of health (PCHS) and one's belief in the extent to which one is responsible for one's own health experiences (MHLC) were also measured and the results were compared with state and trait anxiety levels.

3.2 (iv) Treatment outcome

No participant in the fertility treatment group experienced a successful treatment outcome of the treatment to which the state anxiety measures were related, so it is not possible to measure treatment outcome against state and trait anxiety levels in this preliminary analysis. Similarly, no participant in the normal TTC group experienced a successful outcome on the comparable attempt.

3.3 Demographic factors and state anxiety Measures 1 and 2

Demographic factors, i.e. age, medical condition, husband's medical condition, number of embryos implanted, number of treatments attempted, and time spent trying to conceive for the fertility treatment group, were also considered and comparisons made between the first anxiety measure and the second one in relation to differences in measurements taken at these two points in time within this group.

3.3 (i) Demographics for each group

Group One fertility treatment patients (n = 13)

A total of 13 women are included in the fertility treatment group in this initial exploratory research into psychology and fertility. Eight of these women are also included in the analysis of astrological data reported in Chapter Four, but for the remaining five no astrological information was available, so these were excluded from the analysis in Chapter Four.

Reasons for non-eligibility for fertility treatment women included in this first phase of Study One were: not proceeding further with treatment, treatments discontinued and adoption being considered, very poorly following treatment so gave up trying, already pregnant from treatment when questionnaires received, and became pregnant naturally.

Age range: 31 to 44 years: three women were 34 or under and 10 women were 35 or over. All were married.

12 of the 13 women provided information on time spent trying to conceive. Time spent trying to conceive ranged from zero months to upwards of 37: three tried for up to 12 months, six tried for between 13 to 24 months, one tried for between 25 to 36 months, and two tried for 37 months and beyond.

11 paid for their fertility treatments privately or through insurance.

Two received NHS treatments.

Of the 13 women, 10 had a history of medical problems related to reproductive function and five had partners with medical problems.

Two out of 13 women had already experienced live births as a result of fertility treatment.

Six women had experienced IVF, two had FET, four had ICSI and one had an abandoned attempt.

Twelve women responded to the question whether or not they had ever experienced personal depression in their lives. Five said that had not and seven said that they had had such an episode.

Group Two normal pregnants (n = 16)

Of 19 women who contacted the researcher and offered to take part, 16 completed and returned questionnaire packs supplying sufficient information to take part in Study One, Part One. Of the two who did not take part, one miscarried and did not wish to continue with her involvement and two did not return a completed questionnaire pack.

Age range: Age ranged from 23 to 39, with 10 women of 34 years or under.

All were married.

14 out of 16 women in this group provided information on the length of time spent trying to conceive before becoming pregnant: seven had not been trying to conceive, four had been trying for up to 12 months, two had been trying for between 13 to 24 months, and one had been trying for between 25 and 36 months.

Group 3 non-ft trying to conceive (n = 13)

Of 51 women who offered to take part, 13 returned completed questionnaire packs providing sufficient data for inclusion in Study One, Part One. Reasons for dropping out: decided to give up trying, decided to undergo fertility treatment and was waiting for an appointment, was taking Clomid (a drug taken orally to increase chances of conceiving "normally"), had developed severe back problems so stopped trying until health was better, developed problems with reproductive organs so not able to continue trying, decided to run a marathon so put "everything on hold for now".

Age range: 26 to 42, with 5 women of 34 or under.

All were married.

12 out of 13 women provided information on the length of time spent trying to conceive before entering the study. Six had been trying for up to 12 months, three for between 13 to 24 months and three for upwards of 37 months.

The age range of the fertility treatment group (n = 13) is 31 to 44 years, with only three women of 34 years or under, as research supports the observation that fertility declines sharply after the age of 34 (HFEA 2000). The age range of the normal-pregnants group (n = 16) is 23 to 39 years, with 10 women aged 34 years or under. Seven of the 16 normally pregnant women (43.8%) became pregnant without trying to conceive. Ages of those who had become pregnant

without trying ranged from 23 to 37 years at the time of taking part in the study: four of the women were aged between 23 and 34 years and three of the women were aged between 35 and 37 years.

3.4 State/trait anxiety measures

The short-form version of the state anxiety measure, the Y6 six-item scale (Marteau and Bekker 1992) was used for both first and second measures of state anxiety. The Trait Anxiety Y2 20-item scale (Spielberger 1993) was used for measuring levels of trait anxiety. Although score samples in Graphs One to Three indicate outliers, Kolmogorov Smirnov tests showed that the observations for the three groups come from normal distributions, and therefore parametric tests were chosen for comparisons between and within groups in line with the parametric tests used later in the different parts of this study. However, where possible, non-parametric tests were also carried out to check the robustness of the results.
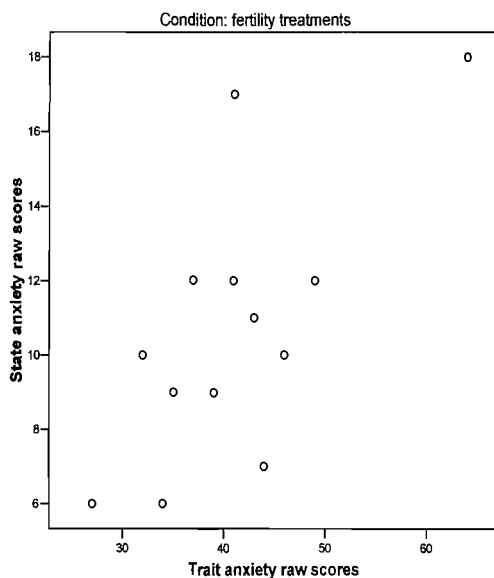
Figure 3.1. State anxiety (y) and trait anxiety (x) for Group 1: fertility treatment hopefuls

Condition: normal pregnants
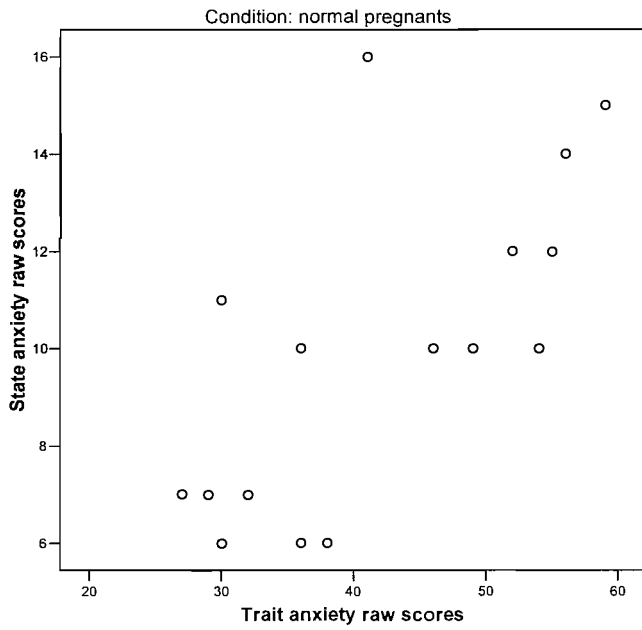
Figure 3.2. State anxiety (y) and trait anxiety (x) for Group 2: normal pregnants (n = 16)

Condition: normal TTC

anx trait raw
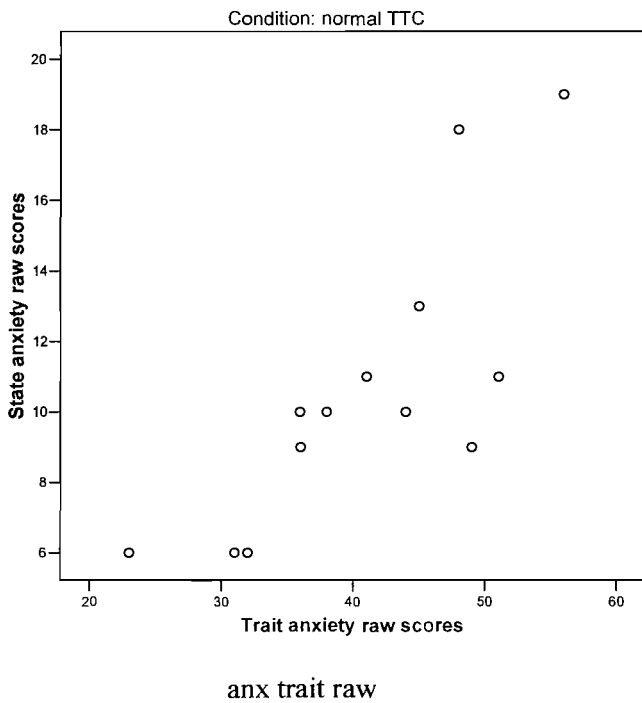
Figure 3.3. State anxiety (y) and trait anxiety (x) for Group 3:normal TTC (n = 13)

Box plots (figures 3.4 to 3.6) for trait and state anxiety scores showing medians and outliers across fertility-treatment, normal-pregnant and normal-trying-to-conceive groups.

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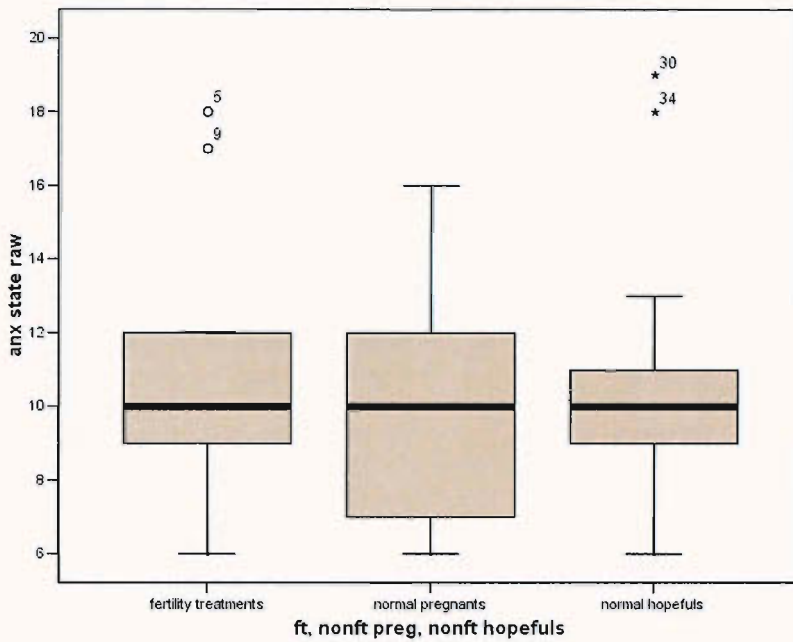
Fig 3.4. Box plots for raw state anxiety (Y6) scores showing medians and outliers across the three groups and outliers within groups.
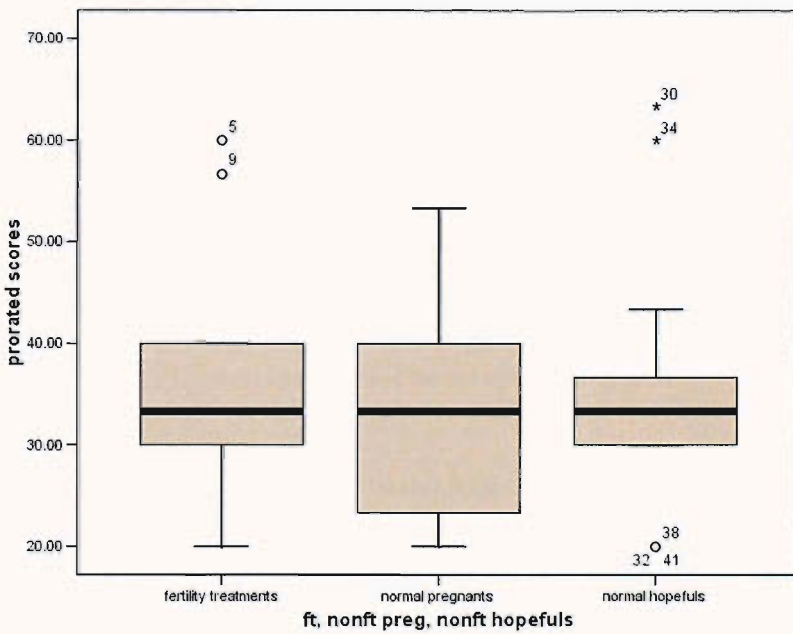
Figure 3.5. Box plots showing medians and outliers for pro-rated state anxiety scores (Y6) across all three groups.
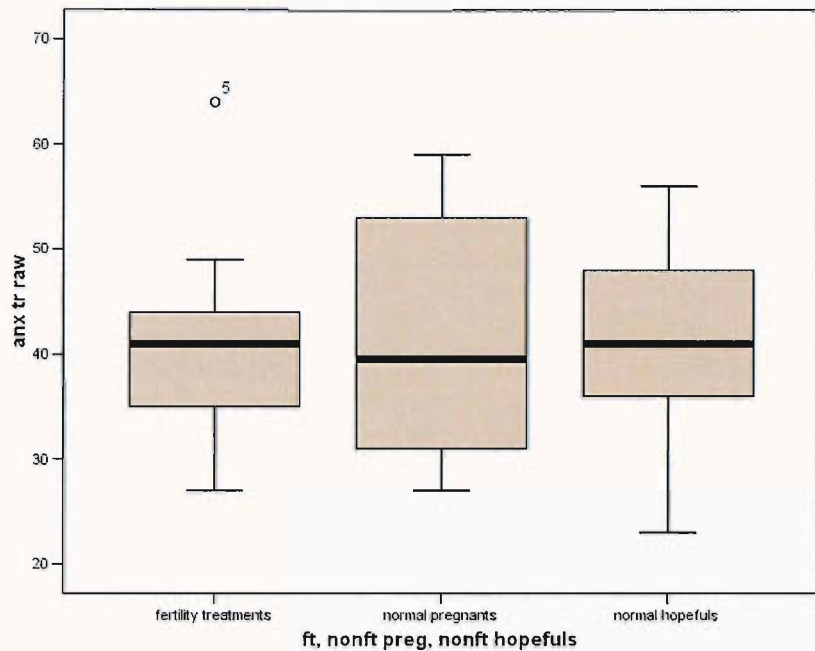
Figure 3.6. Box plots showing medians and outliers for anxiety trait scores across all three groups

Means and standard deviations for trait and first-state anxiety raw scores for all groups are shown in Table 1. One-way ANOVA tests were carried out to test the null hypothesis that there was no significant difference between the three groups for trait anxiety and for the first-state anxiety measure. The results were not significant at the 5% level for either trait anxiety ($F = .054$, $df = 2, 39$, $p = .948$) or for first-state anxiety ($F = .190$, $df = 2, 39$, $p = .827$). Kruscal Wallis non-parametric tests showed similar ($\chi^2 = 0.043$, $df = 2$, $p = 0.979$ and $\chi^2 = 0.17$, $df = 2$, $p = 0.919$ respectively). The null hypothesis is therefore accepted in each case.

Sample means for state and trait anxiety for all three groups were then compared with sample means for 451 adult working women drawn from a normal population (Spielberger 1993). This was done in order to test the null hypothesis that the three groups in this study did not differ in their experiences of anxiety from a normal population of women who were not known to be pregnant or not known to be trying to conceive a child with or without fertility treatment.

Table 3.1
Comparison of t values (pooled variance) for each group with the means for a sample of adult working women (pro-rated scores) (n = 451) for state and trait anxiety

Group	n	State anxiety 1 Prorated scores				n	State anxiety 2 prorated scores				n	Trait anxiety scores			
		t value	df	SD	M		T value	df	SD	M		t value	Df	SD	M
Fertility Treatment Group	13	0.15	462	12.27	35.64	10	2.10*	462	10.89	42.33	13	2.39*	462	9.19	40.92
Normally Pregnants	16	-0.74	465	10.91	33.19	0	N/A	N/A	N/A	N/A	16	2.99*	465	11.06	41.88
Normal TTC	13	0.05	462	13.64	35.34	13	3.63*	462	13.60	46.15	13	2.30*	462	9.25	40.77

t > 1.96 = significant at the 5% level

Three independent sample t-tests (pooled variance) were carried out to compare the mean for each group with the mean from a comparable sample, i.e. adult working women, taking the estimate of the sample means from the literature (n = 451, state mean 35.20 SD 10.61 and trait mean 34.79 SD 9.22 (Spielberger 1993 p13). No significant difference was found for state anxiety first measure for any group. Significant differences at the 5% level were found for all group means for trait anxiety, indicating that these groups had significantly higher levels of trait anxiety but their state anxiety measure 1 levels were comparable with those of a sample of normal female working adults. Mean levels of anxiety for the second-state measure were also significant at the 5% level for the fertility treatment group and the normal TTC group. No State 2 measures were available for the normal pregnant group.

The results of literature research available at the time of undertaking this study indicated that levels of anxiety may be higher for second-state than for first state. A test of the null hypothesis that there would be no significant difference between first and second-state measures was therefore carried out. The alternative hypothesis was that second-state anxiety levels would be higher than first-state measures, because the women in Groups 1 and 3 who were attempting to become pregnant were expected to be more anxious when awaiting the result of their attempt in comparison with their state levels before the attempt.

Paired t-tests were carried out to compare first-state and second-state levels within the two groups for which both measures were available, using one-tail tests as levels of second-state anxiety were expected to be significantly higher for the second-state anxiety measure. In the fertility treatment group the result was significant at the 5% level (t = 2.091, df = 9, p = .033). In the normal TTC group, the second-state level was significantly higher than the first-state level at 5% (t = 2.682, df = 12, p = .010). Wilcoxon tests showed similar results non-parametric results

(W = -1.788, exact p = 0.042, and W = -2.442, exact p = 0.007 respectively). This result supports the alternative hypothesis.

Table 3.2
Compared means and standard deviations for the fertility treatment and normal trying to conceive (TTC) groups for trait and short-form state anxiety measures one and two (raw scores)

Groups	N	STANDARD DEVIATION		MEAN	
		State anxiety measures		State anxiety measures	
		1	2	1	2
Fertility treatments	10	3.34	3.27	10.50	12.70
Normal trying to conceive (TTC)	13	4.09	4.08	10.62	13.85

Pearson's Correlation Coefficients were calculated to test for association between trait anxiety scores with first measure state anxiety scores. High levels of correlation were found (see Table 3) and these were significant at the 1% level. This is shown in the linear relationships between state anxiety and trait anxiety scores indicated in Figures four to seven, for each of the groups. Pro-rated scores calculated for the state anxiety measures were used for these comparisons.

Comparisons of scores, again using the Pearson Correlation (2-tailed test), for the second measure state anxiety with trait anxiety scores for the fertility treatment and normal TTC groups do not show a significant correlation (See Table 3.3).

Table 3.3

Correlation between state and trait anxiety for all three groups

Dependent Measure	State anxiety 1 (before treatment/attempt		State anxiety 2 (after treatment/attempt before outcome known	
	P value (2 tailed)	Pearson's Corr.	P value (2 tailed)	Pearson's Corr.
Trait anxiety (Fertility treatment group n = 10)	.010	.684 *	.327	.357
Trait anxiety (normal pregnants group n = 16)	.004	.683*	Not applicable	
Trait anxiety (normal TTC group n = 13)	.001	.792*	.107	.467

*p = < .01

An independent t-test was used to test the null hypothesis that the second-state anxiety measure for the fertility treatment group was not significantly different from the second-state anxiety measure for the normal TTC group. The result was that there was no significant difference between the levels for these two groups (t = .726, df = 21, p = .476), i.e., the fertility treatment women did not experience a higher or lower level of second-state anxiety compared with the normal TTC women. A Mann-Whitney U Test showed similar results for the equivalent non-parametric test (U = 55, exact p = 0.551).

The results of the t-tests suggest that when waiting to find out whether or not they have successfully conceived, both groups of women suffer comparative raised state anxiety levels, and that fertility treatment is no more stressful than normal attempts. This hypothesis was subjected to a more rigorous test by comparing the average increase of state 2 over state 1 for each group, with each woman acting as her own control. An independent t-test showed no significant difference between groups at the 5% level (t = .622, df = 21, p = .541). Therefore the alternative hypothesis has been rejected.

3.5 Beck Depression Inventory II (BDI-II) and Perceived Health Competence Scales (PHCS) with State Anxiety Y6

A Pearson's Correlation (2-tailed) test was carried out on Groups One and Three for a significant relationship between state anxiety measure one and depression (Beck, Steer & Brown 1996) and also for state anxiety Measure 1 with Perceived Health Competence (PHCS) (Smith, Wallston & Smith 1995). Results are shown in Table 4. No significant relationship was found between these scores for the Normal TTC group (group two) but there was a correlation between state anxiety Measure 1 (r = .788, p = .002) for depression and also, negatively, for PHCS (r = -.758, p = .003) for Group One, the fertility treatment group. No significant relationship was found between depression and PHCS and state anxiety Measure 2 for either group. Tests were also carried out for both groups between state anxiety Measures 1 and 2 and internal locus of control, chance locus of control and 'powerful other' locus of control, but none was significant at the 5% level.

Table 3.4

Correlation between state anxiety measure 1, depression (BDI-II), and perceived health competence scores (PHCS) for the fertility treatment group and the normal TTC group

Group	n	State anxiety Measure 1 and depression (BDI-II)		State anxiety Measure 1 and PHCS	
		P value (2 tailed)	Pearson's Corr.	P value (2 tailed)	Pearson's Corr.
fertility treatment	12	.002*	.788	.003*	-.758
normal TTC	13	.169	.405	.229	-.359

P = < .01*

These results indicate that as the level of depression increases, state anxiety also increases, and that as perceived health competence increases, state anxiety decreases significantly for fertility treatment women but not for women trying to conceive normally.

Figures 3.7 to 3.10 describe the linear relationships between state anxiety 1 with depression and also with perceived health competence for both groups. Failure to reach statistical significance in the normal TTC group (n = 13) may be due to the smallness of sample size. Further research into the results for both groups is recommended.
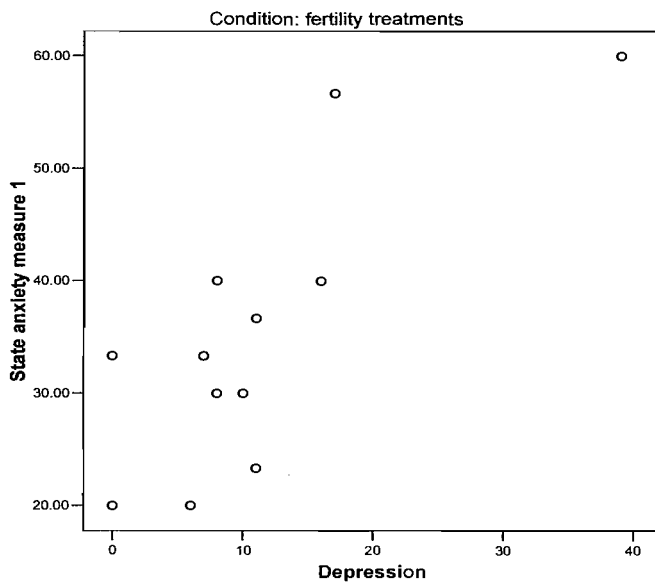
Fig 3.7 showing linear relationship of depression scores (x) with state anxiety Measure 1 (y) for the fertility treatment group (n = 12)
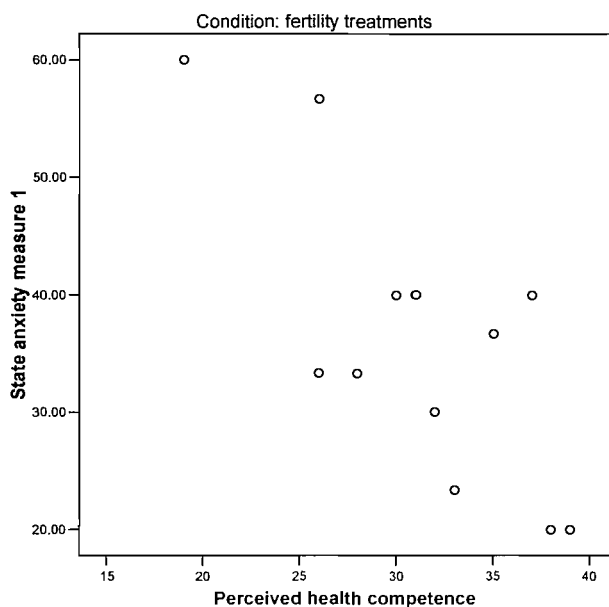
Figure 3.8. Linear relationship of perceived health competence scores (PHCS) (x) with state anxiety Measure 1 (y) for the fertility treatment group (n = 12)
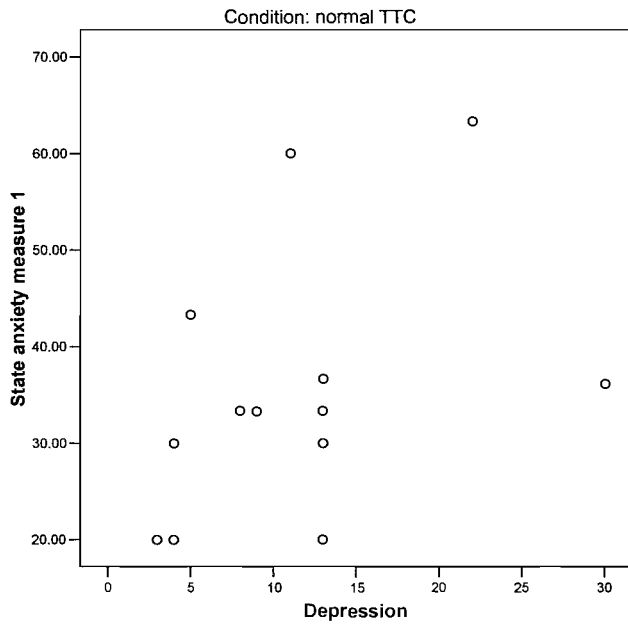
Figure 3.9. Linear relationship of depression scores (x) with state anxiety measure 1 (y) for the normal TTC group (n = 13)
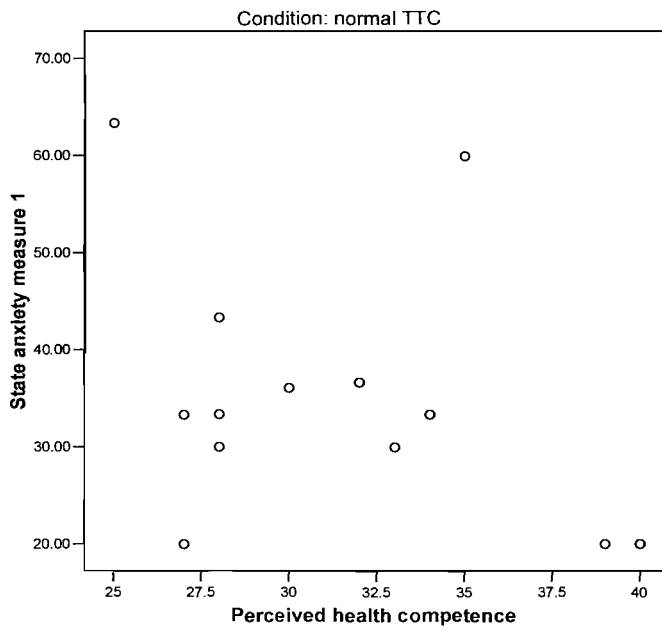
Figure 3.10 showing linear relationship of perceived health competence scores (PHCS) (x) with state anxiety Measure 1 (y) for the normal TTC group (n = 13)

3.6 Beck Depression Inventory II (BDI-II), Multi-dimensional Health Locus of Control (MHLC) with various demographic factors

A series of simple linear regression tests was carried out on the fertility treatment group for second-state anxiety, including the variables: age, time spent trying to conceive, medical history, husband's medical history and prior successful treatments, proneness to depression (BDI-II), multi-dimensional health beliefs, (MHLOC) (Wallston, Wallston & De Vellis 1978) (e.g., belief in one's own ability to look after one's health, another's ability to do it for you, or simply that everything is left to chance) but no significant relationships were found, showing no evidence that raised second-state anxiety levels vary according to these factors.

As none of the women in either the fertility treatment group or the normal TTC group succeeded while taking part in this preliminary analysis section of the study, these findings cannot be tested against treatment or attempt outcomes.

3.7 Summary

Observations for the three groups came from normal distributions, and therefore parametric tests were carried out on the groups in this sample to explore possible relationships between anxiety, depression, health values and beliefs, and various demographic variables that might have a bearing on these psychological factors. Non-parametric tests were also conducted to check the robustness of the results.

There was no significant difference in the trait anxiety or either of the state anxiety measures across the three groups, but there is a difference between first and second anxiety measures for both groups One and Three. As participants in Group Two were already pregnant when they joined the study, no second-state measures were available for comparison.

In all three groups, there was high correlation between the trait and state One measures, but not between trait and state Two.

The association for the fertility treatment group (group One) was significant at the 5% level for increased state anxiety Measure one, with increased levels of depression and also increased levels of perceived health competence, and decreased levels of state anxiety Measure one. There was no significant association between these factors for Group Three, and none for either group between PCHS and state anxiety Measure Two and MHLC and state anxiety Measures One and Two.

A series of simple linear regression tests between state anxiety Measure 2 and age, time spent trying to conceive, medical history, husband's medical history, prior successful treatments,

proneness to depression (BDI–II), and multi-dimensional health beliefs (MHLC) showed no evidence that state anxiety levels vary according to any of these factors. As none of the women in either Group 1 or 3 succeeded in becoming pregnant while participating in this part of the study, it was not possible to test these findings against treatment outcome.

In the second part of the study, clinic-based data collected from fertility treatment patients will be analysed and will provide a mixture of outcomes against which similar findings for those groups may be tested.

Chapter Four

Psychology and astrology: results of analysis in Study One, Part Two

4.1 Introduction

An exploratory analysis is carried out on a group of 27 women who have experienced 114 fertility treatments between them. This exploratory analysis is done to ascertain what astrological factors are present and absent for successful and failed treatment outcomes. The association of these factors with a positive outcome is then maximised between groups by selecting the factors most strongly associated with a positive outcome for the development of a hypothesis for the astrological part of the model, to be tested in Study Two. Chi-squared tests are carried out to identify significant differences between the two groups of treatment outcome and astrology, and a hypothesis is developed. Various astrological factors are explored for significant relationships with two psychological factors: anxiety and depression. Other demographic factors, such as age at time of treatment and treatment outcome are considered when astrology is factored into the equation. Finally, 31 fertility problem conditions are explored for absence and presence of medical astrological factors relating to problems with the woman's and her partner's reproductive health. Figure 4.1 on the following page schematically shows the method used to develop the astrological hypothesis for the model in Study One, Part Two.

Figure 4.1. Diagram of framework for
Study One, Part Two
The exploratory analysis outlined below is part of Study One, Part Two, and was undertaken
in order to develop the astrological hypothesis for testing in the second study.

Of the 34 fertility treatment volunteers for Study One, 27 had sufficient data available to participate in this exploratory stage of the study.

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| Successful treatments (n = 16 live births, with sufficient data, from 15 of the 27 fertility treatment women) explored for absence and presence of astrological factors associated with births of children. | Unsuccessful treatment group then checked for absence or presence of same astrological factors (n = 98 from 26 fertility treatment women). |

Differences maximised between the two groups through selection of particular astrological factors, i.e., Venus and Jupiter contacts most prevalent in the successful treatments.

Rules and conditions drawn from process of maximisation and so providing the hypothesis for testing in Study 2

4.2 Study One, Part Two

In this stage of testing, the data for 114 treatment outcomes experienced by the 27 women taking part were explored for suggestions of astrological patterns that might be associated with fertility treatment outcome. The process of analytic induction (Robson 1993) was used in order to develop hypotheses for testing on a further sample drawn from fertility clinics in the United Kingdom. The results presented in this section are therefore exploratory and no conclusions can be drawn from them.

In Study One, Part One, the fertility treatment group contains 13 volunteers, because of the 34 women who responded to the requests to take part in the whole study, only that number provided enough psychological information relating to first- and second-state anxiety measures for the analyses of psychological factors and treatment outcome. Study One Part Two contains 27 fertility treatment volunteers because this number of women provided enough information on their psychology and astrology to make it possible to carry out the tests for this section relating to some psychological factors, astrological factors, and treatment outcome

Of the 34 women who responded to the request for volunteers through the above sources, and who had a history of past fertility treatments but were no longer continuing with them, 15 women who had experienced a live birth resulting from fertility treatment provided sufficient data to be included in Study One Part One. The remaining 19 women had not succeeded in delivering a live baby as a result of a fertility treatment. Twelve of the 19 unsuccessful fertility treatment women provided sufficient data to take part in Study One Part Two, making a total of 27 fertility treatment women whose total number of treatments (n = 114) were considered in Parts Two and Three.

The data of the 15 successful women was also examined in an initial exploratory analysis of astrological factors and successful treatment outcome resulting in the birth of a live baby which preceded analyses carried out in Parts One and Two of Study One. This initial exploratory analysis of the data of 15 fertility treatment women who had experienced sixteen live births resulting from fertility treatments was carried out in order to refine the original hypothesis before conducting further exploratory work in Study One Part Two on astrological factors associated with success and failure of treatment outcome. Reasons for non-eligibility for inclusion in the initial exploratory analysis: completed questionnaire packs not returned, no longer wished to take part and withdrew details, had not yet experienced a successful birth, unable to provide sufficient information on date, time and place of own birth.

Two of these women subsequently undertook further fertility treatment in order to have more children.

4.2 (i) Demographics for the sample in Study One Part Two (n = 27)

Age range: 25 out of 27 women provided information on their age at time of first treatment. Ages ranged from 25 years to 43 years, of which seven women were 35 years or over.

Out of the 25 women who provided information on their marital status, 23 were married, one was divorced, and one was engaged to be married.

26 out of 27 women provided information on clinic location: 16 women attended a UK clinic and 10 attended non-UK (USA = 9, Australia = 1).

Information was provided on 105 out of 114 treatments considered in this part of the analysis as to whether they were carried out privately or provided by the NHS or overseas equivalent. Nine treatments were provided by the NHS or equivalent and 100 were paid for privately, either through medical insurance or through personal financing.

Twenty-one of the 27 women provided information on time spent trying to conceive. Time spent trying to conceive before undertaking fertility treatment ranged from zero months to upwards of 78 months: eight tried for up to 12 months, nine tried for between 13 to 24 months, one tried for between 25 to 36 months and three tried for 37 months and beyond.

Of the 27 women, nine had a history of one or more of the following fertility problems: fallopian tubes impaired or removed, infrequent ovulation and non-functioning ovary/ies, endometriosis, polycystic ovary syndrome (PCOS), low uterine blood-flow, antibodies to husband's sperm, fibroids, poor egg production, premature ovarian failure, sterilisation.

Eleven male partners had one or more of the following fertility problems: no sperm, vas deferens absent, low sperm count and morphology, low sperm motility. Thirteen partners had no fertility problems. No information was available on the remaining three partners.

Do you believe astrology will have an affect on treatment outcome? Twenty-five out of 27 women provided responses to this question. Sixteen women said that they did not know if astrology would have an affect on treatment outcome, while nine felt that it would. None of the women believed that it would not have an effect on treatment outcome.

Out of 27 women who provided information on whether or not they had had children prior to commencing fertility treatment, ten women already had children, 15 women had not, and no information was available on the remaining 2 women.

The total number of fertility treatments (n = 114) experienced by a sample of women (n = 27), were separated into successful and unsuccessful groups and examined for astrological factors

present in one group that were not present in the other. From this exploratory analysis the following hypothesis was developed.

The system of secondary progressions was used. In this system, one day after the birth is counted as representing one year in the life (see Appendix (xxii). In this way, when a planet associated with fertility makes a contact with a relevant planet in the birth chart during a year in the life when fertility treatment is undertaken, its possible effects may be considered. Types of treatment and the date at which they are carried out are examined in this study. The types are: *in vitro* fertilisation (IVF), intracytoplasmic sperm injection (ICSI), frozen embryo transfer (FET), intra-uterine insemination (IUI), and gamete intra-fallopian transfer (GIFT). Treatments that were abandoned, e.g. where dates had been scheduled for embryo implant, etc., but had to be cancelled because of unforeseen problems such as contracting mumps or developing hyper-stimulation, were also included and viewed as "failed" treatments.

4.2 (ii) Designated factors in the birth chart

Designated planets in the birth chart: Sun, Moon, Venus, Jupiter;
Designated angles in the birth chart: Ascendant and Midheaven.

The exact date of treatment was considered to be associated with one of the astrological factors and designated birth planets and angles if it met the conditions set out at the end of this chapter. They were determined from the process of maximisation, where the factors that contributed the biggest difference between the two groups were selected to form the conditions.

1. Progressions of the Sun and Venus making exact contact within six months each side of the treatment date.
2. Progressed Moon making exact contact within two weeks each side of the treatment date.
3. Contacts of progressed Jupiter with the natal planets (those in the chart for the time, date and place of birth) Sun, Moon, Venus and Jupiter and also the Ascendant (point emerging on the local horizon at the time of birth) and Midheaven (point at which the Sun culminates at the time of birth at the location of birth) within three months each side of the treatment date.
4. Progressed Ascendant or progressed Midheaven making exact contact with designated planets only (i.e. not with the designated natal angles Ascendant or Midheaven) within six months each side of the treatment date.
5. Progressed 5th-house planetary ruler (if it was in the 5th house at time of birth) making exact contact with designated planets and angles within six months each side of the treatment date.

Among traditional astrologers, William Lilly writes of contacts of the progressed Ascendant with the natal (or birth chart) Moon as an indicator that the person "may enjoy a daughter that year" (1985, p 664, 3rd paragraph); while Ronald Davison (1979, p 42, 2nd paragraph and p 43, 3rd paragraph), observes that progressions of the Sun and Moon to Ascendant and/or Midheaven or to Sun and Moon in the birth chart indicate parenthood or motherhood. In this sample, no significant differences for treatment outcome and contacts of the progressed Ascendant with the natal (or birth) chart Sun or Moon were found, or for contacts of the progressed Sun and Moon with the natal Ascendant or Midheaven.

Significant differences between successful and unsuccessful treatments were found, however, for progressions where progressed Venus contacted natal Sun, natal Moon, natal fifth house ruler in the fifth house, and/or Ascendant, Midheaven or where progressed Venus made a contact to its own natal position in the birth horoscope of the woman undergoing fertility treatment. Because of the correlations indicated in the exploration of the preliminary sample, certain transits of Jupiter were included, i.e. when Jupiter transited by conjunction, sextile or trine, the Sun, Moon, Venus, fifth-house ruler in the natal fifth house, natal Jupiter, Ascendant, or Midheaven during the two weeks before implantation of embryos. The definitions of "progression", "transits" and the range of aspects used are given in the discussion following Table 4.1 below.

Only the positive series of aspects showed significant results for Venus and/or Jupiter.

Table 4.1 below shows some results for Venus and Jupiter in the first sample – the sample that is called the "preliminary analysis sample". These results are regarded as exploratory, because the hypothesis was developed from the findings by a process of analytic induction (Robson 1993)

A number of hypotheses are tested, the null hypothesis for each one being that there will be no significant difference between the successful and unsuccessful treatments for the astrological contact. The alternative hypothesis in each case is that there will be a significant difference between the two groups for the contact.

A Fisher's Exact Test was used to measure the difference between the groups for the various astrological factors, where $p \leq .05$ indicates a significant association.

The table shows that the alternative hypothesis is accepted for:
> Progressions of Venus to natal charts, including and excluding time-dependent
> factors (i.e., where birth time was accurate, and known only to within half an hour);

Transits of Jupiter to natal charts during the two-week period prior to embryo implant, including and excluding time-dependent factors;

Venus and Jupiter by secondary progression and Jupiter by transit (as above) considered as a group of factors.

The table shows that the null hypothesis is not rejected for:

Progressions of Jupiter to natal charts, including and excluding time-dependent factors.

Table 4.1
Presence or absence of contacts to or by Venus and Jupiter in the natal charts of women undergoing fertility treatment Total number of treatments n = 102

Type of contact	Planet	Asc/MC[1]	Live births		No/failed pregnancy		Fisher's p value: same or stronger association*
			Present	Absent	Present	Absent	
By secondary progression and in beneficial aspect at time of implant/IUI	Venus	Inc. Excl.	8 (50%) 7 (43.75%)	8 (50%) 9 (56.25%)	19 (22.09%) 14 (16.28%)	67 (66.77%) 72 (83.72%)	0.027 0.020
	Jupiter	Inc. Excl.	4 (25%) 3 (18.75%)	12 (75%) 13 (81.25%)	12 (13.95%) 7 (8.14%)	74 (86.05) 79 (91.86%	0.272 0.189
By transit during 2 weeks prior to implant/IUI	Jupiter	Inc. Excl.	5 (31.25%) 5 (31.25%)	11 (68.75%) 11 (68.75%)	4 (4.65%) 3 (3.49%)	82 (95.35%) 83 (96.51%)	0.004 0.004
By secondary progression and Jupiter by transit during 2 weeks prior to implant/IUI	Venus and Jupiter	Inc. Excl.	13 (81.25%) 12 (75%)	3 (18.75%) 4 (25%)	29 (33.72%) 21 (24.42%)	57 (66.27%) 65 (75.58%)	<0.001 <0.001

based on Fisher's Exact Test: same or stronger association

Asc = Ascendant or rising degree in the natal chart.
MC = Midheaven or culminating degree in the natal chart.

The data for a further 12 unsuccessful fertility treatments were obtained subsequent to the above analysis with Venus and Jupiter distributions as follows:

	New probability
Progressed Venus inc. Asc/MC = 2	0.027
Progressed Venus excl. Asc/MC = 1	0.014
Progressed Jupiter inc. Asc/MC = 1	0.255
Progressed Jupiter excl. Asc/MC = 1	0.184

Transits of Jupiter during 2 weeks prior to implant/IUI inc. Asc/MC = 1   0.005

excl. Asc/MC = 0   0.002

The range of aspects used for the above were conjunction (0 degrees), semi-sextile (30 degrees), sextile (60 degrees) and trine (120 degrees), and very tight orbs of time were applied. For the progressed aspects excluding the Moon and Jupiter, a margin of six months each side of exact contact was allowed. For the progressed Moon aspect to planets, two weeks each side of exact contact were allowed. For the progressions of Jupiter, three months each side of exact contact were allowed. For the transits of Jupiter to planets, the contact had to be exact during a period of fourteen days up to and including the day of embryo transplant.

Two probability values (p values) are given, one for contacts involving the acutely time-dependent factors – the Ascendant and Midheaven – and one for contacts that exclude these angles.

4.2 (iii) Time-sensitive factors

The Ascendant

This is the point on the astrological birth chart which is calculated from time, date and place of birth coordinates. It is the point in the tropical Zodiac that is rising at the eastern horizon of the location of birth at time and place of birth.

The Midheaven

This is the culminating point on the astrological birth chart where the Sun will reach its highest position in the sky in the location of birth at time and place of birth.

Both these points are very sensitive to the time at which an individual is born, as five minutes of clock time equals about one degree of the 360-degree Zodiac, so the degree of accuracy to which these points are known depends upon the degree of accuracy to which the birth time is known.

When time-sensitive astrological factors such as the Ascendant and Midheaven are considered in relation to forecasting treatment outcome, a birth time known to within, say, ten minutes would not provide a reliable identification of astrological time-sensitive factor within a given year in the life. This is because five minutes of time is equal to about one degree of the zodiac and one degree of the zodiac is equal to one year in the life. A birth time that is inaccurate by ten minutes may provide an astrological contact during the life that is inaccurate by two years. This means that if time-sensitive astrological factors are considered for identifying years in which

treatment outcome has a greater likelihood of success, they should be accurate in order for the correct year to be identified.

It is useful to consider the p values with and without angles (Ascendant and Midheaven) simply because they are critically time-dependent. For example, if the woman's birth time is out by five minutes of clock time, the rising and culminating points could be off by one degree, which in terms of real time means out by about one year, using the secondary progression forecasting system where each day after the birthday is taken to represent one year of the life. This "day for a year" symbolism means that the angular relationships formed to the planetary positions in the natal chart from the planetary positions given for, say, the tenth day after the birthday would be interpreted as having expression in the 10th year of life, and the positions of the Ascendant and Midheaven for that particular time in the life are calculatedly accordingly. (See Appendix (xviii) for definitions.) However, if it is possible to find some significance by leaving out the acutely time-dependent factors, that is, the Ascendant and Midheaven, i.e., by considering only the planets, this might then be of help to people who are not absolutely sure of their time of birth. The terms "transit" and "transiting" refer to the position of the planet on an actual date and the angular relationships it forms on that date to planets in the natal chart (see Appendix (xxvii)).

In astrology, the Sun, Moon, Mercury, Venus, Jupiter, Saturn, Uranus, Neptune and Pluto are all considered to be planets, although it is acknowledged that the sun is a star and the moon is a satellite of earth. In accordance with astrological tradition, all are referred to as planets, or "wanderers" (De Vore 1977), as they were perceived in ancient times dating back to Ptolemy and beyond.

The symbolic movement of these bodies within the secondary progression system against the Zodiac is relatively slow. The Sun, for instance, takes 24 hours to move through one degree of the Zodiac, compared with the movement of the Ascendant and Midheaven points of approximately one degree every five minutes. Therefore accuracy of birth time, planetary positions and contacts is not as time-sensitive for the planets as it is for Ascendant and Midheaven, and for the conditions observed in the development of this model, it is acceptable to consider planetary contacts for birth charts of which the time is known accurately to within half an hour.

Venus and Jupiter are of particular interest because of their traditional association with fertility.

Data for treatments where the woman's birth time is known accurately are examined for all astrological contacts, i.e. the time-sensitive factors, the Ascendant and Midheaven, and the planetary contacts. This category is called "astrology including angles". The "angles" are the Ascendant and Midheaven points.

Data for treatments where the woman's birth time is known only to within half an hour are examined only for astrological contacts which exclude the time-sensitive factors, the Ascendant and Midheaven. This category is called "astrology excluding angles". The time-sensitive factors are not considered for the treatments experienced by women with uncertain birth times because of the errors that are involved, i.e., an inaccuracy of five minutes equals approximately one degree of the Zodiac, and in terms of forecasting and identifying months and years when treatments may or may not be successful, this equates to a margin of error of one year.

It is interesting to note the strong association between the Jupiter-Venus models and success of treatments and to compare the strength of association for each of the categories tested. For example, testing for progressed Venus associations alone, including and excluding angles, gives p values of 0.027 and 0.020 respectively, while testing for progressed Jupiter associations alone, including and excluding angles, gives p values of 0.272 and 0.189 respectively. This might imply that Venus is a more significant astrological factor in the secondary progression system than Jupiter, which is not significant although the results move in that direction. However, the transits (see Appendix (xxvii)) of Jupiter, including and excluding angles, both give p values of 0.004. When these are compared with progressed Venus associations, the Jupiter transits appear to have much stronger significance. The contacts of progressions involving Venus and Jupiter and transits involving Jupiter, collectively, and as one pattern, give p values of 0.001 when including the angles and <0.001 when excluding them: the table shows that 13 of the 16 successful births (81.25%) had contacts to or by Venus and/or Jupiter when including acutely time-dependent factors, compared with only 29 out of the 86 unsuccessful treatments (33.7%). When time-dependent factors are excluded, 12 (75%) of the live and healthy births, and 21 (24.4%) unsuccessful treatments had such contacts. Further, the additional 12 unsuccessful fertility treatments gathered subsequent to the development of the model appear to reinforce it when the findings on these data are incorporated into it. The next stage of the research will attempt to validate the model against a new sample of women undergoing fertility treatment.

4.2 (iv) The rules for identifying astrological factors in the model:

1. Progressions of the Sun and Venus making exact contact within six months each side of the treatment date.

2. Progressed Moon making exact contact within two weeks each side of the treatment date.

3. Contacts of progressed Jupiter with the natal planets (those in the chart for the time, date and place of birth) Sun, Moon, Venus and Jupiter and also the Ascendant (point emerging on

the local horizon for the time of birth) and Midheaven (point at which the Sun culminates for the time of birth at the location of birth) within three months each side of the treatment date.

4. Progressed Ascendant or progressed Midheaven making exact contact with designated planets only and not designated angles (i.e. natal Ascendant and Midheaven) within six months each side of the treatment date.

5. Progressed 5th-house planetary ruler (if it was in the 5th house at time of birth) making exact contact with designated planets and angles within six months each side of the treatment date.

These are rigid rules or conditions for applying the astrological hypothesis in the model. Astrological factors cannot be counted as significant for a successful treatment outcome if they do not conform to one or more of the above rules.

4.3 The null and alternative hypotheses

4.3(i) The null hypothesis

The null hypothesis for the astrology in the model is: astrological factors associated with Venus and Jupiter, according to the rules laid out above, will have no significant association with positive treatment outcome.

4.3 (ii) The alternative hypothesis

The alternative hypothesis is: the astrology in the model, according to these rules, will have a significant association with a successful treatment outcome where this is defined as the birth of live baby.

4.4 Age and astrology and treatment outcome

The literature shows that fertility declines sharply from age 35, but in this sample there is no significant effect for age (see Table 4.2). There is a difference in percentages of live births (16% and 11%), but this percentage difference fails to reach statistical significance. It could be that the test lacks the power to detect a difference because of the small numbers. In Table 3, where treatment outcome is examined controlling for age, there are fewer live births for women over 35, but there is still an association between outcome and presence of astrological factor at 5% level of significance. For the age up to 34, when the astrological factor is present, for women who gave approximate birth times, and where time-dependent factors are excluded (Table 4.3), the probability of success is significant. For 35 and upwards, for women whose birth times were given as accurate (Table 4.4), and for whom astrological time-dependent factors were included, the probability of success is not significant but is moving in the direction of significance. In Table 4.3, 38% of treatments resulted in live births, compared with only 5% when the factor is not

present. Over 35, this drops to 31% when the astrological factor is present, but this is still significantly more than when the astrological factor is not present (5%).

Table 4.2. Treatment outcome by age group (n = 114 treatments)

Age group	Live births	No/failed pregnancy	Fisher's p value: same or stronger association
Up to 34 years	10	50	0.431
35 years +	6	48	

The contacts shown in Tables 4.3 and 4.4 are the planetary contacts present or absent at time of fertility treatment implant. These are Sun, Moon, Venus and Jupiter in symbolic contact with the positions of Venus and Jupiter in the birth chart of a woman at the time of undergoing fertility treatment.

Secondary progression is the astrological forecasting system used to calculate the symbolic position of the Sun, Moon, Venus and Jupiter in a particular month or year of a woman's life.

Transits are the actual positions of a planet in the sky on any given day and can be found in any planetary ephemeris. Transits of Jupiter are the contacts that Jupiter in the sky makes with the Sun, Moon, Venus and Jupiter in a woman's chart, during a period of two weeks prior to embryo implantation or intra-uterine insemination (IUI).

Table 4.3 considers astrology where angles have been excluded, i.e. the time-sensitive factors, the Ascendant and Midheaven, have not been considered. Table 4.4 considers astrology where angles have been included.

Tests were carried out to see whether or not there was an association between the presence of Saturn in the birth chart in negative aspect (i.e., conjunction, semi-square+, square, sesquiquadrate or opposition) to the Sun, Moon and/or Venus in the birth chart and the personal responses to the section in the Problems with Fertility questionnaire where a positive response to either of the options "generally anxious" or "anxious about specific issues" indicated presence of anxiety, and a positive response to the option "fairly relaxed" indicated an absence of anxiety. This was also done for personal experience of depression, where depression was treated as being

present if the respondent described having suffered from it at any time during her life, and taken as absent if the respondent answered "no" to ever having had such an experience.

Table 4.3

Treatment outcome by presence/absence of astrological factors (excluding angles) and age group

Type of contact		Up to 34 years			35 years or more		
		Live birth	No/failed pregnancy	p value[2]	Live birth	No/failed pregnancy	p value[2]
Venus and Jupiter by secondary progression and Jupiter by transit during 2 weeks prior to implant/IUI, excluding angles	Present	8 (38%)	13 (62%)		4 (31%)	9 (69%)	
				.0019			.024
	Absent	2 (5%)	37 (95%)		2 (5%)	39 (95%)	

Table 4.4

Treatment outcome by presence/absence of astrological factors (including angles) and age group

Type of contact		Up to 34 years			35 years or more		
		Live birth	No/failed pregnancy	p value[2]	Live birth	No/failed pregnancy	p value[2]
Venus and Jupiter by secondary progression and Jupiter by transit during 2 weeks prior to implant/IUI, including angles	Present	8 (32%)	17 (68%)		5 (26%)	14 (74%)	
				.001			.0.106
	Absent	2 (5%)	35 (95%)		1 (4%)	27 (96%)	

Table 4.5

Contacts of natal Saturn with natal Sun, Moon and Venus and self-report on experience of anxiety and depression

Type of contact		Self-reported personal anxiety n = 49			Self-reported personal depression n = 48		
		General and specific	Fairly relaxed	p value[2]	Depression experienced at some point	No depression	p value[2]
Natal Saturn in challenging aspect to Sun, Moon and/or Venus in the birth chart	Present	4	22	.556	7	19	.181
	Absent	5	18		10	12	

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In Table 4.5, self-reported personal anxiety is a subjective definition given by a woman to a question in the Problems with Fertility questionnaire designed for the study, relating to whether the woman felt she was an anxious person or someone who was relaxed. Self-reported personal depression is based upon a woman's subjective perception of whether or not she believed herself, at some time in her life prior to fertility treatment, to have experienced an episode of depression, regardless of whether or not it was eventually clinically diagnosed.

4.5 Personal and STAI anxiety, BDI-II depression and self-reported depression

Out of 27 women in the sample, 14 completed both first state and trait anxiety measures and a comparison of these scores showed a high degree of correlation, giving a correlation value of .944 (2-tailed test p = 0.01) indicating significance at the 5% level.

A Spearman's rho test was carried out to compare presence or absence of personal anxiety with anxiety scores (n = 14), but no significant association was found between anxiety scores and whether or not personal anxiety was present.

The definition of personal anxiety is drawn from the question on personal anxiety contained in the questionnaire specially designed for the study. Three options were given: a. generally anxious, b. anxious about specific issues such as public speaking and taking exams, and c. fairly relaxed. Respondents who chose either a or b were categorised as having personal anxiety.

Spearman's rho tests were then carried out on depression scores and self-reported depression, and depression scores with diagnosed depression. Self-reported depression is defined as the respondent having believed themselves to have experienced a period of depression for any reason at any time during their life before taking part in the study. A question was included in the specially designed questionnaire for the study that asked: Have you ever experienced depression? The respondent was required to answer "yes" or "no". If the answer was "yes", the respondent was then asked if this was confirmed by a doctor. Whether or not the answer was "no", the respondent was then requested to provide a brief summary of the experience of depression and possible reasons for it. Diagnosed depression has two categories: those with depression diagnosed by a doctor, and those who reported no depression or depression unconfirmed by a doctor.

There was no significant association between personal depression and depression raw scores but there was a significant association between diagnosed depression and depression raw scores (n = 11), (Spearman's rho correlation coefficient .720, 2-tailed, p = .012) at the 5% level.

The significant correlation between diagnosed depression and the BDI-II raw scores supports the validity of this measure.

The results shown in Table 5 indicate that there is no evidence of association between the anxiety measure and the astrological aspects in the natal charts of the women (chi-square = .329, df = 1, p = .566). The association between depression and the astrological aspects is not significant at the 5% level (chi square = 1.789, df = 1, p = .118), but the results suggest that further investigation with a larger sample might be of interest.

4.6 Medical astrology and fertility

Certain astrological factors associated with fertility treatment problems were considered in an exploratory analysis of the group of 27 fertility treatment women in Study One compared with a group of 17 women who had conceived naturally, to ascertain which factors were present in each of the groups and whether there was a significant difference.

First, the fertility treatment group were considered for absence or presence of the astrological factors described for various conditions listed below. A full detailed set of descriptions of traditional associations is presented in Appendix (xxv).

This group of fertility treatment women (n = 27) under consideration had experienced the following medical problems:

Polycystic ovary syndrome (n = 5), ovarian problems (n = 2), fallopian tube problems (n = 7), endometriosis (n = 4), fibroids (n = 2), unexplained infertility (n = 3), and partner's infertility (n = 12).

The conditions, with the exception of partner's infertility, endometriosis and unexplained infertility, were then explored for association of astrological factors with women's fertility problems. At the time of this analysis, no specific astrological information was available on these exempted conditions

4.6 (i) Astrological conditions associated with general reproductive problems

When under some sort of stress or in a poor position, the planets Sun, Moon, Venus, Mars, Saturn and Uranus, and the signs Virgo, Libra and Scorpio are associated with reproductive problems.

Where the term "hard aspect" is used, this means: in, semi-square, square or opposition.

Ascendant/Descendant in Taurus/Scorpio or Scorpio/Taurus, with Moon or Venus in Scorpio.

Sun, Moon or Venus in Taurus or Scorpio in square aspect to Mars, Saturn, Uranus, Neptune or Pluto.

Moon in Libra conjunction or hard aspect to any of the following planets in Libra: Mars, Saturn, Uranus, Neptune, Pluto.

Ovary-related problems:

Ascendant/Descendant in Taurus/Scorpio or Scorpio/Taurus with Moon conjunct Venus in Scorpio.

Sun, Moon or Venus in Taurus or Scorpio and in conjunction or hard aspect to the following planets in Libra: Mars, Saturn, Uranus, Neptune or Pluto.

Cyst formation (PCOS):

Hard aspects to Venus by malefic planets: i.e. Mars, Saturn, Uranus, Neptune or Pluto.

Fallopian tube problems:

Moon in Libra in conjunction or hard aspect with Mars, Saturn, Uranus, Neptune, Pluto.

Sun in conjunction or hard aspect to the following planets in Libra: Mars, Saturn, Uranus, Neptune, Pluto.

Sun in Libra in hard aspect to the planets Mars, Saturn, Uranus, Neptune.

Fibroids:

Moon and Pluto in conjunction or hard aspect to each other.

In the following figures, Fig. 4.1 shows the association of specific conditions associated with specific corresponding astrological factors. Fig. 4.2 shows the relationship between presence of any condition and presence of any astrological factor associated with any reproductive problem and not a specific correspondence between a condition and the astrological factor that represents it. Therefore, Fig. 4.2 differs from Fig. 4.1. in that it shows how many women had a reproductive problem and also had an astrological factor present, regardless of whether that factor was associated with a specific condition. The aim of Fig. 4.2 was to show how many women with a reproductive health problem had an astrological factor associated with any type of reproductive problem, not necessarily representing a particular condition, present in their natal or birth charts.

The graph shows the distribution of astrological factors associated with particular conditions, i.e., one set of conditions, absent or present, in each subgroup of women.

The conditions Unexplained Infertility (UI) and Endometriosis are not shown here. Astrological factors associated with these specific conditions were not available at the time of analysis. There were four cases of endometriosis, three of which were present with other conditions in the women who had them, and there were three unexplained-infertility cases, two of which had astrological factors for other conditions present in the women who had been diagnosed with UI.

In the group of non-fertility treatment mothers (n = 17) who reported no reproductive health problems, PCOS astrological factors were present for one woman, a fallopian tubes factor for one woman, ovary problem factors for three women, and five women had the astrological factors for fibroids present. Some women had astrological factors for more than one condition present in their birth charts.

Figure 4.3. Astrological factors generally associated with reproductive problems found in a group of 27 fertility treatment women's birth charts and compared with a group of 17 non-ft mothers
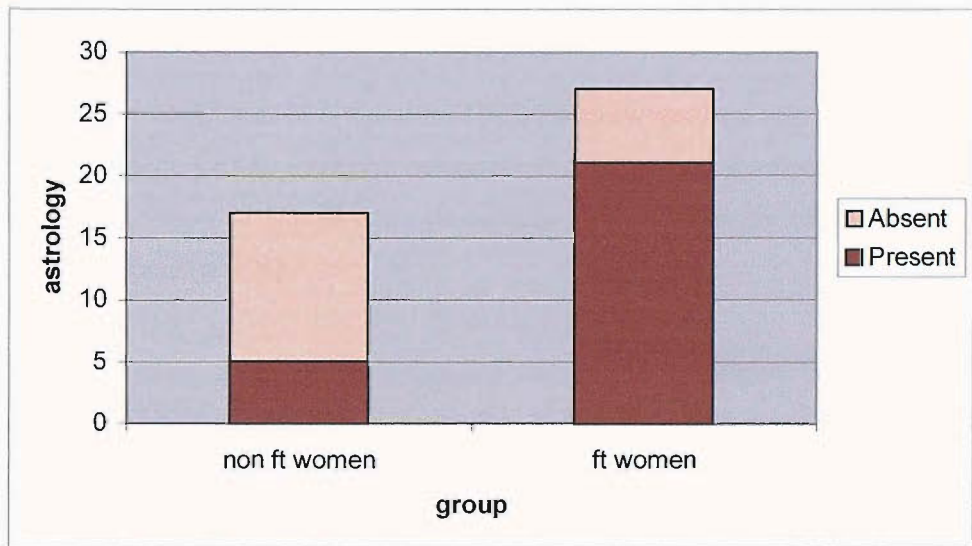
When the two groups are compared and the astrological factors associated with reproductive health problems considered collectively, five out of seventeen non-fertility treatment mothers have the factors present compared with 21 out of 27 fertility treatment women known to be diagnosed with the various conditions considered here. A simple chi-squared Fisher's exact 2-tailed same or stronger test on these comparisons gives a p value of 0.0019.

The researcher compiled a list drawn from the general reproductive factors associated with reproductive problems but which were associated with the area of the chart relating to the partner. It was then hypothesised that there would be a significant difference in the absence and presence of astrological factors associated with partner's fertility problems (defined below) between women who had partners who were experiencing fertility treatment problems and the non-fertility treatment group.

Partner's problems:

> Ascendant/Descendant in Taurus/Scorpio or Scorpio/Taurus with Mars, Saturn, Uranus, Neptune, Pluto in the Descendant axis relating to partner.
> Ruler of this partner area of the chart in conjunction or hard aspect to Mars, Saturn, Uranus, Neptune, Pluto in the partner section of this axis.

There were twelve fertility treatment women who had partners with fertility problems. Nine of these women had the astrological factors present compared with twelve of the seventeen non-fertility treatment women who had the "partner factor" in their chart and were not known to have partners who had experienced fertility treatment problems. A Fisher's exact 2- sided same or

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stronger test gave a p value of 0.567. This shows that there is no significant association between partners' fertility problems and the astrological conditions associated with them in this analysis. The null hypothesis was therefore not rejected.

4.7 Summary

A dataset of 114 treatments experienced by 27 women was explored for astrological patterns associated with fertility treatment outcome. The dataset was divided into two groups: successful outcome, where successful outcome is defined as "baby resulting from treatment" (n = 16), and failed outcome (n = 98).

The groups were compared for absence and presence of astrological factors involving the planets Sun, Moon, Venus and/or Jupiter. From the results of this exploratory analysis it was hypothesised that certain astrological contacts in the birth charts of women undergoing fertility treatment would be present at time of embryo implants which resulted in success and absent at time of embryo implants that resulted in failure.

Significant differences between successful and unsuccessful treatments were found only for relationships where Venus and/or Jupiter were factors: therefore, associations were found for progressed Venus and Jupiter in beneficial contact with the birth chart Sun, Moon, Venus, Jupiter, fifth-house ruler in the fifth house, and/or the time-sensitive angles of the birth chart (the Ascendant and/or Midheaven). Significant associations were found for Venus and Jupiter in the birth chart in contact with progressed Sun, Moon, Venus, Jupiter, Ascendant and/or Midheaven. "Progressed" denotes the symbolic position of a planet in the zodiac at a particular month or year during the life, according to the system of astrological forecasting called "secondary progression". "Beneficial contact" denotes type of angular relationships between planets in the birth chart and symbolic (progressed) planetary positions.

A comparison of treatment outcomes of group by age, where women in one group were up to 34 years of age and women in another group were 35 or over, showed no significant difference between success and failure of treatment outcome. However, when astrological factors were included in the comparison, both groups showed a significant difference, suggesting that astrological factors present at time of treatment are associated with increased chances of success for both age groups.

The birth charts of fertility treatment women were examined for fertility history problems and the presence and absence of astrological factors that are associated with reproductive problems in women and their partners. There were 35 conditions in the sample of 27 women. Out of 35

conditions, 22 had astrological factors present associated with reproductive problems in the woman or her partner.

The presence of astrological factors associated with various reproductive health problems in women (partner was excluded from this comparison) was then considered across two samples: a group of non-ft mothers (n = 17) and the group of ft women (n = 27) in this study. This comparison showed a significant difference at the 5% level (p = 0.0019) where astrological factors for reproductive health problems were more likely to be present in a group of women undergoing fertility treatment compared with women with no history of reproductive health problems who had conceived and borne children without fertility treatment. The samples are small, however, and further research into these associations is recommended.

Astrological and psychological factors that have been shown to have a significant association with fertility treatment outcome will be considered together with other significant variables in a model based on these significant associations, in order to enable the model to forecast success and failure of treatment outcome.

Chapter Five: Study One, Part Three
Combined analysis of results and the development of a model to identify astrological and psychological factors and treatment outcome on the Preliminary Analysis data.

5.1 Introduction

This chapter examines astrological, psychological and other factors that were shown to have significant associations with fertility treatment outcome in Chapter 4, in order to create a model for forecasting treatment outcome. The data of a group of 27 women who have experienced fertility treatment are examined for associations between anxiety and depression and astrology and treatment outcome. This sample of women is divided into two groups, successful outcome and failed outcome. Variables (for example, age and fertility problem history) are tested against these two outcomes. The variables that show significant association with treatment outcome, i.e., clinic location, personal depression/woman's fertility problems, and astrology including or excluding angles, are then entered into a model in a group. The model then runs on the data to ascertain how well it identifies successes and failures of treatment outcome using this collection of significant variables to select the relevant outcomes. The model was run in STATA, where the treatments were first regarded as independent of the women experiencing them. The model was then run again, with the analysis able to take into account the effect of the woman on the treatments she experienced, i.e., a possible clustering affect. This is done in order to ascertain whether the associations are still significant when the clustering affect has been considered.

5.2 Astrology, psychology and treatment outcome

Part (i) Analysis of the data in STATA without the clustering effect

In STATA, the fertility treatments (n = 114) of 27 women were regarded as independent and not as multiple observations on the same woman. Tests were then carried out to factor in the clustering effect.

In STATA, cross tabs were used, noting chi-squared and Fisher's exact p values, to look for associations between the following independent variables where treatment outcome is the dependent variable:

5.2 (i) Measuring the variables

The variables measured are divided into two categories: those variables measured once and those measured for each treatment outcome. The variable measured once relates to factors that are assumed to remain the same for each of the treatments, whereas the variables measured repeatedly, i.e., for each individual treatment, are assumed to change for each treatment.

Variables measured once:

woman's fertility history;

man's fertility history;

personal depression;

diagnosed depression;

personal anxiety;

position in family;

consider adopting a child;

marital status;

use alternative medicine generally;

time trying to conceive in months before beginning fertility treatment;

husband's fertility problems: absent/present;

consulted an astrologer: yes/no;

consulted astrologer on fertility: yes/no;

astrology helps self-understanding: yes/no;

astrology affects treatment outcome: yes/no or don't know;

level of knowledge of astrology: Sun signs/birth charts;

accuracy of woman's birth time: accurate/not accurate;

woman's fertility problems absent or present;

man's fertility problems absent or present;

astrology has an effect on outcome yes/no/don't know;

astrology helps self-understanding yes/no;

woman's fertility problems and personal depression: tested for interaction.

The variables women's or men's fertility problems absent or present, indicate whether or not the woman or her partner had been diagnosed with fertility treatment problems before commencing treatment and so have been included in the category for variables that were measured only once.

Variables measured at time of each treatment

age at time of treatment;

astrological factors excluding angles present;

child or children prior to treatment;

child or children from FT prior to treatment;

clinic location: UK or other (USA, Australia);

treatment type: *in vitro* fertilisation (IVF), frozen embryo transfer (FET), intracytoplasmic

sperm injection (ICSI), gamete intrafallopian transfer (GIFT), zygote intrafallopian

transfer (ZIFT), blastocyst, donor insemination (DI), intra-uterine insemination (IUI), abandoned (implant not attempted because treatment prior to attempt resulted in complications, or illness resulted in having to abandon treatment preparations);

prior attempts:

alternative therapies used for treatment: yes/no;

counselling for treatment: yes/no;

number of embryos implanted;

astrological factors including angles present: yes/no;

age and clinic location: tested for interaction;

age grouped to 34 and from 35 up;

treatments grouped by category: IVF, FET, ICSI, GIFT, ZIFT, blastocyst in one category, IUI and DI in the second, abandoned in the third.

For the last variable listed above, in order to test whether different types of treatment had a bearing on treatment outcome for this group, treatment types were divided into two groups. Group 1 consisted of the methods *in vitro* fertilisation (IVF), frozen embryo transfer (FET), intracytoplasmic sperm injection (ICSI), gamete intra-fallopian transfer (GIFT), zygote intra-fallopian transfer (ZIFT), blastocyst. Group 2 consisted of the methods intra-uterine insemination and donor insemination. The treatment types were divided in this way because Group 1 types address serious reproductive problems in women and Group 2 types primarily address male reproductive problems and are normally advised for women with minor or no identifiable fertility problems. "Abandoned" treatments were not considered, as there could be no possibility of a successful outcome for this group of treatments. This is because abandoned treatments are those in which the treatment process has begun but is halted before reaching egg collection and embryo implant stage for various reasons, e.g., hyperstimulation, development of viral infection such as mumps (!), or adverse reaction to drugs. No significant differences between successful and failed outcome were found for the two groups of treatment type considered.

Of the variables listed above, the following appear to be associated with treatment outcome:

personal depression;

personal anxiety;

alternative medicine used generally;

clinic location, i.e., UK or other (USA and Australia);

woman's fertility problems: absent/present;

astrology excluding angles;

astrology including angles.

Other cross-tabs analyses produced the following associations where treatment outcome was not considered:

Table 5.1
Level of knowledge of astrology and belief in astrology having an effect on the outcome of treatment

Level of knowledge of astrology	Astrology has an effect on outcome		Total
	Yes	No or don't know	
Sun signs only	9	41	50
Birth chart	30	29	59
Total	39	70	109

p< = 0.01 Fisher's exact 2-sided test, significant at the 5% level.

The above distribution indicates that those women whose level of knowledge of astrology included awareness of the birth chart were significantly more likely to believe that astrology would have an effect on outcome compared with those whose level of knowledge of astrology was confined to Sun signs only. This association was significant at the 1% level.

A chi-squared Fisher's exact 2-+ sided test on women's individual successes and fertility problems (n = 114) indicated a marginal association (p = .057).

Table 5.2
Baby resulting from treatment and the absence or presence of woman's history of fertility problems prior to receiving treatment (n = 114)

Baby resulting from treatment	Woman's fertility problems		Total
	None	One or more conditions present	
No baby	20	78	98
Baby	7	9	16
Total	27	87	114

The above distribution shows that 78 (79.6%) out of 98 failures occurred where the woman had one or more fertility treatment problems in her medical history prior to commencing treatment compared with nine (56.25%) out of 16 successes where a history of fertility treatment problems had been experienced prior to commencing treatment.

The relationships of these variables with treatment outcome as the dependent variable were examined through a logistic regression analysis, using the Forward Likelihood Ratio method of model selection. Clinic location, personal depression, and astrology excluding angles or astrology including angles were significant at the 5% level.

Because of the significant association between diagnosed depression and depression raw scores shown in Chapter Four, diagnosed depression was entered into the model as a predictor of treatment outcome (n = 94 treatments). However, when it was entered into the model, a p value of .042 was given (B −1.941, S.E. .954, df = 1). This was lower than the p value for personal depression (n = 105 treatment outcomes) within the model (p = .010, B −2.533, S.E. 979 df = 1), indicating that, for this group, personal depression is a more powerful predictive factor in the model than diagnosed depression. This may be due to differences in numbers between the two model variations or differences in perception of depression by respondents and the definition of depression used in the BDI-II Inventory.

A cross-tabs test showed that there was a confounding relationship between personal depression and woman's fertility problems and that therefore a model that included both of these factors was unstable, so different logistic regression models were developed using each of these separately.

Woman's fertility problems and personal depression were then entered separately into the model. Each showed an association with treatment outcome. Excluding all variables relating to astrology, the models indicated an association with treatment outcome for clinic location and personal depression or clinic location and woman's fertility problems.

The variables were then tested using "Enter", and the following final models were produced:

Table 5.3

Factors showing a significant relationship to fertility treatment outcome (astrology excluding angles included) (n = 105 treatments)

	B	S.E.	Sig.
Personal depression	-2.53	.98	.010
Clinic location	4.09	1.15	.000
Astrological factors excluding angles	3.40	.95	.000
Constant	-3.86	.95	.000

The fitted model is

$$\ln\left(\frac{P}{1-P}\right) = \quad -3.861825 - 4.094105(\text{clinic location}) -2.532711(\text{personal depression}) +$$

3.403338(astrology excluding angles).

The goodness of fit of the model is indicated in the pseudo R^2 value. This value is equal to 1 minus the log likelihood function of final model divided by log likelihood function of model with only the constant term. The larger the effect of the variables in the model, the greater the pseudo R^2 value will be.

$$PseudoR_2 = 1 - \frac{Log \ L_f}{Log \ L_i}$$

where L = likelihood function

The above results (Table 5.3) give a pseudo R^2 value of .4076, indicating that this model is a reasonable fit.

Experience of personal depression is associated with increased likelihood of treatment outcome failure and has a small effect on the odds of success (Exp(B) = .079). Success of treatment outcome compared between UK and other clinics (clinic location) has the greatest effect (Exp(B) = 59.986). Astrological factors are the second most powerful effect in this model (Exp(B) = 30.064).

Astrological factors including angles replaced astrological factors excluding angles and this produced the following results:

Table 5.4
Factors showing a significant relationship to fertility treatment outcome (astrology including angles included) n = 105 treatments

	B	S.E.	Sig.
Personal depression	-2.68	1.05	.011
Clinic location	3.95	1.14	.001
Astrological factors including angles	3.06	.94	.001
Constant	-3.93	.95	.000

The pseudo R^2 for this model is .3669, indicating a reasonable fit.

Tables 5.5 and 5.6 show the results obtained when the woman's fertility problems variable replaces the personal depression variable in Models 5 and 6.

The pseudo R^2 for this model is .3894.

Table 5.5
Factors showing a significant relationship to fertility treatment outcome (astrology excluding angles included) (n = 109 treatments)

	B	**S.E.**	**Sig.**
Woman's fertility problems	-1.80	.80	.024
Clinic location	2.84	.89	.001
Astrological factors excluding angles	3.48	.91	.000
Constant	-3.35	.93	.000

The pseudo R^2 for this model is .3894, indicating explanatory power of 39%.

Table 5.6
Factors showing a significant relationship to fertility treatment outcome (astrology including angles included) (n = 109 treatments)

	B	**S.E.**	**Sig.**
Woman's fertility problems	-.95	.75	.206
Clinic location	2.17	.71	.002
Astrological factors including angles	2.56	.78	.001
Constant	-3.44	99.	.000

The pseudo R^2 for this model is .2981.

Personal depression and woman's fertility treatment outcome give significant values at the 5% level when entered individually into the model for astrology excluding angles (Table 5.5), but woman's fertility treatment loses its significance when entered into a model where astrology excluding angles is replaced with astrology including angles (Table 5.6).

There are 27 women in the sample who have a varying number of treatments ranging from 1 to 11 per woman (total number of treatments n = 114). The treatments, therefore, had to be considered in relation to each woman in order to allow for a possible effect on the Standard Error. The results of Models 1 to 4 presented in Tables 3 to 6 are based on the assumption that observations are independent. This is not the case in this dataset, as some women had multiple treatments. Ignoring this interdependence may give rise to Standard Errors (SEs) that are too low,

and hence to false results. The models are therefore run again in STATA to take account of the effect of clustering of treatments within women, and to examine the effect on the SEs.

Part (ii): analysis of the data in STATA where the clustering effect is considered

Logistic regression in STATA was used to test for significant relationships where the clustering effect was factored into the analysis.

Table 5. 7
Results of logistic regression in STATA on the relationship of clinic location, personal depression, astrology excluding angles, and astrology to outcome, where treatment outcome is dependent variable, allowing for the clustering effect (n = 105)

Outcome	B	Robust Std. Err. (RSE)	SIG.
Clinic location	4.09	1.06	0.000
Personal depression	-2.53	.86	0.003
Astrology excl. angles	3.40	.84	0.000
Constant	-3.86	1.01	0.000

The p values for clinic location and astrology excluding angles do not change between the cluster and non-cluster models. P values for personal depression increase in significance from .010 to .003 when clustering is factored into the analysis.

Table 5.8
Results of logistic regression in STATA on the relationship of clinic location, personal depression, astrology including angles, and astrology to outcome, where treatment outcome is the dependent variable, allowing for the clustering effect (n = 105)

Outcome	B	Robust Std. Err. (RSE)	P value
Clinic location	3.95	1.25	0.002
Personal depression	-2.68	1.03	0.010
Astrology inc. angles	3.06	.94	0.001
Constant	-3.93	1.10	0.000

When treatment outcome is considered against clinic location, personal depression, and astrology including angle, the p value for clinic location marginally decreases in significance from

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0.001 in the non-cluster model to 0.002; personal depression increases from 0.011 to 0.010, and astrology including angles remains unchanged at 0.001.

Table 5.9
Results of logistic regression in STATA on the relationship of clinic location, woman's fertility and astrology including angles to outcome, where treatment outcome is the dependent variable, allowing for the clustering effect (n = 109)

Outcome	B	Robust Std. Err. (RSE)	P value
Clinic location	2.17	.74	0.003
Woman's fertility	-.95	.93	0.308
Astrology inc. angles	2.56	.85	0.003
Constant	-3.44	1.17	0.003

When the effect of personal depression is compared with woman's fertility in the models shown in Tables 5.6 and 5.7, the coefficient for personal depression (Table 5.8) is -2.681247, whereas that of woman's fertility problems (Table 5.9) is -.9525268.

When personal depression is replaced with woman's fertility problems in the model, the p value for clinic location decreases from 0.002 to 0.003, woman's fertility problems decreases from 0.206 to 0.308, and astrology including angles changes marginally from 0.001 to 0.003.

When clustering is factored into the model, the coefficient measure for woman's fertility problems in Table 5.10 is -1.80361, compared with that of personal depression in Table 5.8 where it is -2.681247.

Table 5.10
Results of logistic regression in STATA on the relationship of clinic location, woman's fertility, and astrology excluding angles, where treatment outcome is the dependent variable, allowing for the clustering effect (n = 109)

Outcome	B	Robust Std. Err. (RSE)	P value
Clinic location	2.84	.66	0.000
Woman's fertility	-1.80	.81	0.026
Astrology exc. Angles	3.48	.77	0.000
Constant	-3.35	.97	0.001

The comparisons between SE and RSE for each of the factors in the models is small (no difference > .30) indicating that even though treatments range from between 1 to 11 per woman in the sample, this has no significant effect on the predictive power of the model.

There were sixteen successful treatment outcomes out of 114 treatments in the preliminary analysis sample, therefore the baseline prediction rate for the likelihood of success in this sample is 14%. When no other variables are taken into consideration, each treatment has a 1 in 7 chance of succeeding.

Table 5.11

Classification tables for various factor logistic regression models showing different success and failure predictor rates in fertility treatment outcome, allowing for clustering effect (n = 105)

| Common Model factors: Clinic location plus variations shown below: | Percentage Correct | | Overall percentage |
	Failure %	Success %	
Personal depression and astrology excluding angles	97.83 (90 out of 92)	53.85 (7 out of 13)	92.38 (97 out of 105)
Personal depression and astrology including angles	95.65 (88 out of 92)	61.54 (8 out of 13)	91.43 (96 out of 105)
Personal depression (model minus astrology)	98.91 (91 out of 102)	15.38 (2 out of 13)	88.57 (93 out of 105)
Woman's fertility problems and astrology excluding angles	96.88 (93 out of 96)	46.67 (7 out of 15)	90 (100 out of 111)
Woman's fertility problems and astrology including angles	96.88 (93 out of 96)	53.33 (8 out of 15)	90.9 (101 out of 111)
Woman's fertility problems (model minus astrology)	96.88 (93 out of 96)	20 (3 out of 15)	86.48 (96 our of 111)

Cut off value: .5

Under the model containing the factors clinic location and personal depression without the astrology, 88.57% of cases are correctly classified, with 15.38% of successes predicted. Under the

model with astrology excluding angles the overall rate is slightly higher at 92.38%, but correctly predicted successes increase to 53.85%, and for the model including angles the percentages are 91.43% and 61.54% respectively.

When personal depression is taken out of the model and replaced by woman's fertility problems, without the astrology, 86.48% of cases are correctly classified, with 20% of successes predicted. Where astrology excluding angles is included in this model, the overall rate increases slightly to 90.9%, but the correctly predicted success rate increases to 53.33%. Correctly predicted failures for this last version of the model are identical to that in which astrology includes angles, at 96.88%, and to woman's fertility problems without astrology in the model.

The extremely small differences between SEs and RSEs in the non-cluster and cluster models indicates that taking out the effects of clustering does not change the models or their interpretation significantly, therefore the models are accepted for further testing in Phase 2.

5.3 Summary

Cross-tabs analysis was carried out, using chi-squared and Fisher's exact p values, which identified significant associations between variables and fertility treatment outcome.

Of these variables, personal depression, women's fertility problems, astrology excluding angles, and astrology including angles remained significant in relation to treatment outcome, when entered into a forward stepwise logistic regression model.

A chi-squared Fisher's exact test showed significant associations between astrology including angles and time trying to conceive (p = .036), significant at the 5% level.

A chi-squared Fisher's exact test showed a significant association between level of knowledge of astrology and a belief in whether or not astrology has an effect on outcome (p = .001), at the 1% level.

A chi-squared Fisher's exact test showed an association approaching significance between women's individual successes and fertility problems (n = 114) of p = .057.

There were four models tested in STATA where clustering effect was not considered:

Model 1: personal depression (p = .014), clinic location (p > .001), astrological factors excluding angles (p > .001). Pseudo R^2 = 0.41.

Model 2: personal depression (p = .013), clinic location (p > .001), astrological factors including angles (p = .001). Pseudo R^2 = 0.37.

Model 3: woman's fertility problems (p = .013), clinic location (p= .001), astrological factors excluding angles (p = .001). Pseudo R^2 = 0.39.

Model 4: woman's fertility problems (p = .174), clinic location (p= .003), astrological factors including angles (p = .001). Pseudo R^2 = 0.30.

At 41%, Model 1 has the greatest explanatory power.

These four models were then tested again for a clustering effect

In Model 1, p values for personal depression increase in significance from .010 to .003 when clustering is factored into the analysis. This indicates that an absence of personal depression is associated with an increase in successful treatment outcome. There is no change in the other variables in the model. Pseudo R^2 = 0.41.

In Model 2, the p value for clinic location marginally decreases from 0.001 to 0.003, personal depression increases from 0.011 to 0.010, and astrology including angles remains unchanged at 0.001. Pseudo R^2 = 0.37.

In Model 3, after the clustering affect has been factored into the model, the p value for clinic location marginally decreases from .002 to .003, woman's fertility decreases from 0.206 to 0.308, whereas astrology including angles marginally increases from 0.001 to 0.003. Pseudo R^2 = 0.30.

In Model 4, the p value for clinic location marginally increases from .001 to 0.000, woman's fertility decreases from .024 to .026, and astrology excluding angle remains unchanged, after the clustering affect has been factored into the model. Pseudo R^2 = 0.39.

At 41%, Model 1 has the greatest explanatory power.

There is no difference in Pseudo R^2 between any of the non-cluster models and the cluster models.

When clustering effect is factored into the model:

Model 1 identifies 54% of successes and 98% of failures, with an overall percentage of 92%.

Model 2 identifies 62% of successes and 96% of failures, with an overall percentage of 91%.

Model 3 identifies 47% of successes and 97% of failures, with an overall percentage of 90%.

Model 4 identifies 53% of successes and 97% of failures with an overall percentage of 91%.

Personal depression, woman's fertility problems, and clinic location are common to all the treatments that an individual woman has experienced, but astrological factors apply to each treatment and vary within the woman. This is the only factor in the model that can vary by treatment for the same woman and that can account for the success or failure of particular treatments for an individual.

Personal depression, woman's fertility problems, and clinic location are all factors that do contribute towards the likelihood of success, but for each woman rather than for each treatment.

The astrological factors can identify which of the treatments for a particular woman is more likely to succeed or fail.

In Chapter Six, the results presented in Chapters Three to Five relating to astrology, psychology, and success and failure of treatment outcome will be discussed. These are the findings relating to anxiety, depression, fertility treatment processes, astrology and timing of treatment, the relationship of astrology to psychology, and their associations with fertility treatment outcome. The implications of these relationships for success and failure of treatment outcome will also be discussed.

Chapter Six
Discussion of the results for Study One presented in Chapters Three to Five

Although there are many studies with small number samples (the ones reported in this thesis mostly fall in the range of 13 up to 50+) that indicate a significant relationship between anxiety and/or depression and treatment outcome (as presented in Chapter One) there have been studies carried out with large samples (ranging from 97 to 818) that have shown strong associations between stress and treatment outcome, in which anxiety was generally considered where increased stress correlated significantly with decreased likelihood of success (Boivin & Schmidt 2005); where depression is significantly associated with lower pregnancy rates (Thiering et al. 1993); and where both state anxiety and depression scores correlate with lower success rates (Oddens, den Tonkelaar & Neiuwenhuyse 1999).

Various design problems emerged at different stages of the research process that, in part, account for the smallness of the sample considered in Study 1. Other factors relate to the administration of the measures, and others to availability of data. These are discussed as follows.

6.1 Chapter Three: Psychological factors and treatment outcome

Based on the belief argued in some literature that women hoping to become pregnant, whether seeking fertility treatment or not, would be anxious to conceive successfully and that women already pregnant would be anxious about the safe delivery of a healthy baby, it was hypothesised that the three groups would have means in all measures that were significantly higher than the means from a sample drawn from a normal population. However, state anxiety Measure One means for all three groups did not vary significantly, and state anxiety Measure Two for the fertility treatment was only just approaching significance at the 5% level.

The higher trait levels for these groups compared with sample means from a normal population of working women may be due to (a) the smallness of the sample, (b) a sampling bias resulting by chance in an extreme sample, or (c) the life situations experienced by each group, (i.e. hoping to conceive and hoping for a safe delivery of a healthy baby) whereby trait anxiety has been artificially raised because of the long-term anxiety that may be experienced in a situation that continues for some time, i.e. months or years. Further exploration with a larger sample may provide more information.

In the fertility treatment context, Eugster et al. (1999) suggest that "state anxiety can be seen as an acute effect of the treatment procedure, for instance because of the uncertainty about the treatment outcome or taking medication, while trait anxiety reflects more a chronic state as a result of the experience of infertility or previous treatment procedures" (p 579).

The correlation of trait with state anxiety across all three groups in this study shows that a person with high or low trait anxiety will usually have high or low state anxiety respectively. This correlation is consistent with the literature and confirms the validity of the preliminary analysis samples for each of the three groups. The sample shows no significant correlation at the 5% level, in either group, between trait and second-state anxiety scores measured just after embryo implantation but before the result is known, although the tendency is in the direction of significance but this may be due only to chance. This result suggests that the second-state anxiety levels may be different from the first-state anxiety levels because of the situation in which the participants completed the second measures, i.e., waiting for the outcome of an attempt to conceive normally or through fertility treatment embryo implant, and that the possible elevation of state anxiety by the situation may account for the lack of significant levels of correlation of the second-state anxiety measure with trait anxiety compared with the first-state anxiety measure. This finding would benefit from further research in a larger sample study.

The results from the study showing correlation between state anxiety Measure One, depression (BDI-II) and perceived health competence scores (PHCS) for the fertility treatment group and the normal TTC group, indicate that as the level of depression increases, state anxiety also increases, and that as perceived health competence increases, state anxiety decreases significantly for fertility treatment women but not for women trying to conceive normally.

The Perceived Health Competence Scale (PHCS) is a domain-specific measure of the degree to which an individual feels capable of effectively managing his or her health outcomes (Shelton Smith, Wallston & Smith 1995). Perceived health competence is an efficacy/competence-related construct derived from social learning theory. The measure is designed to assess efficacy/competence beliefs concerning one's health and to identify the degree to which a person believes they have control over their health issues and outcomes. The measure is designed to correlate positively with health beliefs that reflect a sense of personal control and lower susceptibility to health threats, i.e., a person's health outcomes depend upon their own actions rather than chance, and people with a positive correlation will perceive themselves at less risk of a negative health-related outcome.

Women hoping to conceive normally do not experience the stress associated with the fertility treatment process that has been further associated with increased levels of state anxiety.

Fertility treatment women may experience higher levels of state anxiety when attempting to conceive, not just because of the stresses of the treatment process itself, but also, perhaps, because of a sense of failure they may have from seeking fertility treatment because they are unable to conceive a child normally. However, the correlation of decreased state anxiety with

increased PHCS may indicate that fertility treatment women who feel in control of their experiences when undergoing treatment are more likely to experience less anxiety because they are less likely to expect a failed treatment outcome. This may have important implications for the way in which fertility treatment patients are counselled, generally, at the beginning of the treatment process. Raised anxiety levels have been associated with likelihood of treatment failure, so those fertility treatment women whose PHCS scores are comparatively low may need encouragement of a sense of being in control of one's experiences when in the fertility treatment programme, as this may contribute to the likelihood of a successful outcome. However, further research into this potential association is needed.

Although in the normal TTC group there is only moderate and non-statistically significant correlation, nevertheless it is in the same direction as for the fertility group: i.e. state anxiety and depression increase together, and the more competent women feel about managing their own health the less anxious they are when trying to conceive.

The measures for pre- and post-embryo implant or insemination were not completed at the same time, i.e., different women completed the measures at different times during the period while they were awaiting the results of their attempts. The dates on which they completed the measures in relation to known result of pregnancy test ranged from approximately fourteen days to the day before the result was due to be made known to them. It might be that the closer a woman gets to the date on which the result is known, the more anxious she may become, and this could be allowed for in future research designs.

There were no successful outcomes in the three sample groups explored in Chapter Six, so it was not possible to test for raised levels of state and trait anxiety against successful treatment outcome.

6.2 Summary

The results presented in Study One, Part One, Chapter Three on psychological factors related to state and trait anxiety show that the sample groups, even though small, reflect patterns in larger samples contained in similar studies. In the comparison between groups of fertility treatment women and those who are trying to achieve pregnancy without fertility treatment, there appears to be no difference in women who are trying to conceive in the normal way in relation to increased levels of anxiety whilst waiting to see whether or not they have been successful in attempting to become pregnant.

Increased incidence of depression and decreased perceived health competence may be factors associated with significantly increased levels of state anxiety prior to embryo implantation

in the fertility treatment group of women. This is an area for further research, as techniques that are designed to help women develop a greater sense of control within the treatment process may help to reduce levels of anxiety and make the process easier to manage. This might be achieved through patient-consultant dialogue and better forms of communication.

6.3 Chapter Four: Depression and treatment outcome

Depression was considered to have been experienced by the patient if:

1. She had reported experiencing a period of depression in her life prior to undertaking fertility treatment;
2. She had experienced a period of depression in her life prior to treatment and which had been confirmed by a medical practitioner, i.e., diagnosed depression.

The treatments of the women who had indicated that their depression had been clinically diagnosed had their BDI-II raw scores correlated with this indicator, showing a significant association, which supported the validity of the measure.

Diagnosed depression was then compared with treatment outcome. When diagnosed depression (n = 94 treatment outcomes) was entered into the model as a predictor of treatment outcome, a p value of .042 resulted (B -1.941, S.E. .954, df = 1). When all responses were considered together as simply experience of personal depression, it was found that the p value for diagnosed depression was lower than the p value for personal depression (n = 105 treatment outcomes) within the model (p = .010, B -2.533, S.E. 979 df = 1), indicating that for this group the general category of personal depression is a more powerful predictive factor in the model than diagnosed depression. This may be due to differences in numbers between the two model variations.

The above results suggest that, for women who believe that they have experienced episodic depression, whether clinically diagnosed or not, there is a strong significant correlation of depression with a failed treatment outcome. This suggests that, for this group, perceived episodic depression, whether confirmed by clinical diagnosis or not, is a more powerful predictive factor than diagnosed depression alone. Therefore, if women believe they have experienced a period of depression they could be at greater risk of increased likelihood of failure of treatment outcome. Further research into self-reported depression (clinically confirmed or not) should be explored using larger samples for its association with failure of treatment outcome, to test whether the significant association found in this group is replicated in larger ones. If such an effect is replicated, it may be of help to women who perceive themselves as having experienced depression to have this addressed as part of the fertility treatment process.

6.3 (i) Astrology and fertility

Existing literature on Western astrology and fertility in relation to predicting the years when a woman is likely to have children dates back to the time of Ptolemy (100-170 CE), and astrologers have been trained to use these principles in their consultation work with clients to make forecasts about such likely events in the clients' lives. However, no scientific research has been carried out into the association of certain astrological factors and their ability to predict events reliably. The researcher, in her practice as a consultant astrologer for approximately twenty years prior to undertaking this doctoral thesis, had advised a number of clients on years during which their children were likely to be born, and had observed that nine mothers with fourteen children had given birth to their children during years when such astrological factors were present.

However, it was not until another client confided that she had tried eight IVF attempts over five years and the eighth had finally been successful, resulting in the birth of her only child, that the researcher considered the possibility of astrological factors and their association with a possible successful fertility treatment outcome. The researcher checked the astrological factors, and found that the difference between the eighth successful attempt and the preceding seven failures seemed to be associated with the presence and absence of Venus and Jupiter contacts, respectively, at the time the treatments were undertaken. The question then occurred to the researcher whether it was possible to identify and forecast successful fertility treatment times using astrological indicators.

There were a number of possible pitfalls to address. It could be argued that children were born to women during years targeted by astrology as particularly fertile years simply because these women were encouraged to attempt successful conception during such years, and that they were relaxed about the outcome because they were reassured about its likely success by the astrologer they consulted. In the case of the IVF client, she had not consulted an astrologer for guidelines in targeting optimum treatment times, but this was only one individual case. In order to test for a possible association, controlling for these factors, the researcher needed to collect a sample of fertility treatment women with a history of both failed and successful treatments and who had not consulted astrologers for guidelines. Their treatment data could then be examined for any patterns that were present for the successes that were not present in the failures.

Volunteers were selected who were sure of their birth times to within a few minutes, as this would ensure greater astrological accuracy when identifying certain contacts with points in the women's birth charts. The fifteen women selected had experienced sixteen successful births and a number of failed treatment attempts across several years. The researcher explored the astrology surrounding the sixteen births, looking at both time of conception and time of birth of child, in order to judge the extent to which the factors indicated in the literature as astrological indicators of birth of children were present and then compared these findings with the failed treatments. In this way, a set of conditions was established to form a hypothesis that could be tested on a second

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sample for a significant association between certain astrological factors and a successful treatment outcome.

6.3 (ii) *Other, non-astrological, factors associated with treatment outcome*

It was also important to consider and control for other non-astrological factors that had been identified as having some bearing on the success and failure of treatment outcome. These were independently considered in Chapter Four before deciding whether or not to include them in the final analysis in Chapter 5 and whether or not such factors were apparently influenced by astrology.

6.3 (iii) Age and fertility and implications for astrology

Different groups had different age ranges (p 4), so this could be a factor in distinguishing the normal pregnants and trying-to-conceives (TTC's) from the fertility treatment women. Seven of the 16 normally pregnant women had become pregnant without trying, so the natural fertility of this group seems higher than that of the fertility treatment group. This may be because of the general lower age of this group, together with the absence of diagnosed fertility problems. The astrological factors associated with increased likelihood of having children in certain years of a woman's life apply to all women, fertility treatment and non-fertility treatment women alike, and may be associated with increased likelihood of becoming pregnant and successfully giving birth to a healthy child, but relative to the quality of the woman's reproductive health as described in her birth chart (Lilly 1985). One implication of this may be that astrology can increase the likelihood of success for any women, but that it will be relative to other factors, such as a history of fertility treatment problems and age. Astrology may still make a significant difference in this exploratory analysis when fertility history and age are controlled, but the level of that difference may have to be realistically viewed against what is practically achievable in a given set of circumstances. This to say that, for example, a post-menopausal woman who no longer ovulates will not become pregnant just because there is a particular aspect of Venus and/or Jupiter operating in her life at a particular time. Other factors must allow for this outcome to be realised within reasonable bounds.

6.3 (iv) A possible relationship between psychology, astrology and treatment outcome

An exploratory analysis of the data in Study 1 showed no significant association between Saturn factors and failed treatment outcome, even though existing literature indicates such an association (Lilly 1985, Ptolemy ((CE 100 – 180) 1980). It may be that it is not so much the presence of Saturn as the absence of Venus and/or Jupiter that is significantly associated with a successful outcome, because of a possible relationship between anxiety and the absence of Venus and Jupiter contacts, rather than anxiety and the presence of Saturn contacts at the time of undergoing treatment.

Venus and Jupiter contacts are associated with times in a person's life when they are likely to experience happiness and success and to feel optimistic and content with life events. If such contacts are not active in a particular year during which treatment is undertaken, it might be argued that the person is less likely to feel happy, optimistic and content, and therefore more prone to negative emotional states such as anxiety and depression. May (1977) suggested that anxiety and fear were rooted in a lack of admiration, acceptance, being liked by others, for whatever reasons, usually related to something we feel threatens what we are all about and why we should be important. Presence of Saturn may not be the appropriate corresponding astrological factor for presence of anxiety (and, to some extent, depression), if these are the conditions that are associated with increased stress in the form of anxiety and proneness to depression. It would then be more likely to be Venus (attractiveness, happiness and popularity) and Jupiter (success) that would be present by progression in a year during which a person felt liked, admired, popular and accepted. , Theoretically, absence of such contacts would increase the likelihood of feeling less attractive, etc., than in years when such contacts were active. This might be why, in psychological terms, e.g., less anxiety related to the conditions described by May (1977), the astrological factors Venus and Jupiter tend to be present when the outcome is likely to be successful.

It has been argued here that the significant correlation between increased levels of perceived health competence (PHCS) and decreased state anxiety found in the fertility treatment group in Study 1, Part 1 might be due to those women with higher levels of perceived health competence being less likely to expect a failed treatment outcome. People prone to anxiety and depression tend to catastrophise – they expect the worst outcome in a situation. Theoretically, Venus and Jupiter, with their traditional associations of happiness, contentment and success, would make contacts to a person's chart at times when a person's outlook would tend in the positive direction, a time when their negative tendencies would not be emphasised or encouraged (Carver & Scheier 2000). Failed treatment outcome, in prone types, might encourage them to give up because they expect that bad outcomes are permanent (Abramson, Seligman and Teasdale 1978, Abramson, Metalsky & Alloy 1989). If years are targeted during which astrological factors might, theoretically, reduce these expectations in fertility treatment patients, this may result in reduced anxiety levels and increased treatment success. Further research is recommended into this intriguing possible relationship between astrology and psychology and its implications for the fertility treatment process.

Lillqvist and Lindeman 1998), researching an association between belief in astrology and tendency to experience an increased number of stressful life events, found that in a study of 50 students attending courses on astrology (age range: 22-55 yrs M: 40.2) (n = 20), psychology (age range: 16-59 yrs, M 37.1) (n= 21) and German language (age range: 21-50, M = 33.3) (n = 9), in Helsinki-based further and higher education institutions, the astrology group had experienced significantly more recent crises than the control group (combined psychology and German

language students: $F_{(2,47)} = 8.00$, $p < .001$). For the control group, interest in astrology was positively correlated with the number of crises, $r = .44$ $p < .05$). It was suggested that these results indicated that astrology played a successful role in coping with acutely stressful situations, and that astrology appeared to provide meaningful explanations for ambiguous and confusing experiences, giving a feeling of increasing the sense of control over one's own actions. The participants were not informed of the true objectives of the study, and were told that the study's objectives were concerned with people's perceptions of themselves and the world. The study concluded: "astrological information seemed to have the function of fulfilling the basic need for self-comprehension in general and in stressful situations in particular" (p 207). However, the sample was small (n = 50 students) and the study recommended further research.

This model might be applied to fertility treatment women, in that they might gain from astrological input as it could increase their sense of control. An increased sense of control has an important relationship with the levels of anxiety shown in the results of the exploratory analysis, where increased perceived competence led to a greater feeling of control correlating with negative levels of anxiety and depression.

In traditional astrology, each planet represents a separate and individual principle that is distinct from another, and these principles can manifest in a number of ways. For example, Venus is associated with happiness, but happiness can be experienced in a number of ways, and this might be through making affectionate friendships, falling in love, having children, or achievement through a vocation. All these experiences are different, but are perceived, in astrology, to be derived from one principle. This concept is fully explored by Dennis Elwell (1999) in "The Cosmic Loom".

6.3 (v) Astrological factors and medically diagnosed fertility problems

The birth charts of fertility treatment women were examined for fertility history problems and the presence and absence of astrological factors that are associated with reproductive problems in women and their partners. There were 35 conditions in the sample of 27 women. Out of 35 conditions, 22 had astrological factors present associated with reproductive problems in the woman or her partner.

In order to test for a possible significant association, the presence of astrological factors associated with various reproductive health problems in women (partner was excluded from this comparison) was then considered across two samples: a group of non-ft mothers (n = 17), and the group of ft women (n = 27) in this study.

The results of this comparison showed a significant difference at the 5% level (p = 0.0019) where astrological factors for reproductive health problems were more likely to be present in a group of women undergoing fertility treatment compared with women who had conceived and borne children without fertility treatment and without a history of reproductive health problems. The samples are small, however, and further research into these associations is recommended.

There may be a problem in this research approach, as PCOS, for example, may be present but undetected in some of the population, and may not always present as a problem with fertility (Taylor & Collins 1992). The women in this sample were considered to have PCOS present as an obstacle to pregnancy if they had self-reported the condition. The self-reports were not drawn from medical diagnosis. However, if it is a condition of the factor that PCOS presents as a problem and an obstacle to successful pregnancy – and not simply that it is present – then it could be viewed as a differentiating factor between fertility treatment and non-fertility treatment women. It might also be of value when the reproductive health of a woman diagnosed with unexplained infertility is being considered and options for further exploration are being considered.

6.4 Chapter Five: Psychology and astrology in relation to treatment outcome

In Chapter Five, the findings on psychology and astrology in relation to treatment outcome were brought together for the purposes of developing a model that could identify a treatment that was successful for each woman, and that consequently could be used as a means of targeting a time when treatment would have the greatest chance of a successful outcome, i.e., a live baby.

The model developed from the exploratory research on the first sample might then be able to detect times of successful treatments for women in the second sample.

6.4 (i) The clustering effect – factors relating to treatments and not only to the women experiencing them

There were 27 women in the sample under study in this chapter. Between them, they had experienced 114 treatments. Some factors in the model were common to all the treatments, i.e. personal depression, woman's history of fertility problems, and clinic location. Each individual woman had experienced these factors for all the treatments she had undergone. However, the astrological factor applied to each of the treatments and varied within the women. This factor is the only factor that can vary by treatment for the same woman, and so can account for the success or failure of a particular treatment for an individual.

Personal depression (self-reported and experienced prior to commencing treatment), woman's history of fertility problems, and clinic location (measures taken once) are all factors that

do contribute towards the likelihood of success, but they are factors for each woman rather than each treatment.

Astrology, however, can identify which of the treatments for a particular woman is more likely to succeed or fail. Having established this in the first study, through exploratory analysis, these findings were then tested on the second study, which is reported in Chapter Seven.

There was an interesting association between women's level of knowledge of astrology and belief that astrology will have an affect on the outcome – a greater knowledge is significantly associated with a belief that astrology will have an affect on the outcome but there was no significant association between this belief and a successful outcome. "No" and "don't know" were both considered to be negative responses, while the response of "yes" showed a clear commitment to the ability of astrology to determine a successful outcome, and so it was judged acceptable to collapse the categories in this way. As no expectancy effect was shown in Study One, this factor was not considered in Study Two. However, in a future study design it would be desirable to test for the possibility that a greater knowledge of astrology might lead fertility treatment women to reject a time of treatment which might then give rise to a nocebo effect (i.e. negative results through negative expectancy). More research is therefore needed into this possible association: more times of treatment in relation to belief that certain times are not good for success should be explored, in order to gain an understanding of such an expected level of success where times perceived as astrologically unsuccessful are avoided. In essence: would just avoiding bad, or non-astrologically favourable, times improve success rates?

6.4 (ii) Clinic success rates

The baseline success rate for the sample in Study One is 14%, which means that there is a one in seven chance of succeeding. The national UK reported rate is 1 in 4/5 (The HFEA Guide to Infertility 205/6) and the USA reported rate is one in three (CDC website 2005). So, the baseline success rate does not represent the rates for any of the individual clinic locations in the exploratory analysis. The baseline rate for this sample gives a lower chance of succeeding with a fertility treatment. This may have been because of a sampling bias in the way in which the data were collected. For example, volunteers were drawn from notices describing the astrological and psychological factors that were to be explored in relation to fertility treatment outcome placed with websites and publications that offered support groups and advice for those women who had not yet succeeded. Of those women that had succeeded, this may also have encouraged participation from those who had experienced many failed attempts before achieving success, and women who had succeeded but wanted further children through fertility treatment in the hope that the results would help to reduce the numbers of failed attempts in the future. Also, the study may have been perceived by some as offering hope through a new approach, i.e., the use of astrology, to increase

the likelihood of success for those who had experienced many treatment outcome failures. For these reasons, the sample may have been biased in the direction of low success rates for this particular group of women. Another reason for a possible bias in the sample might be that fertility treatment is naturally stressful, so research into this area of medicine may attract people who are inclined to look sympathetically on astrology.

6.4 (iii) How good is the model? The classification table results

The classification table (Table 5.13) presented in Chapter Five, showing different variations of the model where factors are common to all (i.e., excluding clinic location), indicates that the model is reasonably good at predicting failures with or without astrology. For example, personal depression considered with astrology gives predictive failure rates of 97.83% and 95.65%, compared with personal depression alone, which gives 98.91%, and in fact indicates that personal depression is the best indicator of failures in that version of the model. The success rates, however, are dramatically affected by inclusion and exclusion of the astrological factor, where rates of 53.85% and 61.54% compare with the rate for personal depression alone at 15.38%. There is a similar dramatic difference for the model whereby the woman's fertility problems factor is considered. When astrological factors are included in the model, they give success rates of 46.67% and 53.33%, compared with woman's fertility problems alone at 20%. This shows that including astrology improves the model's ability to predict success.

Personal depression is a better predictive factor than woman's fertility when the astrological factors are included, but woman's fertility is better than personal depression if the astrological factors are not taken into account (20% against 15.38%, respectively).

It would be expected that a history of fertility problems would be a better indicator of failure and success, and that absence of them would be associated with greater likelihood of a successful treatment outcome resulting in a live baby, but the numbers of these successes are very small: two out of 13 for the model including personal depression, and three out of 15 for the model including woman's fertility problems. Therefore, no real conclusions can be drawn about which is the better model. However, the astrological factor appears to be valuable as a contributor to the models' ability to predict successful treatment outcome resulting in a live baby.

A possible reason why all of the different models, with or without astrology, have good predictive levels of treatment outcome failure may be because the failure rate in this sample is so high. For example, in the personal depression models, only 13 out 105 treatments resulted in live babies, and the woman's fertility problems model is only marginally greater, with only 15 live babies out of 111 treatments. It would seem, then, that it is harder to identify successes because there are so few of them in the sample.

In Chapter Seven, the model developed through Chapters Three to Five is tested on a fresh group of women, a clinic-based sample of 40 women with 96 treatments between them, to test whether the exploratory findings in Study One are replicated in a second study with a different group of women and a new set of treatment data.

The associations that have been developed from the analysis of the first study and which will be tested on the fertility treatment sample of women in Study Two are:-

Differences between state anxiety levels taken before treatment and after treatment but before outcome is known.

Associations of depression, women's fertility history and astrological factors with treatment outcome, as included in the Model developed through Chapters 3 to 5.

The astrological conditions drawn from the exploratory analysis in Study One, and which the model uses to indicate absence or presence of astrological factors at time of treatment, to identify successful and failed treatment outcome, will be independently tested on the sample of treatments in Study Two.

The association of astrological factors with women's reproductive problems will also be tested on the fertility treatment women in Study Two.

The diagram that follows (Figure 6.1) outlines the framework for the structure of Study Two, presented in Chapter Seven.

Figure 6.1. Developing and testing the Model
Diagram of astrological and psychological factors considered together, in order to develop the model for predicting treatment outcome in Study One, Part Two

Successful treatments

Unsuccessful treatments

Significant variables, i.e., psychological and astrological factors associated with treatment outcome identified through chi-squared analysis of differences between groups

All significant variables entered into a logistic regression model and considered for their association with treatment outcome

Those variables that remained significant formed the final model for testing on a new sample of women in Study Two.

Final Model:
Clinic location
Personal depression
Women's fertility problems
Astrology including/excluding birth time dependent points
(e.g. angles)

Chapter Seven
The analysis conducted in Study Two

7.1 Introduction

This chapter presents the results of the two strands to the analysis tested in Study Two.

Firstly, discussion and conclusions for tests carried out to explore the data collected in Study Two relating to psychological states in a sample of women undergoing fertility treatment at three different clinics are presented. Demographic descriptions are given for the group. Tests were carried out to see whether there were differences in state and trait anxiety levels and levels of depression between women who experienced a failed treatment outcome and women who experienced a successful treatment outcome resulting in a viable pregnancy. Levels of state anxiety were measured twice for both groups within the sample: the first measure taken before treatment and the second measure taken after treatment but before outcome was known. The subsequent scores were then compared for significant differences between these two groups. Finally, a series of simple linear regression tests was carried out on the sample to test for possible relationships between various demographic factors, i.e., age, time spent trying to conceive, medical condition of woman and partner.

Secondly, the model developed in Study One is now tested on the data collected in Study Two (presented in this chapter) to see how well it performs in predicting likelihood of success and failure of treatment outcome on a different sample. Firstly, 12 treatments the outcome of which was unknown to the researcher were examined in a blind prediction test in which only the absence or presence of astrology at time of treatment determined by the conditions presented at the end of Chapter 4 were applied to determine success and failure of treatment outcome. Then the model is tested on the Study 2 data in two ways. Firstly, the regression equation from the model is used to predict the outcome for the 12 treatment outcomes, where the result was unknown to the researcher and sufficient information is available on the treatments for the model to test for a possible outcome. The regression equation is also applied to the remaining 43 cases in the whole of the clinic-based sample (n = 96 treatments) where sufficient information is available for the model to predict the result. This is a further blind prediction test. Secondly, the variables in the model developed in Study One are fitted to all 55 cases in the whole of the clinic-based sample (n = 96 treatments), and the results of these analyses are then presented.

7.2 Brief presentation of methods used in Study Two

7.2 (i) Data

The dataset from Study One (n = 114 treatments) and the dataset from Study Two where treatment outcome was unknown (n = 12 treatments) were combined to form a merged file. This was done so that the model developed in Study One could be used to predict treatment outcomes for the unknown treatment data collected in Study Two. The remaining 43 cases from the clinic-based sample (n = 55) were then added, with their outcome unknown, to the dataset from Study One (n = 114 treatments) to produce a merged file (n = 157) and the model run on the 43 cases to see how well it could predict treatment outcome where the outcome was unknown to the model.

All the data from the participants for each of the clinics was entered into a separate file and the model developed from Study One was then tested on this second set of data to see how well it could identify success and failure of treatment outcome.

Data for Study Two (the group where treatment outcome was unknown, and the clinic-based sample as a whole) were collected from three different fertility clinics through promotion of the study by posters and leaflets provided in the waiting rooms of the clinics. Patients who wished to take part applied to the Clinic Nurse or Receptionist for questionnaire packs containing STAI anxiety measures, i.e., trait anxiety and state anxiety before treatment and after treatment before outcome is known, and Beck Depression Inventory II (BDI-II) measures together with a questionnaire designed for the study that enabled the collection of information on patients' subjective experiences of the fertility treatment process. In line with the design for Study One, only female fertility treatment patients were invited to take part. The decision to look only at the experiences of female fertility treatment patients was determined by the constraints of the research question.

The data were then entered in an SPSS programme file and appropriately coded for analysis.

7.2 (ii) Anxiety and depression

The sample scores for anxiety and depression were analysed for possible significant relationships.

To test for a possible significant relationship between levels of anxiety and success and failure of treatment outcome, and levels of depression and success and failure of treatment

outcome, the clinic-based sample was divided into two treatment outcome groups: one group of women who had experienced a successful treatment (i.e. a viable pregnancy) and one group of women who had not experienced a successful treatment.

7.2 (iii) *The astrological model*

The model developed in Study One found significant associations between astrology, fertility problems, depression and clinic location, and success and failure of treatment outcome. This model was then applied to the data collected in Study Two.

7.2 (iv) *Demographics*

Details of the demographics are provided in Part One of the Results Section.

Data were collected from the patient populations of three fertility clinics, Clinics A and Clinics B1 and B2. Clinics A and B1 were located within NHS hospitals. Clinic B2 was a private clinic. All Clinics were located in the south of England.

The patients from Clinic B1 received their fertility treatment at Clinic B2, which held the licence for carrying out fertility treatment. Clinic B1 did not have such a licence, so patients attending at Clinic B1 were referred to Clinic B2 for the completion of their treatment. The Consultants from Clinics B1 and B2 both operated at Clinic B2.

Data were collected from the clinics in the following periods of time:

Clinic A: data were collected between May 2001 and December 2003.

Clinic B1: data were collected between November 2003 and September 2004.

Clinic B2: data were collected between May 2004 and January 2005.

7.2 (v) *Non-random sampling of populations*

The collection of participants for the clinic-based sample consisted of patients who responded to posters and information leaflets (see Appendices (xxii) and (xxiii), and (xviii) and (xxiv), respectively) displayed in the waiting rooms of the three clinics.

7.2 (vi) *Sample size for astrology and treatment outcome associations*

A power calculation based on the results of the preliminary analysis, in which there were sixteen live births out of 115 treatments, showed that 14 live births are needed to show significance at 5% with 80% power. The live birth success rate for women is assumed to be 20%, based on the Human Fertility and Embryo Association (HFEA) 2000 statistics, which suggest that, nationally, one in five women experiences a successful treatment outcome. Therefore, 70 women are needed in the trial to give 14 successful births.

7.2 (vii) Sample size for anxiety and treatment outcome associations

Sample size calculation is based on detecting a difference in mean scores on the six-item short form of the Spielberger State Anxiety scale for women who do and do not achieve clinical pregnancy in the cycle in which anxiety levels are measured. An estimate of the means and standard deviation clinical scales for the general population, and of clinically significant changes in anxiety scores, was taken from Marteau and Bekker (1992). To detect a difference of 10 points with 80% power and a 5% significance level, a minimum of 19 cases is needed in each group. Statistics provided by the HFEA (2000) show that 28.6% of women undergoing treatment achieve clinical pregnancy, and therefore a total sample size of 67 is required to provide an expected 19 in this group.

7.2 (viii) Types of data collected

Information on fertility treatment experiences of patients was collected through the questionnaire designed for the study, and psychological measures relating to anxiety and depression.

7.3 The design for Study Two

The questionnaire "Problems related to Fertility" designed for Study One was used in Study Two, but was shortened at the request of the consultants. Even in its edited form, however, it was constructed to allow for the collection of qualitative data with the intention that the additional information might provide further insight and understanding into the responses in the psychology measures used in Studies One and Two.

7.3 (i) Questionnaire pack (see Appendix (xix) for full details):

Instructions on how to complete and return the questionnaires

Two stamped and addressed envelopes for the return of the questionnaires directly to the researcher

Questionnaire (abridged version) designed for the study

Beck Depression Inventory (BDI-II)

Trait Anxiety Y2

State Anxiety Y6 (two copies)

Each questionnaire pack was numbered and each of the questionnaires in the pack carried the same number.

Packs of questionnaires were left with the Fertility sisters at all three clinics.

Posters in the waiting rooms of each of the three clinics promoted the study and invited patients who were interested to request a questionnaire pack from the clinic staff.

When a questionnaire pack was given to a patient, the clinic nurse took a note of the patient's name against the number on the pack.

The patient took the pack and if she wished to take part, she completed the questionnaires and returned them to the researcher in the stamped and addressed envelopes provided.

7.3 (ii) Preserving the anonymity of the patient

It was an important part of the research that the researcher was able to confirm whether a treatment had resulted in the birth of a baby. The clinic nurse kept a record of the patient's name against the questionnaire pack, so that as the study progressed the researcher could contact the clinic nurse, give the number of the patient, and ask whether a positive treatment outcome had resulted in a viable pregnancy. The clinic nurse could then check the patient's records and give this information to the researcher without the researcher knowing who the patient was and without the clinic nurse having access to the patient's completed questionnaires.

7.3 (iii) Objectives of the study

To test the ability of the model developed in the first study to predict likelihood of success and failure of treatment outcome for the second study sample, with treatment outcome being concealed from the researcher by a third party.

7.3 (iv) Measures used

Problems related to fertility questionnaire, STAI and BDI-II. The history of the use of these measures is provided in Chapter Two.

A questionnaire designed specially for this study was also used; this was an abridged version of the original questionnaire designed for Study One. The questionnaire was edited at the request of the consultants out of a desire to protect their patients from the "responder burden effect". This was also the reason why only the STAI and BDI-II questionnaires were used in the second study. A full copy of the abridged version of the questionnaire used for the clinic-based samples in Study Two is contained in Appendix (xx).

7.3 (v) Ethical considerations

It was necessary to apply to the respective Local Research Ethics Committees for permission to conduct the studies at Clinics A and B1, which were attached to NHS hospitals, and to submit a full description of the study design to the committees in order to secure approval for Clinics A and B1 to take part in the study. The researcher was also asked to provide the Local Ethics Committee for B1 with a letter of agreement from the Manager of the private hospital to which Clinic B2 was attached, confirming that Clinic B2 could take part in the study, and this was done. The researcher also presented her study design to the 19 members of the local ethics

committee for Clinic B1 as part of the process of securing approval for Clinic B1 to take part in the study.

Patients from all clinics were understood to have given their consent to take part in the study by returning the completed questionnaires to the researcher.

All data were secured in anonymous form on a protected database. No names were kept on electronic files. Hard copy data were kept in a locked filing cabinet in the private office of the researcher, to which the researcher alone had access.

Ethical guidelines advised by the School of Social Sciences at the University of Southampton were met.

7.3 (vi) Types of fertility treatment considered

Eight different types of treatment were considered in this study: IVF, ICSI, GIFT, ZIFT, Blastocyst, FET, IUI and DI. Full definitions are provided in Appendix (vi).

7.3 (vii) Methodological problems

There was a delay of six months in starting data collection at Clinic A because of problems presenting the researcher's application for ethics committee approval. The first meeting was postponed due to illness of members, the second meeting was unable to consider the researcher's application because the doctor designated to present it was called away to a medical emergency and a further meeting was unable to be convened because members were away on holiday. There was a delay in starting collection of data at Clinic B2 because correspondence from the researcher did not reach the Consultant until two months after it was posted.

Approximately 25% of Clinic A's patient population was non-English speaking. A translator at the Clinic translated the questionnaire pack into the patients' native language so that this percentage of the patient population had the option to take part in the study if they so wished. Posters were also displayed in the patients' native language.

The translator had offered to promote the study to the patients in their own language for the duration of the study, but developed health problems and was unable to do this. Throughout the time during which data were being collected at Clinic A, no non-English speaking patients requested the questionnaire packs. This may have been due, in part, to the inability of the translator to promote the study because of ill heath occurring three months into the duration time for data collection.

All these problems contributed to the smallness of the eventual sample size of treatments gathered in Study Two on which enough data were provided to test the models developed in the preliminary analysis in Study One.

7.4 The null hypothesis

The null hypothesis for Study Two is that with levels of state and trait anxiety, subjective report of experience of personal depression, and women's history of fertility problems controlled, astrological factors will have no link to success or failure in treatment for infertility.

7.5 Results Section

7.5 (i) Plan of analysis:

In this section, results are reported in three parts. Part One presents results on anxiety and depression for the women in the clinic-based sample. Part Two present results for the first model developed in Study One tested in four ways.

Firstly, the researcher used only the astrological conditions laid down in Chapter Four to identify treatment outcome on 12 cases the results of which were unknown to her.

Secondly, the regression equation from the model is tested on 12 treatment outcomes from the second sample the results of which are unknown to the researcher.

Thirdly, the regression equation from the model is tested on the remaining 43 treatment outcomes where the result was treated as missing in order to test the model's ability to predict the outcome.

Fourthly, the variables identified as significant in the model developed in Study One were fitted to the data obtained for the second study (n = 55) where enough information was provided to enable the model to assess the likelihood of outcome and to make a forecast.

Part One: psychological factors and fertility treatment outcome

7.5 (ii) Comparisons of state/trait anxiety and depression scores within the clinic-based sample (n = 39)

Levels of state and trait anxiety and proneness to depression (BDI-II) were compared.

Anxiety state and trait levels were also compared within the clinic-based sample (n = 19), where a second state anxiety measure had been completed during the time after implant and before the result was known.

Treatment outcome was measured against state and trait anxiety levels for women in the clinic-based sample. State and trait anxiety levels for women in the clinic-based sample were compared between treatment outcome groups where one group was successful and the other was not.

Demographic factors, i.e. age, medical condition, husband's medical condition, number of treatments attempted, and time spent trying to conceive for the fertility treatment group were also considered, when comparisons were made between the first anxiety measure and the second one in relation to differences in measurements taken at these two points in time within this group.

7.5 (iii) Demographics

A total of 40 women are included in the second study clinic-based sample for research into psychology and fertility in Part 1 of this second stage. These women were recruited from three fertility clinics, Clinic A (n = 11), Clinic B1 (n = 19) and Clinic B2 (n = 10), of which one was private and two were NHS. The clinics were all located in the south of England.

Age range: 23 to 46 years. At the time of starting fertility treatment, 19 women were 34 or under and 21 women were 35 or over.

All were married.

37 of the 40 women provided information on time spent trying to conceive. Time spent trying to conceive ranged from zero months to 126 months: 11 tried for up to 12 months, 12 tried for between 13 to 24 months, five tried for between 25 to 36 months and nine tried for 46 months and beyond.

Of the 40 women, 20 had a history of medical problems related to reproductive function, and out of 38 women who provided information, 14 had partners with medical problems.

14 out of 40 women had already experienced non-fertility treatment live births, and one woman had already experienced 1 live birth as a result of fertility treatment.

Of the 40 women who responded to the question on whether they had ever experienced personal depression in their lives, 19 said they had not and 21 said that they had had such an episode.

Information on method of payment for treatment was available on 41 out of 96 fertility treatments: 23 were privately paid for, and 18 treatments were provided by the NHS.

Information on age at time of treatment was provided for 95 of the 96 treatments: 25 treatments were undertaken when the woman was aged 34 or under, and 70 were undertaken when the woman was aged 35 or over.

Out of 89 treatments on which information was available, 59 were *in vitro* fertilisation (IVF), or frozen embryo transfer (FET), or intracytoplasmic sperm injection (ICSI), or gamete intra-fallopian transfer (GIFT) or zygote intra-fallopian transfer (ZIFT); 30 were either intra-uterine insemination (IUI) or donor insemination (DI).

Sample means for state and trait anxiety for the women in the clinic-based sample (n = 40) were compared with sample means for 451 adult working women drawn "from a population based on a total of 1,838 employees of the Federal Aviation Administration (1,387 males: 451 females)" where the group of females was considered as a separate group within the sample. The overall sample is described as being made up mainly of white-collar workers, and heterogeneous with regard to educational level and age. Employees' administrative responsibility ranged from clerical positions to high levels of supervisory management (Spielberger 1993, p 13). The means were compared in order to test the null hypothesis that the group in this second study did not differ in their experiences of anxiety from a sample of women who were not known to be pregnant or not known to be trying to conceive a child with or without fertility treatment.

Table 7.1

Comparison of means for the clinic-based sample (n = 40) with the means for a sample of adult working women (n = 451) for state and trait anxiety

Group	N	State anxiety 1 Prorated scores		n	State anxiety 2 prorated scores		n	Trait anxiety scores	
		T value	Df		T value .	Df		T value	Df
Fertility treatment women	39	0.124	489	20	3.75*	470	40	5.81*	490

$t > 1.96$ = significant at the 5% level

Independent sample t-tests were carried out to compare the means for the clinic-based sample group with the means from a sample of adult working women, taking the estimate of the sample means from the literature (n = 451, state mean 35.20 SD 10.40 and trait mean 34.79 SD 9.22) (Spielberger 1993 p13). No significant difference was found for state anxiety first measure. Significant differences at the 5% level were found for group means for trait anxiety, indicating that this group had significantly higher levels of trait anxiety, but their state anxiety Measure 1 levels

were comparable with those of a sample of female working adults. Mean levels of anxiety for the second state measure were also significant at the 5% level for this clinic-based sample group. These findings reflect those for the fertility treatment group (n = 13) and the trying-to-conceive-normally group (n = 13) in the first study (Table 3.2 p 82).

Independent sample t-tests were also carried out to compare the state means first measure for the clinic-based sample group with a UK sample of student nurses, in order that UK scores could be compared for any differences. The sample means for the student nurse group (Marteau & Bekker 1992) was 39.9 with a SD of 7.5, n = 39. When considered with the mean and SD for the clinic-based group, this gave a t value of 1.140, which is less than 1.96, indicating no significant difference between the two sample means at the 5% level.

No UK sample trait means were available for comparison[11].

Table 7.2

Comparison of clinic-based study sample means for state anxiety (Y6) Measure 1 (before treatment) and state anxiety (Y6) Measure 2 (post-treatment before outcome was known (n = 19)

	Mean	n	Std. Deviation	S.E. Mean
Anxiety Y6 second measure	46.84	19	14.51	3.33
Anxiety Y6 first measure	44.21	19	15.75	3.61

State anxiety scores taken for women before fertility treatment were compared with state anxiety scores taken for women after treatment and before outcome was known, using a paired samples t-test. There were no significant differences between the means for each of these groups (t = 1.105, df 18, p (2-tailed) = .284). This is unlike the finding for the first group of fertility treatment women in Study 1, where a significant difference was found between anxiety state one and two levels at the 5% level (t = 2.091, df = 9, p (2-tailed) = .033) (see p 83, last paragraph).

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[11] The researcher contacted Rachel Crockett, a colleague of Therese Marteau, for assistance in locating a paper that would provide trait sample means. Marteau had extensively researched state means for her work on the development of a short-form version of the state anxiety measure. In an emailed reply to the researcher, dated 6 June 2005, Crockett stated that neither she nor colleagues in the Psychology Department at the Institute of Psychiatry, King's College, London were able to provide information on such measures. No conventional database searches used by the researcher have located a UK-based trait comparison mean.

Table 7.3

State anxiety second measures taken after fertility treatment but before outcome was known compared with success or failure of treatment outcome (n = 19)

	Baby resulting from treatment	n	Mean	Std. Deviation	Std. Error Mean
Anxiety Y6 second measure	No baby	12	48.34	15.01	4.33
	Baby	6	51.67	14.72	6.01

An independent samples t-test was done to test for a relationship between state anxiety levels taken after treatment but before outcome was known, and this showed no significant association (t = -.446, df 16, 2-tailed p value = .662 at the 5% level.

A Pearson's Correlation (2-tailed) test was then carried out to test for a significant relationship between trait anxiety and state anxiety measures One and Two and depression.

Table 7.4

Correlations between Depression (BDI-II scores), Trait anxiety, State Anxiety Measure 1 (before treatment), and State Anxiety Measure 2 (after treatment but before outcome is known)

	n	Depression (BDI-II)	
		P value	Pearson's Corr.
Trait anxiety (Y2)	39	.000	.792*
State anxiety (Y6) Measure 1	38	.000	.811*
State anxiety (Y6) Measure 2	19	.003	.637*

Trait anxiety and depression were highly correlated (r = .792) and the relationship was significant at the 5% level (p < .001). There was a high correlation between state anxiety Measure 1 (before treatment outcome (r = .811, p = < .001)) and for depression at the 5% level. State anxiety Measure Two (after treatment but before outcome is known) and depression were reasonably correlated (r = .637, p = .003).

Results for the second measure are presented here to show that although only 19 measures of anxiety after treatment before outcome is known were obtained from this sample compared with 38 measures obtained for anxiety Measure One (before treatment), the correlation between depression and anxiety remains significant.

Table 7.5

BDI-II depression scores andsuccess and failure of treatment outcome (n = 81)

	Baby resulting from treatment	**n**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Depression raw scores (BDI-II)	No baby	73	16.29	10.31	1.21
	Baby	8	14.38	8.02	2.83

An independent samples t-test was done to test for a relationship between depression scores and baby resulting from treatment. This showed no significant association (t = .507, df 79, p value 2-tailed .614)

Part 2: testing the model on the second study clinic-based data

7.6 Testing the astrological conditions set down in Chapter Four

The researcher then examined the 12 cases the outcome of which was unknown, using the astrological conditions laid down at the end of Chapter Four to see how well these conditions could identify successes and failures in this sample of treatments the outcome of which was unknown to the researcher.

If an astrological factor was present according to the pre-set conditions, then the treatment was classified as a success. If no astrological factor was present according to the pre-set conditions, then the treatment was classified as a failure.

The researcher followed these conditions exactly and classified two out of three successes correctly and eight out of nine failures correctly.

This procedure was undertaken to see how well astrology alone, could identify treatment outcome. A Fisher's exact chi-squared test of these results produce a p value of .066.

7.6 (i) Testing the model on 12 "blind" cases

The dataset from the first study, the preliminary analysis sample, was added to the dataset from the second study, the clinic-based sample, where treatment outcome was unknown. This created one file, called the "merged" file.

In the clinic-based sample, there were 21 out of 96 treatments the outcome of which was unknown to the researcher. The variables used in the final model from Study One to predict

likelihood of success or failure of treatment outcome were personal depression, fertility history, clinic location, and astrology. Information on all these variables was available for 12 of the 21 outcome-unknown cases in the clinic-based sample in Study Two. Fertility history and personal depression were run separately in different versions of the model, because of the confounding effect that each had on the other.

The 12 outcome-unknown cases were added to the 114 outcome-known treatments for the first sample, from which the model had been developed in Study One, giving a total of 126 cases for the merged file.

The models developed on the preliminary sample were then used to predict the likelihood of treatment outcome for the 12 unknown cases based on the 114 known outcome cases.

Results are presented from the application of the Model developed in Study One to the data in the merged file (n = 114 treatments from the preliminary analysis file and n = 12 blind outcome treatments from the clinic-based sample) in order to predict the outcome for these 12 blind cases from data gathered for Study Two.

For the purposes of the STATA classification table, a cut-off value of 0.14 was used, instead of the default value of 0.5. This is based on the marginal rate calculated on number of successes versus failures in the Preliminary Analysis sample Study One. There were 16 successful treatments resulting in viable pregnancies out of a total of 114 treatments, indicating that without considering any other variables, a treatment in this first sample had a 14% chance of succeeding when undergoing fertility treatment.

The model developed in Study One was then used to identify the successes and failures of the 12 cases from Study Two where treatment outcome was not known, and the required information, i.e. astrological data, experience of personal depression, clinic location, and a history of fertility problems, was available for the model to test. None of the 12 cases had astrological time-sensitive factors (i.e. astrology including angles) present, so there was no difference in results between the model for excluding angles and the model for including angles for astrology. Therefore, only the results for the model versions using astrology excluding angles are presented here.

Table 7.6

Model 1: astrology excluding angles and personal depression

Casewise list. Blind cases: probability of success values

Case	Blind treatment observed outcome	Predicted probability	Predicted outcome
115	Success	.021	F
116	Fail	.021	F
117	Fail	.021	F
118	Fail	.387	S
119	Fail	.021	F
120	Fail	.002	F
121	Success	.048	F
122	Success	.048	F
123	Fail	.002	F
124	Fail	.002.	F
125	Fail	.002	F
126	Fail	.021	F

In the 12 blind cases, Model One (personal depression, astrology excluding angles, and clinic location) correctly identified none of the three successes, and incorrectly identified one failure as a success.

Table 7.7

Model Three. Astroexcl and Fertility history

Blind test of cases (n = 12) where treatment outcome was unknown before applying the model – probability of success values

Case	Blind treatment outcome	Prediction	Predicted group
115	Success	.034	F
116	Fail	.034	F
117	Fail	.034	F
118	Fail	.532	S
119	Fail	.034	F
120	Fail	.006	F
121	Success	.532	S
122	Success	.158	S
123	Fail	.006	F
124	Fail	.006.	F
125	Fail	.034	F
126	Fail	.006	F

In the 12 blind cases, Model Three (astrology excluding angles, and women's fertility history) correctly identified two out of three successes, and wrongly identified one of the failures as a success.

7.6 (ii) Testing the model's ability to predict treatment outcome on the remaining 43 clinic-based cases

The dataset from the first study, the preliminary analysis sample, was then added to the 43 cases (which excluded the 12 blind cases) where treatment outcome for all 43 cases was shown as "unknown", creating another larger merged file (n = 157). The variables used in the final model from Study One to predict likelihood of success or failure of treatment outcome (personal depression, fertility history, clinic location, and astrology) were then run separately in different versions of the model on these 43 cases, as had been done with the 12 blind cases.

For clinic location, women's fertility history, and astrology excluding angles, the merged file analysis on the 43 cases (n = 169) correctly classified 0 out of one success and 32 out of 42 failures, giving an overall success rate of 74.4%.

For clinic location, women's fertility history, and astrology including angles, the merged file analysis on the 43 cases (n = 169) correctly classified one out of one success and 36 out of 42 failures, giving an overall success rate of 80%.

For clinic location, personal depression, and astrology excluding angles, the merged file analysis on the 43 cases (n = 157) correctly classified 0 out of one success and 37 out of 42 failures, giving an overall success rate of 86%.

For clinic location, personal depression, and astrology including angles (time-sensitive factors), the merged file analysis on the 43 cases (n = 169) correctly classified one out of one success and 38 out of 42 failures, giving an overall success rate of 91%.

When astrology alone, excluding angles, was used to identify success and failure of treatment outcome, 0 out of 1 success and 34 out of 42 failures were correctly classified, giving an overall success rate of 80%.

When astrology alone, including angles, was used to identify success and failure of treatment outcome, one out of one success and 38 out of 42 failures were correctly classified, giving an overall success rate of 91%.

As with the 12 blind cases, where astrology alone was used to identify treatment outcome, there is no difference in the result when the model is used compared with the researcher's personal examination of the data. This is because the researcher is applying the same conditions set down for the astrology in the model as that used for applying the astrology in the independent blind test. Therefore, knowledge of outcome for the sample of 43 cases has no bearing on astrology's ability to identify successes and failures correctly.

Table 7.8, below presents the figures for the merged file analysis (n = 157) when the model was used to predict treatment outcome for the remaining 43 cases in the clinic-based sample treatments.

Table 7.8

Observed treatment outcome of 43 clinic-based cases and treatment outcome predicted by Study One Model

Model Version	Treatment Outcome	Analysis of 43 treatment outcomes		
		No baby	Baby	% Correct
Clinic location Women's fertility Astrology excluding angles	No baby Baby	32 1	10 0	76.2 0
	Overall %			74.4
Clinic location Women's fertility Astrology including angles	No baby Baby	36 0	6 1	85.7 100.0
	Overall %			80.0
Clinic location Personal depression, Astrology excluding angles	No baby Baby	37 1	5 0	90.2 0
	Overall %			86.0
Clinic location Personal depression, Astrology including angles	No baby Baby	38 0	4 1	90.5 100.0
	Overall %			91.0
Astrology excluding angles only	No baby Baby	34 1	8 0	81.00 0
	Overall %			80.0
Astrology including angles only	No baby Baby	38 0	4 1	90.5 100.0
	Overall %			91.0

An examination of the above table immediately reveals the problem with the success rate: of the 43 remaining cases, only one resulted in the birth of a live baby. The other three babies in

the sample were contained in the 12 blind cases. This baby is detected only when the model includes the time-sensitive astrology factor: astrology including angles.

The model version, clinic location, personal depression, and astrology including angles, gives the best failure detection rate of 38 out of 42 cases, or 90.5 and, therefore, this version is the best version of the models for predicting treatment outcome on the 43 clinic-based cases the outcome of which was unknown to the model.

7.6 (iii) Testing all the data in the clinic-based sample

The four versions of the model developed in Study One were then run on the entire data (n = 96 treatments) to test the fit of the models on the dataset in the clinic-based sample in the second study.

Table 7. 9

Clinic-based sample (n = 55 treatments) – summary of p values and ExponB values for variables considered against baby resulting from treatment in each of the four different models where the clustering effect was not considered

Model tested in STATA without the clustering effect		
Model (M)	**P value**	**ExponB value**
M.1 Astrology excluding angles Personal depression	.217 .845	3.748 .812
M.2 Astrology including angles Personal depression	.066 .710	9.4443 .664
M.3 Astrology excluding angles Fertility history	.200. .473	3.943 .419
M.4 Astrology including angles Fertility history	.064 .455	9.420 .397

No variables had significant p values in any of the versions of the model, with only astrology approaching significance, at p = .066 in Model 3 and p = .064 in Model 4.

7.6 (iv) Testing the data for a clustering effect

The model was then run again to test for a possible clustering effect.

Table 7.10
Model tested in STATA: clinic-based sample (n = 55 treatments) – summary of p values, coefficients and Robust Standard Errors for variables considered against baby resulting from treatment in each of the four models

The four models tested with clustering effect				
Model (M)	P value	Standard Error (SE)	Differences in SE and RSE due to "clustering"	Robust Standard Error (RSE)
M.1 Astrology excluding angles Personal depression	0.135 0.838	1.07 1.07	.18 .04	.88 1.02
M.2 Astrology including angles Personal depression	0.058 0.717	1.30 1.10	.04 .03	1.18 1.13
M.3 Astrology excluding angles Fertility history	0.148 0.447	1.07 1.21	.12 .07	.949 1.14
M.4 Astrology including angles Fertility history	0.065 0.441	1.21 1.24	.00 .037	1.21 1.20

No variables had significant p values at the 5% level in any of the versions of the model when applied allowing for a possible clustering effect, with only astrology approaching significance, at $p = .058$ in Model 2, and $p = .065$ in Model 4.

There is very little change in the Standard Deviations allowing for the clustering effect, and so this does not change the interpretation of the results or the conclusions drawn from the results, although p values slightly improve after clustering effect has been considered.

7.6 (v) Power calculation on sample size (n = 55)

A Logistic Regression Power Analysis (Hsieh, Block and Larsen 1998) was carried out on the sample of treatments with enough data (n = 55) to be tested by the models in this study. In order for the null hypothesis not to be falsely rejected, the power produced by the calculation should be close to one. On this sample the power is 0.53513 or 53.5%, which is just over half and is, therefore, low. An acceptable power level would be 80% or over. An acceptable power level could be achieved with a sample size of 115 treatments.

7.6 (vi) The null hypothesis is not rejected

When applied to the data for Study Two, the model developed in Study One did not produce evidence to reject the null hypothesis that astrological factors have no bearing on fertility treatment outcome at the 5% level (p = 0.058).

7.7 Discussion

7.7 (i) Psychology

Comparisons of results for tests carried out on associations between state anxiety levels Measures one and two, and state anxiety and depression showed that the group of fertility treatment women in Study Two differed from the group in Study One in that levels of state anxiety were significantly higher for the Study Two group second level compared with the first level but there was no significant association for the fertility treatment group in Study One. Both groups had significant associations of state anxiety with depression. The women in the second study group were all undergoing treatment at UK fertility treatment clinics, while the women in the first study group were gathered from the UK and other countries. There may have been some differences in the experience of the treatment process that contributed towards levels of anxiety in the different groups. Both groups are small, however, with Study One fertility treatment group n = 10 and Study Two fertility treatment group n = 19, and the smallness of the numbers may account, in part, for the differences in the results.

A counselling service was available through all three clinics from which data were gathered for the second study (Chapter Seven) in this thesis, and a number of studies have produced evidence to support the value of this service in managing various levels of stress, including anxiety and depression. These studies are presented in the Literature Review in Chapter One. Additional research has also shown that women were found to have significantly higher state and trait anxiety and depression scores than normative levels, irrespective of a successful or failed treatment outcome in a study (n = 113 childless couples) carried out by Merari, Chetrit and Modan (2002). Counselling and family assessment were recommended on the basis of the findings because of the impact of the stress that the couples on the fertility treatment programme were experiencing, and the effect of this upon their relationship. Connolly, Edelmann, Bartlett, Cooke, Lenton & Pike (1993) found that counselling compared to information alone did not lead to any enhanced reduction in levels of anxiety or depression when two groups were compared: i.e., a control group where couples were given information about the treatment programme compared with a group given the same information plus three sessions of counselling, before, during, and on conclusion of the first treatment cycle. Domar et al. (1992), in a US-based study of 52 self-referred women receiving medical treatment for infertility and attending a 10-week group behavioural treatment programme, found that women experienced a significant decrease in negative

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psychological symptoms of state and trait anxiety and depression as well as of anger levels and levels of confusion or bewilderment, together with an increase in levels of vigour or activity. The study recommended group behavioural treatment that includes stress management as an effective form of therapy for infertility patients overwhelmed by difficult decisions and who feel a need for more control in their lives. Lukse & Vacc (1999), in a study of pre-test and post-test data obtained from 50 IVF and 50 ovulation-induction medication patients receiving treatment at two US-based infertility treatment centres, found that both groups of women experienced measurable levels of grief and depression (instrument used: the Grief Experience Inventory) before, during, and after treatment. Grief levels were higher for women who did not achieve pregnancy. The study recommended that counselling should be offered before women initiated the infertility treatment process, and that their current levels of distress and coping strategies should be assessed prior to commencement of treatment, to give the best opportunities for them to develop better adaptive behaviours that would help with coping with the process and the medical procedures. In a study of 2250 patients (Schmidt et al. 2003), the main predictor of perceived importance of patient-centred care and professional psychosocial services for both men and women was shown to be a high infertility-related stress in the marital, personal and social domain, and it was recommended that a supportive attitude from medical staff and the provision of both medical and psychosocial information and support should be integral aspects of medical care in fertility clinics. However, when counselling and similar support services are offered, infertile patients may choose not to use them because the patients prefer to rely upon family and friends, and the more distressed patients who may wish to seek professional support found it not possible because they did not know who to contact and what the cost of the counselling service might be (Boivin et al. 1999).

Emery, Beran, Darwiche, Oppizzi, Joris, Capel, Guex and Germond (2003) explored the value of routine pre-IVF counselling in a Swiss study of 141 couples (282 participants) attending an IVF programme between May 1999 and December 2000, where couples were given a 15-minute presentation on the counselling concept and also complete information on the study by the investigator. Couples who were initially indifferent but open to counselling were randomly assigned to two groups: group A (counselling, n = 100 participants), and Group B (no counselling, n = 100 participants). Group C (n = 24 participants) was made up of couples who wanted counselling (no randomisation) and had agreed to fill out the questionnaires for the study. Group D (n = 58 participants) was made up of couples who had refused counselling (no randomisation) but agreed to complete the study questionnaires. Couples could move from one group to another within the duration of the study. Six participants from Group C moved to Group B. Questionnaire packs containing STAI measures and BDI measures were posted to participants with a stamped addressed envelope for the return of the completed forms at T1, which was defined as the time after the IVF information session but before counselling interventions and IVF treatment for Groups A and C, and all were mailed again at T2, which was defined as six weeks after embryo transfer (four

weeks after embryo transplant). Participants were asked to rate the expected counselling help at T1, and to rate the help they believed they had actually received at T2, by choosing from the following: (1) little help (2) moderate help (3) much help (4) don't know. Anxiety and depression measures were analysed using ANOVA, and counselling ratings were analysed using the non-parametric Kruskall-Wallis test. Differences between T1 and T2 counselling ratings were analysed using chi-squared and Cochran's Q-test. When the T2 measures were taken, anxiety and depression in those women who had achieved pregnancy were significantly lower than in those women who had not achieved pregnancy. Although there was no significant effect of counselling on anxiety and depression levels (it was the outcome of the treatment that subsequently significantly affected anxiety and depression levels), counselling was perceived as providing help for 86% (75/87) subjects and 96% (25/26) of those requesting it. The study concluded that the counselling model was of value as a form of psychological assistance for pre-IVF couples.

It may be that the finding in the study presented in this chapter of no significant association between raised anxiety levels and treatment outcome could be due to the availability of counselling within the three clinics taking part in Study Two, and the potential impact that this might have had on the anxiety and depression levels of the patients taking part. An independent samples t-test between groups for those who had received counselling prior to treatment and those who had not showed no significant differences between the means for each of the groups for trait and state anxiety 1 and 2, and BDI II depression scores. However, the numbers considered were small (n = 74 for anxiety trait and first state measure where counselling = 11 and prior counselling = 63, n = 23 for second anxiety state measure where prior counselling = 7 and no prior counselling = 16, and n = 70 where prior counselling = 10 and no prior counselling = 60) so further research is recommended with groups containing large numbers in both categories in order to gain more insight into various psychological and other factors that may have an association with fertility treatment outcome.

A comparison of clinic-based study sample means for state anxiety before treatment and state anxiety after treatment but before outcome was known (n = 19) (see Table 7.2, p 144) showed that increases in levels of anxiety before treatment corresponded significantly with increased levels post-treatment while awaiting outcome. However, an independent samples t-test taken to test for a relationship between state anxiety levels after treatment but before outcome was known showed no significant association (see Table 7.3, p 144) suggesting that increased levels of state anxiety did not have a bearing on success or failure of treatment outcome (Eugster et al. 2004). This is in line with existing literature that shows no significant association between raised anxiety levels and treatment outcome (Ardenti et al. 1999, Eugster et al. 2004, Harlow, Faby, Talbot, Wardle & Hull 1996, Thiering et al. 1993).

Level of depression against trait and state anxiety was then compared using a Pearson's Correlation (2-tailed) test to show whether a significant relationship existed between levels of anxiety and levels of depression (see Table 7.4 p 145). Trait (n = 39) and state Measures 1 (n = 38) and 2 (n =19) significantly correlate with depression. This suggests that, for this group, incidence of anxiety increases significantly with incidence of depression, a finding supported by Oddens et al (1999).

There were significant correlations between state and trait anxiety for this sample (n = 40) and between level of depression (BDI-II) and state and trait anxiety (N = 39), showing that levels of anxiety increased with levels of depression. There were also significant differences in the means for state anxiety before treatment and after treatment while awaiting outcome (n = 17), indicating that women who undergo fertility treatment are likely to have increased anxiety levels (Ardenti et al. 1999, Csemiczsky et al. 2000). The links with depression may also suggest that women undergoing fertility treatment who are likely to be particularly anxious are also likely to experience increased levels of depression (Merari et al. 1992). However, there were no significant associations between raised levels of state pre- or post-treatment, trait anxiety, or depression, and success and failure of treatment outcome for this sample (n = 17).

Therefore, although for this group there is a significant relationship between levels of anxiety and depression, they do not have a significant bearing on the success or failure of treatment outcome.

A number of studies have found support for a significant association between raised state anxiety levels and failure of treatment outcome (Ardenti et al 1999, Cesmickzy et al. 2000, Demyttenaere et al. 1992, Eugster et al. 1999, and Gallinelli et al. 2001), although those by Csemickzy et al. (2000) and Gallinelli et al. (2001) investigated small samples and their results would need further research with larger groups. Eugster et al. (2004) found no association between trait and acute state anxiety (i.e. one of two measures having a high score ≥ 36 indicating raised anxiety) but did find an association between episodic anxiety, i.e. raised state anxiety before and after fertility treatment, and failed outcome. Demyttenaere et al. (1988) found support for raised trait anxiety levels and lower conception rates (n = 116 women) but, in a later study, Ardenti et al. (1999) did not find evidence to support this association (n = 200 women). A small study comprising two groups of IVF women (n = 25 and n = 26) and one control group of women undergoing laparoscopy for sterilization (n = 24) found no significant association between treatment outcome and state or trait anxiety, but the sample was small and the study acknowledged that further research would be needed to test the reliability of the findings. Anxiety, generally, was found to be significantly associated with treatment outcome, i.e. increased likelihood of failure, in studies carried out by Demyttenaere et al. (1992), Demyttenaere et al. 1994, and Thiering et al.

(1993), and these studies also found evidence to support an association of depression with failure of treatment outcome.

There may be methodological reasons for the lack of a significant relationship between anxiety and treatment outcome in this study.

The State-Trait Anxiety Inventory for Adults (Spielberger 1983) advises that when administering the State and Trait anxiety scales, the administrator or examiner should seek to establish a trusting relationship with the persons completing the forms before they complete them, to circumvent a possible tendency for the participant to avoid admitting to feeling tense, frightened or upset, for example, when selecting statements from the questionnaires that most accurately reflect their feelings, or seeking statements that give a more positive picture of themselves, such as, "I feel calm", when these do not accurately describe the person's feelings, which may be more negative.

In the study presented in this chapter, it was not possible to establish such a trusting rapport with the clinic-based sample, because of the need to protect the anonymity of the patient. The patient collected these measures as part of a questionnaire pack and followed the instructions provided (see Appendix xix) in order to complete all questionnaires. These completed forms were then returned anonymously to the researcher.

The advantage of this method is that the participant is not known, and therefore should feel no pressure to select the statements that provide an accurate picture of how she truly feels. It is not possible to quantify how much time each individual spent on selecting items from these measures, so it is not known whether the items were selected spontaneously or whether some time was taken over their selection, even though the questionnaire gives guidelines on this. Also, if a participant had problems in understanding what was meant by a particular statement, it was not possible for them to make this known to the researcher. These problems in administration due to the requirements of the study design may have had some bearing on eventual scores, but it is not possible to quantify this.

An independent samples t-test showed no significant association between depression and baby resulting from treatment, i.e., successful treatment outcome.

The model's failure to identify successes in the second sample may be due to the fact that all treatments took place in the UK. Clinic location had the greatest effect on the model's ability to predict likelihood of success and failure of treatment. Women receiving treatment outside the UK had a much greater likelihood of succeeding than those born in the UK (see Appendix (ii)

Table 1) and this is in line with existing literature (Adamson 2002, Klipstein et al. 2005, Wells 2004, PGD 2005 and HFEA Guide to Infertility 2005/6) discussed in Chapter 1 (see Section 1.6 (i)). Women receiving treatment in the UK had a much smaller likelihood of succeeding, and this gave rise to very low probability values in the model when tested on the second sample, where clinic location was a baseline factor and so was removed from the model when run on the clinic-based sample.

7.7 (ii) Astrology

Only four viable pregnancies with enough data for testing by the model resulted from the 96 treatments obtained for the second sample in Study Two, and therefore the results must be treated with great caution. This gave rise to problems where, for example, a difference of one less detected success for astrology excluding angles (two out of four) compared with astrology including angles (three out of four) and the model which considered only astrology excluding angles when identifying success and failure of treatment outcome against other variables in Study Two registered astrology as non-significant. So a difference of one success makes a crucial difference to the ability of the model to identify successes significantly. This is another reason why further research on a larger sample with a greater number of successes and failures is recommended.

When the astrological conditions set out at the end of Chapter Four were used to select successes and failures in the blind cases sample (n = 12), the astrology according to these conditions identified two out of three successes and eight out of nine failures. Other astrologers following these conditions would achieve the same result when independently examining the same blind cases sample. However, the problem of very few successes present in the whole clinic sample, which was tested in the model, also applies when considering the effectiveness of the conditions to identify the correct outcome for this smaller sample.

As the conditions for astrology are those that determine whether the model identifies a treatment outcome as a success or failure, the researcher's knowledge of the outcome would make no difference to the result in either the whole sample or the sample where treatment outcome was unknown.

To examine the hypothetical chances of succeeding using astrology for the clinic-based sample, it is necessary to calculate the number of live births when astrology was present as a percentage of the number of treatments when astrology was present. Though this is 66% for the 12 blind treatments, there are only 3 births out of twelve treatments. Looking at all the treatments in the clinic sample, for astrology including angles (where birth time is known accurately) the rate is 3/13 = 23%, and for excluding angles (where birth time is known to within half an hour or

so) 2/12 = 17%. These would be compared with the marginal success rate for the same cases, which is 4/40 = 10% for including angles and 4/41 = 9.75% for excluding angles.

Although the p value for astrology's effect on treatment outcome is not significant, had it been possible to advise the women in the second sample in advance on timing of treatment, the advice would have been to choose their treatments when astrology was present, as this would give them a greater likelihood of success. The rate for live births when astrology was present suggests that women who knew their accurate birth times might increase their chances of succeeding with fertility treatment from 9% to 23% (about two and half times as much) if they used astrology to choose their times of treatment, and that women who were not sure of their birth times could increase their chances of succeeding from 10% to 17%. However, these results are based on very small numbers in the second sample – only four babies born where astrological data were present – so further research is needed on a much bigger sample to test this hypothesis.

Although none of the factors in the four models, after allowing for the clustering effect, produced significant p values at the 5% level, astrology was close, at .058 for Model 2 and .065 for Model 4, and so would be considered significant at the 10% level. In view of this, and the fact that the sample size was small (n = 55 treatments), further research would be worthwhile. The power of the test for Model 2 was 0.53513 (Alpha = .05, Beta = 0.46487), and for Model 4 it was 0.54104 (Alpha = 0.05, Beta = 0.45896). The usual practice seeks to achieve an Alpha of .05 and a Beta of .20, where there is a 5% chance of rejecting a true null hypothesis and a 20% chance of accepting a false null hypothesis, respectively, and so reduce the likelihood of making either a Type 1 or Type 2 error.

A power calculation was then carried out on the results delivered by the models, and it was shown that 115 treatments would be needed in order for a reliable result to be obtained.

7.7 (iii) Number of babies in the Study Two sample and UK clinic success rates

The success rates of the clinics studied here differed to the extent that Clinic A's success rate was around 6% while Clinic B1 and B2 had success rates of around 33%. This may have been due to the demographics for the patient populations in Clinics A and B. Clinic A treated patients from different ethnic backgrounds, who often who had problems understanding English. They may have found it difficult to follow the clinic regimes when undergoing treatment because of confusion in communication between staff and patients, even with the help of interpreters for one of the ethnic groups. Clinic A also treated patients from a very broad age range, i.e. very early twenties to late forties. Patients attending Clinics B1 and B2 were white, middle class and well educated, often having professional backgrounds. Communication and cooperation were good and the number of treatments in the older age range was fewer than for Clinic A. Age of women considered against

time of treatment compared between groups shows Clinic A group (n = 31 treatments) has an age range of between 29 and 40 years, mean 37.90 SD 2.454, median 39 years) compared with Clinics B1 and B2 group (n = 62 treatments) with an age range of 23 – 46 years, mean 34.73, SD 3.799, median 35 years.

These considerations, taken together with other difficulties in the running of the design for Study Two data collection, e.g., limited duration of period in which data could be collected and insufficient information available on birth data on women taking part in the study, may have contributed to the low number of babies available to be identified by the model developed in Study One as successes achieved by participants in Study Two.

7.7 (iv) Medical astrology and fertility

In Study One, an exploration of the data of 27 fertility treatment women showed a significant difference in presence of astrological factors associated with fertility history problems compared with a group of 17 mothers who had reported no such problems (p =0.0019). The astrological conditions for testing were as follows.

When under some sort of stress (receiving hard aspects,) or in a poor position, the planets Sun, Moon, Venus, Mars, Saturn and Uranus, and the signs Virgo, Libra and Scorpio are associated with reproductive problems.

Where the term "hard aspect" is used, this means: in semi-square, square or opposition.

Ascendant/Descendant in Taurus/Scorpio or Scorpio/Taurus, with Moon and/or Venus in Scorpio.
Sun in general, Moon or Venus in Taurus or Scorpio, in conjunction or hard aspect to Mars, Saturn, Uranus, Neptune or Pluto.
Moon in Libra in conjunction with, or making hard aspect to, any of the following planets in Libra: Mars, Saturn, Uranus, Neptune, Pluto.
Hard aspects to Venus by malefic planets, i.e. Mars, Saturn, Uranus, Neptune or Pluto.
Sun in Libra in hard aspect to any of the planets Mars, Saturn, Uranus, Neptune.
Moon and Pluto in conjunction, or hard aspect to each other.

In this second study, there were 14 fertility treatment women whose birth data were given as accurate to within half an hour (n = 7 accurate, n = 3 within 10 minutes and n = 4 within half an hour), making it possible to test for the associations. Of these fourteen women, nine had diagnosed fertility problems and five were diagnosed as having unexplained infertility. There was no control group available for comparison for Study Two, so the control group from Study One

was used as the control group here. When the results of the two groups were compared, it was found that 10 out of 14 of the fertility treatment women had the astrological factors present, compared with five out of 17 mothers with no reported history of fertility treatment problems. A chi-squared Fisher's exact 2-tailed same or stronger test on these comparisons gives a p value of 0.0237.

7.8 Conclusion

The psychological factors state and trait anxiety and depression are not shown to have a significant association with success and failure of treatment outcome for the clinic-based sample in Study Two.

Controlling for fertility history and personal depression across both samples in Studies One and Two, astrology as a factor for predicting the likelihood of treatment outcome remains the only factor close to significance (p = .065) and the factor in all versions of the model that has the largest coefficient, and therefore the greatest effect.

The results obtained from the application of the model in Study One and its application in the blind test for 12 cases in Study Two, and the subsequent testing of the model for the sample in Study Two, suggest that although the model can identify factors that have a significant effect on the likelihood of a successful outcome, it is less likely to predict success or failure in individual cases. This suggests that further research on a larger sample is necessary in order to obtain a clearer understanding of the potential of using astrology alone as a predictive factor in identifying treatment outcome.

Astrology is the only factor from Study One replicated in Study Two that appears to have an influence on predicting the likelihood of success and failure of treatment outcome for the clinic-based sample, and this is only close to significant, at p = .058. Also, the smallness of both samples (n = 16 babies out of 116 treatments for Study One and n = 4 babies out of 96 treatments for Study Two) advises caution in the interpretation of the replicated results, and further research on larger samples is necessary. Based upon the power calculations for the models tested in the clinic-based sample, a larger sample of no fewer than 115 treatments with available data should be recruited. It would be of further value if these 115 treatment outcomes were unknown to the researcher before the models were tested upon them.

The significant association found in Study One for medical astrology factors and presence of fertility treatment history is replicated in Study Two, where ten out of fourteen fertility treatment women had astrology factors present compared with the Study One control group of five out of 17

mothers with no reported history (p = 0.0237). This is significant at the 5% level, but these results must be viewed with caution, as the control group is the same in both comparisons.

In consideration of the results presented in this Chapter, the null hypothesis for astrological factors and their association with treatment outcome is not rejected, but in view of the smallness of the second sample, further research into the association of astrology with fertility treatment outcome is recommended.

Chapter Eight

Conclusions and implications for fertility treatment procedures and outcome with recommendations for further research

8.1 Introduction

This final chapter summarises the main conclusions that are drawn as a result of this research. The implications to which the findings from both Study One and Study Two give rise, in terms of future fertility treatment procedures and the types of further research to be explored, are also presented.

In this research project, psychological and astrological factors were examined for a possible significant relationship with success and failure of fertility treatment outcome. Two studies were carried out: one in Phase One and one in Phase Two.

8.2 Study One: Phase One

Phase One formed the exploratory part of the research process. Different variables were considered independently for significant association with success and failure of treatment outcome for a sample of women mostly recruited from the UK, USA, Australia and parts of Western Europe.

Astrological factors were different for each of the treatments, but the other factors in the four different models remained the same for all treatments, because they related to the individual woman. In the model, this means that while personal depression, clinic location and a history of fertility problems can determine the likelihood of success and failure of each individual woman, only astrology can determine the likelihood of success of each individual treatment.

8.3 Study Two (Phase Two) – the replicate study

In Study Two (Phase Two) of the research, a second group of women was recruited from three different UK fertility clinics. Psychological tests were carried out on this group to assess the psychological profiles of the women taking part and their experiences of anxiety and depression. This group formed the group for Study Two.

The treatments experienced by the women in this study sample were divided into two groups, successful and unsuccessful, and the models developed in Study One were used to predict treatment outcome for this group.

8.4 Overall conclusions drawn from the findings for Studies One and Two

8.4 (i) State anxiety, depression and perceived health competence

To date, no research into the associations between perceived health competence (PHCS) and anxiety or depression in relation to gaining a better understanding of the psychological implications for women who are undergoing the fertility treatment process has been located. It therefore appears that the research presented here is the first to indicate an association between levels of PHCS and anxiety and depression, where the higher the perceived control a woman undergoing fertility treatment has over her health issues, the lower her levels of anxiety and depression are likely to be. Strategies that help women manage their experience of the fertility treatment process in order to reduce stress levels might help to make the process less difficult. It has been shown that negative feedback from clinic staff can increase stress levels in fertility treatment women (Boivin 1999), and the development of a stronger sense of perceived health competence in these women may enable them to manage negative feedback more effectively. Providing information about the treatment process results in patients feeling less stressed (Domar et al. 1992, Schmidt et al. 2003), and being made to feel involved in the process rather than just feeling as if they are patients to whom something medical is being done (Aronson, 2000) helps them feel less anxious and tense when they are undergoing treatment. The research in this thesis has not produced evidence to support an association between raised anxiety and depression levels and increased likelihood of treatment outcome failure, but other studies have shown evidence to support such associations (Demyttenaere et al. 1988, Domar et al. 1992, Smeenk et al. 2001, Theiring et al. 1993), and these are described and presented in Chapter One.

In the group of fertility treatment women in Study One, the association of anxiety with depression and perceived health competence indicates that recognition and treatment of depression in fertility treatment women could help reduce anxiety levels.

When the PHCS levels for the group of fertility treatment women (n = 13) from Study One were considered against their MHLC ratings for Chance, Internal and Powerful Other, no significant association was found, but an association approaching significance (p = 089, Corr. -.491, 2-tailed) was found for PHCS with MHLC belief in a powerful other. This suggests that the greater the belief in another person having control over one's health issues, the lesser is the belief in oneself having such control. This seems an obvious relationship, but it has important implications for the patient-doctor/consultant relationship in the fertility treatment process. Women undergoing fertility treatment who feel that the consultant is in control, or that they are less able to control their health issues because they are being treated by a consultant, are likely to have a reduced sense of personal control, which may then be associated with increased levels of anxiety,

with the attendant consequences for the treatment outcome. Therefore it may be important that patients are encouraged to work with their consultant and to perceive the relationship one between equals, in which the patient's own contribution to the management of the process is valued and acknowledged. This may then result in reduced anxiety levels for the patient and better treatment outcomes. However, the sample in this study is small (n = 13) and more research with larger groups into the possible associations of MHLC and PHCS with regard to anxiety in the fertility treatment setting is recommended.

It may be all the more important that the issue of developing better coping strategies through developing a stronger sense of perceived health competence is addressed in women who have experienced repeated treatment failures, as this experience has been shown to be associated with subsequent deteriorating psychological well being (Oddens et al. 1999). Consultants and clinic staff might be encouraged to discuss the patient's concerns with the patient as they move through the process together, in order to help the patient achieve a stronger sense of being in control of any health issues that may develop around or within the treatment process, itself. Therefore, further research into the association of anxiety and depression levels and PHCS is recommended, as the encouragement of women to feel more in control of their treatment processes may reduce state anxiety levels, with beneficial effects for women undergoing fertility treatment, with a resulting increase in the likelihood of successful treatment outcome.

The significant relationship between state anxiety and episodic depression found in the group of women in Study Two suggests that there may be a relationship between increased levels of anxiety about specific situations such as undergoing fertility treatment and experience of depression earlier in the life. Hunter (1992) found some evidence to support this association. Identification of past experience of depression in women presenting for fertility treatment may therefore be useful, because such an experience may act as a predictor of maladaptive coping strategies in such women, with inability to cope possibly leading to increased stress levels and subsequent likelihood of failed treatment outcome. Both clinically and non-clinically diagnosed depression should be explored for its possible implications relating to coping with the fertility treatment process, as women who perceive themselves as having experienced depression, whether or not it has been confirmed by a medical practitioner, may be more prone to expect or fear a negative outcome than those who have no past experience of depression, with attendant implications for the success of the treatment process itself. It is therefore recommended that the association between state anxiety and episodic depression found in Study Two be further explored on a larger sample of women.

8.4 (ii) The development of the model

The results of the explorations from both parts of Phase One were then combined within a model for forecasting treatment outcome. This model was developed using the forward stepwise likelihood ratio logistic regression method.

The results of all the research carried out in Phase 1 indicated that clinic location, fertility history, personal depression and astrological factors (time-dependent and non-time-dependent) had a significant association with treatment outcome, and that a logistic regression model allowing for a clustering, or woman, effect based upon these factors should have significant power to identify success and failure of treatment outcome.

The four models developed in Study Two, in which psychological, biological, demographic and astrological factors were combined, were then tested on the data in Study Two in a replication of the study design for Study One.

A test was carried out of 12 treatments drawn from this second UK clinic-based sample, with the outcomes unknown to the researcher. The models developed in Phase One that included the factors woman's fertility problems, personal depression, and astrology including angles, were run on the treatments. In a blind test of 12 cases, the treatment outcomes of which were unknown to the researcher, using the astrological factor alone, the model identified two out of three successes and eight out of nine failures, with only astrology producing a p value that was close to significant, at p = 0.066. The ability of the models to predict treatment outcome was no better than when the astrological factors were considered.

When the models developed in Study One were tested on all available treatments (n = 55) in the second sample in Study Two, none of the factors in the four different models produced a significant association with treatment outcome. However, the model that included women's fertility problems, personal depression and the time-dependent astrological factor (astrology including angles) was close to significant, and was able to correctly identify three out of four successes (75%) and 44 out of 51 failures (86%). This produced a close-to-significant p value for astrology, at the 5% level, of .058.

It should be noted, though, that the second study sample is very small. There were nine babies in a total of 96 treatments. Out of this total of 96 treatments, only four successes and 51 failures provided sufficient data to be tested by the model. The very small number of successes suggests that the results are inconclusive, and therefore further research should be carried out on a larger sample.

A power calculation indicated that for the results to be reliable, a total of 115 treatments was required.

In the exploratory analysis sample, there were 114 treatments available to test, sixteen of which resulted in success.

Another model design problem lay in the differences between both samples relating to clinic location. In the exploratory analysis sample, the preliminary analysis sample, there were 13 UK women, 13 USA women and one Australian. Clinic locations were categorised into UK and Other. Within this categorisation, women were much more likely to succeed in having a baby as a result of fertility treatment if they were based in the USA, rather than in the UK. Existing literature shows that the USA experiences a one-in-three chance of success (CDC website 2005) while a UK based treatment yields a one-in-four-to-five chance of success (HFEA Guide to Infertility 2005/6). The explanatory power of the clinic location was the strongest factor in the model. There are a number of factors that can explain why, when comparing the USA with the UK, clinic location might be a more powerful indicator of successful treatment outcome. Two examples are the availability of pre-implantation genetic diagnosis (Wells 2004), available throughout the USA but not available in the clinics in the UK during the years in which data were gathered for these studies, and patient selection (Deonandan et al. 2000), whereby only women at lower risk of failure (e.g., below 34 years of age, with fewer fertility-related health problems) are encouraged to attend various clinics (all clinics in the USA are privately run). These factors are presented in detail in Chapter One. PGD is becoming increasingly more available in the UK (HFEA Infertility Guide 2005) as more clinics obtain licences to carry out this procedure. Studies conducted in such clinics may reveal a clearer understanding about the impact on successful treatment outcome in relation to clinic location in future research.

In the second sample, the clinic-based sample recruited for Study Two, all treatments were undertaken in the UK, so the strongest factor in the model developed in the first phase could not be used in the model when it was applied to the treatments in the second sample.

When personal depression and fertility history did not show up in the model as significant, a chi-squared Fisher's exact test was carried out on the second sample, and this showed that there was no significant association between these variables and treatment outcome for this group when the variables were considered independently. It is therefore not surprising that they had no significant effect within the model on the second group.

8.5 The model applied to the data

The results of the blind test on 12 treatments, the outcomes of which were unknown to the researcher, are worthy of further investigation. Two out of three babies (66.7%) and eight out of nine failed treatments (88.9%) were correctly identified, using only the astrological conditions set out at the end of Chapter Four, giving an overall success rate of 84.61%. However, the number of successes is very small in this sample, and so a similar test on a larger sample is recommended

The smallness of the samples in both studies means that the results delivered by the model are lacking in power. The power of the model (Hsieh, Block& Larsen, 1998) is the probability of rejecting a false null hypothesis, and is measured from 0 to 1, so a model with a power factor of .9 would give very reliable results. Usually, .8 is taken as an acceptable level of power, indicating an 80% chance of detecting an effect where one exists in the population.

The number of treatments needed to give a reliability factor of .8 or 80% is 115. In the exploratory analysis, fertility treatments available for analysis were 105, close to this number, but in the replication study only 55 treatments were available for analysis – less than half the number needed to provide the acceptable power level.

The power level for Model Two (p = .058 for astrology including angles) is 0.53513, or 53.5%, and the power level for Model Four (p = .065 for astrology including angles) is 0.54104, or 54.1%. This means that there is only a 53% or 54% chance that Models One and Two will show an actual effect that exists in the fertility treatment population.

The power levels for Models 2 and 4, in which astrology approaches significance, are low, and so affect the robustness of the model, indicating that further research is needed on much larger samples.

The robustness of the model was also affected by the loss of the clinic location factor in the replication study.

In Study One, almost half the sample was USA-based, with the remainder based in the UK. In the exploratory analysis, those based in the USA had a much greater chance of experiencing a successful treatment outcome than those in the UK. In Study Two, all the women had experienced treatments at UK clinics, so it was not possible to include the strongest factor in the model when it was run again on the second sample.

In order to test the model with clinic location included, a much larger sample could be gathered from several countries, e.g., USA, UK and Europe. This effect could then be allowed for when assessing the predictive power of the model. Other known factors, such as pre-implantation genetic diagnosis (PGD), which have been shown to be associated with increased success rates, could also be incorporated into the model. Tests could also be run to test whether the PGD variable is significant in the model and whether it has a confounding effect on the clinic location variable, as PGD is widely available in the USA, while at the time these studies were undertaken was not available in any of the UK clinics from where the data were collected.

The results of the blind test (see Section 8.5 above) show that the model is better at predicting failures than predicting successes.

Of the several factors tested on the larger sample (n = 55 treatments) in four different models with astrology included in all four, only astrology was close to significant in the second study when fertility history and personal depression were controlled, indicating that this factor was the strongest factor in the model.

8.6 Medical astrology and fertility problems

The research presented in this thesis showed that there was evidence to support an association between reproductive health problems traditionally associated with certain astrological factors when a group of non-fertility-treatment women were compared with women undergoing fertility treatment who had clinically diagnosed reproductive problems (including unexplained infertility). Specific astrological factors were identified in an exploratory analysis in Study One, and the control group from this study used in a comparison of women drawn from Study Two. The findings from each study comparison with the same control group suggest that further research into these apparent associations would be valuable in gaining further insight into this apparent relationship in order to assess whether or not these astrological factors could act as an aid to identifying fertility problems, and in the case of unexplained infertility, possibly identifying areas that could be further explored for insight into this condition. Future study designs would need to consider medical diagnosis against astrological factors where women had indications in their birth charts of a potential vulnerability to a fertility problem, i.e., women clinically diagnosed with a history of fertility problems should have their birth charts analysed for absence or presence of astrological factors found in this research to be significantly associated with such problems. The findings would then have to be analysed in comparison with a control group of women who were known not to have fertility problems (or conditions that could give rise to them, e.g. polycystic ovary syndrome (PCOS)), clinically confirmed in a prospective, longitudinal study on a sufficiently large enough sample. The challenge in such a design would be to factor in unexplained infertility effectively so that the reliability of the results would be strengthened.

8.7 Summary

The replication of a significant association between presence of astrological factors and presence of history of fertility problems is interesting, and it is of further interest to note that the ratio, which is quite high, of present to absent in the fertility groups in both Study 1 and Study 2 is fairly close. In the first study, 77.77% of fertility treatment women with fertility history had the astrological factors associated with reproductive problems, compared with 71.42% in the Study Two sample. However, it must also be noted that the same control group was used for both comparisons, and the numbers in all the groups are small. Therefore, further research with much larger groups into these possible associations is recommended.

The results of the models developed in Study One and tested on the data for Study Two indicate that further research is necessary to investigate the association of astrological factors with fertility treatment outcome, an association that is significant in the replication study at the 10% level.

A future study design might seek to gather a sample of women experiencing fertility treatment in different countries, e.g., the UK and USA, rather than in one country, i.e. the UK, so that clinic location can be factored into the model. Availability of PGD, and impact on patient selection of private clinic considerations in different countries, could also be factored into the model in order to ascertain what the implications might be for predicting success and failure of treatment outcome when these factors are considered together in a logistic regression model.

Clinics providing pre-implantation genetic diagnosis might be examined in comparison with those that do not provide this service, and this factor incorporated into the model to test for a significant association with success of treatment outcome.

The finding of a significant association between anxiety and perceived health competence might be further explored in a future study design by including this measure as part of the questionnaire pack given to volunteers taking part in a future study. Research into this association on a larger sample may provide a more reliable insight into the apparent relationship between raised anxiety and perceived health competence, where the more the woman feels in control of her own health issues when undergoing fertility treatment, the less anxious she is likely to be.

Further research with a more sensitive study design, using instruments to research issues around counselling and its impact on anxiety and depression levels (Boivin & Schmidt 2005, Guerra et al. 1998, Klonoff-Cohen et al. 2004) in relation to treatment outcome in terms of better coping strategies, is also recommended. The value of astrological counselling interviews to help women

manage the stress experienced when undergoing IVF and other forms of fertility treatment might also be usefully explored, as there is some evidence to suggest that astrological counselling interviewing can help patients to develop better coping strategies for managing challenging health issues (Harris 2004). Lillqvist et al. (1998, p 207) concluded that the results of their study suggested: "that astrology plays a minor role in dealing with earlier traumatic events and a more important role in coping with acutely stressful situations. Based on predictability and controllability, astrology seems to provide meaningful explanations for ambiguous and confusing phenomena, and to increase the feeling of control, which is often lost in stressful situations." They also noted that perceived self-control – the control over one's own actions – was significantly more important for those participants after they had taken part in an astrology course. In the light of this, and in consideration of its implications for the effective management of situational anxiety and past depression, it would be of interest to research further the possible relationship between astrological counselling and the development of perceived health competence in the context of fertility treatment outcome.

Data could also be collected from countries like France and Scotland, where the birth time is registered on the birth certificate, to ensure a greater likelihood of an accurate birth time for, hypothetically, better astrological results. The time-dependent astrological factors are the angles of the chart known as the Midheaven and Ascendant (for definitions see Appendix (xxviii)). These angles are strongly associated with character and personality, and health and well being. They are also very sensitive to inaccuracies of the birth time. For example, if a woman believes her birth time to be accurate and she is, in fact, fifteen minutes off from the actual accurate point, the year in which the astrological factor is activated could fall roughly within a three-year window, with a margin of a year each side of the actual year in which the contact occurred. Thus, if only time-dependent factors were operating during a fertile year and were not supported by planetary factors, a small inaccuracy in the birth time could lead to the model being unable to detect an astrological factor for a successful birth year. Similarly, the model might indicate an unsuccessful birth year because a time dependent-factor was erroneously thought to be present. The definition of birth time has been disputed, but is generally taken as the time at which the umbilical cord is cut, because this symbolises the final severing of the infant from its mother and the beginning of its life as an independent human being.

The astrological component of the model could be further refined according to existing literature on various astrological factors associated with fertility problems. The research presented here focused on a narrow selection of factors that the literature presented as important considerations in the birth of children in a woman's life, because the researcher found these to be significant in the lives of her clients who had had children during the years when the astrological factors tested in this research were in contact with their birth charts. Other research could be

undertaken that explores different astrological factors presented in traditional astrology (Lilly 1985, Ptolemy 1980) for significant associations, and such associations could be incorporated into the model in future research to test whether they have a significant bearing on the model's effectiveness.

March (2002) found that conception was more likely when the woman's birth chart phase angle between the sun and moon was replicated in the sky at the time of attempted conception, or within a window of sixteen hours of the attempt, and this factor could be included in the model in future research in order to test for its significant association with treatment outcome. Also, the findings of Nicky Allsop (see footnote 5, Chapter One) whereby certain stars, rather than planets, might be associated with successful fertility treatment outcome, could be incorporated into the model design together with her findings on the apparent importance of clinic location. Astrologically, where there is a considerable distance (e.g. different towns or counties) between two clinics, location has a bearing on whether particular stars are considered to be in contact with the woman's birth chart, i.e., a particular fertile star may contact a woman's birth chart if she has treatment at Clinic A but not at Clinic B. This factor might also be considered as a potentially confounding factor in relation to clinic location and the availability of pre-implantation genetic diagnosis, and it would be of interest to ascertain whether there is such a confounding relationship between these variables.

Further research into personality and astrology, on larger samples, is also recommended, in order to understand better the possible relationship between psychology and astrology and counselling and astrology and their possible effects on treatment outcome, together with research into a possible relationship between issues of control in the management of personal health and their possible association with levels of depression.

Research into lunar cycles and influence on the moon and psychology suggests a possible association between psychological factors and astrology (Neal and Colledge (2000), Roberts 1999), and this might be usefully explored further for the potential value it may have in helping fertility treatment women cope with the stress of the fertility treatment process. For example, is it possible to predict mood states according to lunar phases, and if so, can intervention methods (bio-medical or psychological) be introduced to prevent or minimise influence on such mood states either prior to or during experience of them? Further, what implications might this have for fertility treatment outcome? Other astrological factors might also be considered in relation to mood states and treatment outcome. Sanders & Bruce (1997) found that women were in a better mood during the month in which conception was achieved. From the point of view of astrology, Venus is associated with a sense of happiness and well being – "feeling happy" – and Jupiter is associated with optimism. These astrological factors were found to be significantly associated with successful fertility treatment resulting in the birth of a live baby in Study 1 and close to significant in Study

Two. Future study designs on larger samples, which test for this association with mood state, might yield further useful insights and understanding for their possible relationship with treatment outcome.

In further studies carried out on UK samples, the number of treatments should be at least 115 in order for the model to perform effectively. Also, further exploratory research on clinic location by region or clinic performance according to data presented by the HFEA (HFEA Guide to Infertility 2005/6) in relation to success and failure rates of treatment might be undertaken in order to consider this factor as a possible contributor to a stronger model taking into account patient selection and availability of PGD.

It is also recommended that more research into astrology and biology is carried out, where astrological factors are associated with certain reproductive problems, in order to gain a more detailed understanding of the apparent correspondences identified in the research presented in this thesis. Such research could be undertaken to ascertain whether there is value in this branch of astrology as a diagnostic aid to identifying biologically located fertility treatment problems, in particular for those women with unexplained infertility. It would also be of contributory value to explore the possible links between the effects of stress on the immune system and the subsequent impact on reproductive function and an association with treatment outcome, with astrology being factored into the research design. Such research may help to improve the patient's experience of the treatment process, with possible beneficial results for the subsequent outcome.

The finding of a near-significant result in the replication study (Study Two) for the association of astrological factors with successful treatment outcome where treatment is timed to coincide with perceived beneficial astrological markers poses an intriguing challenge for future researchers into this phenomenon. Although the exploratory study (Study One) was designed to identify the astrological factors that are most strongly associated with treatment outcome, these associations were very strong in this preliminary analytical stage and so it may not be surprising that even in this small second study sample, a near-significant effect was found. This is testament to the views of Kelly et al. (1998) and Roberts (1997) that research should focus on very strong effects when seeking to replicate applications of astrological associations in practical everyday life.

In future research into astrology and fertility treatment outcome, a research design that incorporates the measures suggested here might help in providing a better understanding of these factors in the fertility treatment process, and might help to provide additional insight into the findings of the exploratory analysis and the replication study presented in this thesis.

Appendices

Appendix (i) Computer Software programmes used in this research

SPSS Statistics computing package

Solar Fire Version 5 Astrological software

Table 1.1: Comparison of percentage success rates for UK (1.04.01 to 31.03.02) and USA (2002) embryo transplants resulting from IVF and ICSI:

Own (non donor) Eggs	Live Births			
	Fresh embryos		Frozen embryos	
	UK	USA	UK	USA
Below aged 35	31.2%	43%	17%	27.9%
Aged 35 to 37	25.3%	37.1%	16.4%	24.1%
Aged 38 to 39	21.3%		15.7%	
Aged 38 to 40		26.4%		20%
Aged 40 to 42	14.7%		12.2%	
Aged 41 to 42		12%		16.6%

UK figures taken from the Human Fertilisation and Embryo Authority website 2005 (http://guide.hfea.gov.uk/ClinicNationalStats)

USA figures taken from the Centres for Disease Control and Prevention website 2005 (http://apps.nccd.cdc.gov/ART2002/national02.asp)

Tables 7.10 to 7.13 showing details of individual models from Chapter Seven.

Table 7.10: Model 1: astrology excluding angles and personal depression tested on Clinic based sample (without clustering effect)

Model 1	B	S.E.	Sig.
Astrology excluding angles	1.321	1.069	.217
Personal depression	-.209	1.067	.845
Constant	-2.901	.857	.001

The above results give a Pseudo R^2 value of 0.051. None of the factors in this version of the model was shown to be a significant factor in the success or failure of the treatment process.

Table 7.11: Model 2: astrology including angles and personal depression tested on Clinic based sample

Model 2	B	S.E.	Sig.
Astrology including angles	2.245	1.220	.066
Personal depression	-.410	1.103	.710
Constant	-3.468	1.092	.001

The above results give a Pseudo R^2 value of .142. None of the factors in this version of the model was shown to be a significant factor in the success or failure of the treatment process. However, astrology including angles (time sensitive points) was approaching significance at the 5% level with a p value of = .066. This factor had the greatest effect (Exp(B) = 9.444).

Table 7.12:

Model 3 astrology excluding angles and history of fertility problems tested on Clinic based sample

Model	B	S.E.	Sig.
Astrology excluding angles	1.372	1.071	.200
Woman's fertility problems	-.871	1.213	.473
Constant	-2.739	.773	.000

The above results give a Pseudo R^2 value of .070. None of the factors in this version of the model was shown to be a significant factor in the success or failure of the treatment process.

Table 7.13:

Model 4: astrology including angles and fertility history tested on Clinic based sample

Model	B	S.E.	Sig.
Astrology including angles	2.243	1.210	.064
Woman's fertility problems	-.923	1.236	.455
Constant	-3.370	1.046	.001

The above results give a Pseudo R^2 value of .159. None of the factors in this version of the model was shown to be a significant factor in the success or failure of the treatment process. However, astrology including angles (time sensitive points dependent upon accuracy of birth time) was approaching significance at the 5% level with a p value of = .064. This factor had the greatest effect (Exp(B) = 9.420).

Proposed Design: Three groups of 50 women (in each group) will be compared on the following basis:

Group 1: patients undergoing or who have undergone treatment cycles will provide details of times, dates and places at which various stages of different methods of IT (infertility treatments) were administered or undertaken.

Group 2: women who were pregnant or hoping to conceive naturally at time of entry into the study will provide information on estimated date of delivery (where appropriate) and dates relating to times when conception was/is attempted and (eventual) outcome.

Group 3: women who have already had children at any point in their lives will provide information on dates, times and places of births of children and their own birth data together with history of any problems experienced in childbirth, miscarriages, failed attempts at conception, abortions, etc.

Two questionnaires have been specially designed for the study, which incorporate sections on astrology and gather information on birth data and knowledge of astrology. These are "Problems Relating to Infertility Questionnaire" and "Pregnancy and Birth Experiences" Questionnaire.

Participants in Group 1 will be asked to complete the Problems Relating to Infertility Questionnaire, Fertility Problems Inventory, Trait anxiety measures, MHLOC (Multi-dimensional Health Locus of Control Questionnaire), PHC (Perceived Health Competence questionnaire), Beck Depression Inventory II Questionnaire, and State Anxiety measures shortly before fertility treatment commenced.
Participants in Group 2 will be asked to complete Pregnancy and Birth Experiences Questionnaire, Trait Anxiety questionnaire (and its State counterpart on entering the study), MHLOC, PHC and Beck Depression Inventory II.

Participants in Group 3 will be asked to complete only the general questionnaire relating to Pregnancy and Birth Experiences.

Null Hypothesis:

Astrological factors will have no link to success or failure in treatment for infertility, levels of state and trait anxiety and perceived health competence controlled.

Source of Population: A notice giving details of the proposed study is to be placed in Childchat, the publication of CHILD, Bexhill-on-Sea and private individuals who approached the research directly having heard about the study by word of mouth. The study includes patients undergoing GIFT, ICSI and IUI. Various websites devoted to providing support groups for women seeking or undergoing Infertility Treatment, mothers of children, pregnant and women seeking to become pregnant canvassed personally by the researcher, volunteers responding to newspaper articles about the study and also people attracted to the study by word of mouth through those already taking part.

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Appendix (v) - Notices appearing in various publications seeking volunteers for Study One

Can astrology increase chances of success in In Vitro fertilisation?
I am a PhD research student at the University of Southampton who is looking into the correlation of certain astrological factors and the success and failure rates of in vitro fertilisation.

Volunteers for the study would need to be women seeking or undergoing IVF and who could provide their times, dates and places of birth to the researcher. All volunteers would be guaranteed absolute confidentiality and material would be kep on a secured data base.

If you would like to know more about this study please contact: Mrs Pat Harris MSc., 1 Highfield, Twyford, Nr. Winchester, Hants., SO21 1QR. Tel/Fax: 01962-713134 email: harris@interalpha .co.uk

CHILDchat Magazine Summer 1999 Issue no. 84.

If you are hoping to become pregnant, are actually pregnant and/or have a child/ren already, your experiences could really help women who are seeking treatment for infertility.

I am carrying out research at the University of Southampton into factors that may or may not correlate with success and failure of treatment for infertility. This study forms the core of my PhD in the applications of astrology to health psychology. Existing research suggests that anxiety, stress and depression may contribute towards problems in successfully conceiving a child. Traditional astrology asserts that there are points in a woman's life when she is more likely to have a child than at any other time. I am looking for volunteers so that I can study all these factors and see if there is a relationship between them that may help women who are considering undergoing treatment for infertility. Your experiences of conception and pregnancy would be invaluable in this regard, whether your baby was conceived with or without treatment. If you would like to know more about the study with absolutely no obligation to take part please contact me, Pat Harris, MSc., D.F.Astrol.S, at 1 Highfield, Twyford, Nr. Winchester, Hants, SO21 1QR, Tel: 001962 713134 email: harris@interalpha.co.uk .
Our Baby magazine, November issue 2001.

In the Stars
If you're interested in astrology, then you could be the person Pat Harris is looking for. She's carrying out research into factors that may or may not be linked with success and failure of treatment for infertility. Existing research suggests that stress may contribute towards problems in conceiving a child, but traditional astrology also asserts that there are points in a woman's life when she's more likely to have a child than at any other time. Contact Pat Harris, MSc., D.F.Astrol.S., at 1 Highfield, Twyford, Hants., SO21 1QR (01962 713134): email harris@interalpha.co.uk)

Practical Parenting: complete guide to pregnancy, Issue No. 1 Oct. 2001.

Appendix (vi) Definitions of fertility treatments explored in this research

IVF – In vitro fertilisation: procedure in which an egg is fertilised in a laboratory dish, rather than inside the woman's body (called in vivo fertilisation). The newly formed embryo is then placed in the woman's uterus.

ICSI – Intracytoplasmic sperm injection: a microsurgical technique done during in vitro fertilisation in which a single sperm cell is injected into the egg to enhance fertilisation.

GIFT – gamete intrafallopian transfer: a procedure in which egg and sperm are placed into the fallopian tubes for fertilisation by way of laparoscopy

ZIFT – zygote intrafallopian transfer: surgical procedure in which an egg is fertilised outside the woman's body in alaboratory dish; the next day, the zygote (the fertilised egg in its earliest stages of development) is deposited into a fallopian tube, from which it will move into the uterus.

Blastocyst - occurring near the 5th day after fertilisation, the embryonic stage during which the embryo implants in the uterine lining (endometriosis).

FET – Frozen embryo transfer: frozen and stored (cryo-preserved) embryos are thawed and transferred to the prepared uterus

IUI – intrauterine insemination: procedure in which specially prepared sperm are deposited directly into the uterus at the time of ovulation.

DI - Donor Insemination: sperm produced by someone other than the woman's husband or male partner is introduced into the vagina at optimum ovulation time.

Definitions are taken from: Resolving Infertility (Quill edition 2001) produced by the staff of Resolve with Diane Aronson, publishers: Harper Collins, NY, USA

Proposed Design:
A group of women (n = 80) undergoing treatment cycles will provide details, where known, of times, dates and places at which commencement of treatment and embryo transplantation were administered or undertaken.

This is not a multi-centre study.

Recruitment:
Numbered (to protect patient anonymity) questionnaire packs will be available at Homerton Fertility Unit. Postage and packing are provided for the questionnaires' return.

Group A – those who achieve embryo replacements through IVF and other fertility treatments
Group B - those who are unsuccessful

There are a greater number of clinical pregnancies than resulting live births and, allowing for this, it is expected that between 25% and 30% (HFEA Annual Report 2000) of the patients will achieve successful embryo transfer.

Questionnaires:
Problems Relating to Infertility questionnaire
Spielberger Trait Anxiety measure (before treatment and between embryo implantation and pregnancy test outcome. A4 posters will be displayed at the Unit to remind participants about this second measure).
Beck Depression Inventory II

Anxiety levels at these two stages will be compared between groups A and B and may provide further understanding of their possible relationship to outcome. The Beck Depression Inventory II will ascertain presence and level of depression.

Sample size calculation is based on detecting a difference in mean scores on the six-item short form of the Spielberger State Anxiety scale for women who do and do not achieve clinical pregnancy in the cycle in which anxiety levels are measured. An estimate of the means and standard deviation clinical scales for the general population, and of clinically significant changes in anxiety scores was taken from Marteau and Bekker (1992). To detect a difference of 10 points with 80% power and a 5% significance level, a minimum of 19 cases are needed in each group. Statistics provided by the Human Fertility and Embryo Association (2000) show that 28.6% of women undergoing treatment achieve clinical pregnancy and therefore a total sample size of 67 is required to provide an expected 19 in this group.

22 out of 80 women would be expected to achieve clinical pregnancy which would allow us to detect a difference of 9.3 in mean anxiety scores but the number of participants who will not return the completed questionnaire and each of the three measures in the packs is unknown.

Null Hypothesis:
The Null Hypothesis is that none of the psychological factors outlined above will predict success or failure in IVF treatments, other factors controlled, including timing of the IVF procedures noting that one study has shown that the timing might be crucial (Millard 1993).

Source of Population:
Fertility Units, Clinics A, B1 and B2

Duration of study
September, 2003 to March, 2004

Research carried out on data not related to the proposed study has indicated that it would be helpful to my overall analysis to identify IVF and other fertility treatments that result in live births without needing to know the identity of the mother. To take account of this, the

senior nurse at the Fertility Unit keeps a record of the name of the patient against the questionnaire pack number given out. If an IVF or other fertility treatment results in a live birth for that patient taking part in the study, the number (and only the number), together with length of gestation resulting in the live birth will be given to me.

If a questionnaire pack has been returned to me with that number on it I will then be able to match up the live birth outcome with the number and whether or not the live birth related to the particular fertility treatment for which the patient completed the anxiety and depression measures

The senior nurse will not know whether the patient has returned the pack in order to take part in the study and will not see any of the questionnaires so will not be able to match up questionnaire information with names.

I will have only numbers so will not be able to identify patients taking part in the study.

This should preserve the anonymity of patients who choose to take part and provide me with the extra information I need about fertility treatment resulting in live births for individual cases. This information would be particularly helpful to the astrological component of the study proposal relating to timing of treatment and possible impact on treatment outcome but might also provide some insight on anxiety levels and fertility treatments resulting in live births as compared with pregnancies that terminate at various stages.

PROBLEMS RELATING TO INFERTILITY

General Questionnaire for women having undergone/undergoing/preparing for treatment to gather data for a study in factors which may or may not relate to the success and failure of infertility treatment

All information provided on this questionnaire is treated with absolute confidentiality and any data used in publications of the study will be presented in anonymous form to protect the identities of the participants.

Volunteer's name:................................... Date ....

Section 1
Your and your partner's position and relationships in your families of origin:

1. Are you (please tick):

   a. adopted   ....

   b. an only child   ....

   c. one of a number of siblings   ....

   c (i) if yes, please state no of .... brothers   .... sisters

   ....your position e.g. oldest, youngest etc.

   c(ii) Were any of your siblings adopted: Yes .....   No ......

   c(iii) Number of adopted sisters:

   older than you ....   younger than you..........

   c(iv) Number of adopted brothers:

   older than you ....   younger than you ....

2. If you were adopted were you adopted with a biological brother and/or sister
          Yes .....   No .....

   2a. Please give gender and relationship to you e.g. older brother/sister, twin brother/sister etc.

   ....

   ....

3. Is your partner adopted   Yes ....   No ....

4. Have you ever considered adopting your own child/ren?   Yes ....   No ....

   4a. If yes, do you have any specific preferences e.g. child's age, gender?

Section 2:
Your treatment

5. How long had you been trying to conceive before seeking infertility treatment for the first time?

Number of years ....   Number of months ....

5a. Did you already have a child or children?   Yes ....   No ....

If yes, please give gender and dates of birth: ....

....

Are you able to elect times of specific stages of treatment to ensure the best possible "window" of opportunity for the best time for the treatment to work? For example, if you are given a specific day for egg collection, are you able to select the time during the day when this should take place? Or, if you are given a choice between one day or another, are you able to choose your preferred day? In other words, do you have any say at all regarding when any of these stages of treatment should be undertaken? Please tick either yes or no in Questions 6 to 11 as they apply to you.

6 a. Are you able to select the date of **the commencement of your treatment cycle**, (here, commencement relates to the first day of your period)?   Yes ......   No ....

   b. If no, who decides this for you ....

   c. On what grounds? ....

7. In IVF: (in Vitro Fertilisation)

a. for collection of eggs   Yes. ....   No .....
b. fertilisation of eggs by sperm   Yes ....   No .....
c. replacement of embryo   Yes ....   No .....

8. In GIFT: (Gamete Intrafallopian Transfer)

a. for collection of eggs   Yes ....   No ....
b. mixing with sperm for an agreed number
   to be immediately transferred
   into one fallopian tube.   Yes ....   No.....

9. Are you receiving ICSI (Intracytoplasmic
   Sperm Injection) treatment as part of the
   IVF programme?   Yes ....   No .....

a. If yes, are you able to elect times of
   treatment to ensure the best possible
   "window" of opportunity for the best
   time for the treatment to work?   Yes ....   No ....

10. In FET (frozen embryo transfer)

    a. election of implantation of embryo/s   Yes ......   No ......

11. In IUI (Intra Uterine Insemination):
    a.   election of time of introduction of prepared sperm into
       uterus   Yes ....   No ......

12. Have you previously had a live birth?   Yes ......   No ......
    If "no" please go to Q17.

13. Children to whom you have given birth

    a. No of males ....

    b. Dates of each child's birth ....

    c. No. of females ......

    c. dates of each child's birth...

14. Were any of these children born early or late, i.e., before or after their due date?

    If so, please give details for each one as follows:

    Birth date   due date   actual date of arrival

    . Did you use astrology to:

    (i) Find the years in which you were likely to have children   ......Yes   ......No

    (ii) Plan the years in which you were likely to have children   ...... Yes   ...... No

    If you answered yes to either of these questions please give details of the children to whom
this applies.

15. Were any of these children the result of

a. IVF   Yes ....   No ....

date/s of birth of each
child..
.
b. GIFT   Yes ....   No ....

date of birth of each child ....

c. ICSI   Yes ....   No ....

date of birth for each child ....

d. IUI   Yes ......   No ......

date of birth for each child ....

e. FET   Yes ....   No ......

e (i)date of birth and combination of treatment resulting in FET for each child
....

16. Were any of these births the result of different
    treatments carried out simultaneously   Yes ......   No ....

    If so, please list under appropriate headings:

    date of birth for each child   *Method of conception*

    {e.g.   5 May 1993)   *(e.g. IVF & GIFT)*

    ....
    ....
    ....
    ....
    ....
    ....
    ....
    ....

17. Please list the dates and results of any IVF/GIFT/ICSI/FET treatment you have undergone which did not result in a live birth (again, stating which method and outcome (e.g. Successful creation of embryo, conception only, pregnancy which did not reach full term and/or did not result in a live birth). **Harvesting of eggs may be inapplicable for some types of treatment e.g., FET: please write N/A in the column where this applies**. Please complete as per categories shown below

Example:

date of first day of period starting the monthly cycle during which treatment is to begin	no. of eggs harvested + date for this	exact date of treatment i.e. embryo implantation and number	Method	Outcome
25th May 1999	6	9 June 1999	IVF	successful creation of embryos, 2 replaced, 4 frozen & stored. pregnancy resulting in one still birth
3rd Dec 1998	2	21 Dec 1998	IVF & GIFT Simultaneously	successful creation of 2 embryos, both replaced, pregnancy aborted in 6th week

Please complete using above as guide:
(please use additional sheets if more space is needed)

date treatment cycle begins, i.e. first day of chosen period	no. of eggs harvested + date for this i.e. embryo implantation	exact date of treatment	Method	Outcome

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18. Please give details of personal medical history relating to need for IVF/GIFT/ICSI treatment. (E.g. diagnosed cause and any complications either in yourself or in your partner).

(please use additional sheets if more space is needed)

19 a. Have you suffered from depression at any time in your life?   If yes, please give details: dates of duration of depression and reasons believed to be the cause of it.

b. Was the depression diagnosed as clinical, at any time (i.e. confirmed by a doctor)?

Yes ………..   No ………

If yes, please give date (or approximate date if known) of confirmation. …………………………….

(please use additional sheets if more space is needed).

Section 3
Now, some questions about your attitude to astrology

20. Do you have any knowledge of astrology?   Yes ……   No ……..

If so, please give a brief description of when, how and why you became interested in it.

21. The following options are designed to give some indication of your level of awareness of astrology: Please tick your choice/s and/or provide a brief description where requested:

    (i) none whatsoever, e.g. you have never read, heard or seen any material in the media on astrology and do not know anything about it or what it means   ....

    (ii) confined to newspaper or magazine horoscopes, i.e., sun sign columns and sun sign material in general ....

    (iii) popular books published which tell you about

        a. your sun in a particular sign   ....
        b. your relationships between different signs ....

    (iv) knowing what a birth chart looks like:
        a. its appearance   ....
        b. where the ascendant is   ....
        c. what the ascendant symbolises ....   (if chosen, please give brief description)
        ....
        d. where the midheaven is   ....
        e. what the midheaven symbolises ....   (if chosen, please give brief description)
        ....
        f. the names of all the planets in the chart   ....
        g. the names of all the signs of the zodiac   ....
        h. what aspects are   ....   (if   chosen,   please   give   a   definition)
        ....
        i. the way in which they describe the character and psychology of a person ....

(v) Other   ....
        Please state ....

22. Have you ever consulted a professional astrologer for advice Yes ......   No ....

        If yes, did you find the advice (please tick your choice):

        (i)   Extremely helpful   ....

        (ii)   only partially helpful   ....

        (iii)   mostly unhelpful   ....

        (iv)   not helpful at all   ....

        (v)   damaging to some extent   .... (if chosen, please explain briefly why):
        ....
        ....
        ....
        ....

23. Have you studied astrology   Yes ....   No ....
    **If yes, please give details of any courses or tuition you have had and the schools,
    institutions etc., with which you have studied astrology**
    ....
    ....

24. Do you believe that astrology can help people to understand themselves better? Please select
one category by ticking your choice and completing where appropriate:

    a. Not at all   ....

    b. In certain areas of their lives ....   (please give examples)

    ....

    a. In most areas of their lives   .... (please give examples)

    ....

    b. In all areas of their lives.   ....

.

25. What are your expectations from taking part in this study relating to Astrology? Please tick
    your choice:

    a. Astrology will probably have no effect.   ....

    b. Astrology may or may not have an effect, I do not know.   ....

    c. Astrological factors will help predict success and failure rates.   ....

26. Please tick **one** of the following options for the statement below:

    Using astrology to understand my own nature, its strengths and weaknesses emotionally,
    mentally and physically can help me to better health

    (a) not at all ....   (b) rarely ....   (c) sometimes ....

    (d) often ....   (e) always ....   (f) don't know ....

27. Have you used any non-NHS/conventional healing methods to recover from illness, either
physical or psychological?

    Yes   ....

    No   ....

If yes, please state which ones, giving the dates when they were used, the type of illness being
treated and whether or not you found them to be effective.

(please use additional sheets if more space is needed)

Section 4:
Your reasons for choosing to undergo fertility treatment and your feelings about the experience

27. Why did you decide to undergo IVF/ICSI/GIFT/FET treatment? (Please specify which were used next to your reasons for deciding to undergo such treatment).

(please use additional sheets if more space is needed)

28. How did you feel about undergoing the process?

(Please use additional sheets if more space is needed)

29. How do you feel now that you have undertaken it/are in the process of it? (please underline). Please give a brief description:

30. What is helpful about the process? (E.g. what, if any, aspect of the process made you feel good?) Please give a brief description:

31. Was anything unhelpful about the process? E.g. what may have caused for you psychological or emotional stress   Yes ....   No ....

    If yes, please give a brief description:

32. Do any factors in the process give you a sense of anxiety?   Yes ......   No ....

    If yes, please state which ones:

33. What, if any, aspect of the treatment process gives you the **greatest** sense of anxiety?

34. Would you consider yourself to be an anxious person (please tick your choice):

      a. Generally   ....

      b. only related to specific issues   .... (please give examples, e.g. about punctuality, flying, travelling alone, speaking in public, doing well in exams, the safety of one's family, etc.)

....

      c. No, I am fairly relaxed about most things in life   ....

35. Is your treatment (please tick your choice)

      a. provided by the NHS   ....

      b. paid for by yourself/ves   ....

      c. paid for by medical insurance   ....

      d. other   .... (please specify)

....

Section 5
Further details on yourselves and location of your treatment which will help in conducting the study

Name: .... Tel: (day) .... Evening ....

Address: ....

Email: ....

Occupation: ....Marital status ....

Age:.............Date of birth..................... Place of birth ....

time of birth .... **(please give local time and state if exact and if not please state whether time given is to within 5 minutes, 10 minutes, 15 minutes, etc.)**
....

36   If you are able to give your time of birth exactly is this the exact time for: (please tick your choice):

      a. your first breath   ....
      b. cutting of the umbilical cord   ....
      c. your first sound/cry   ....
      d. full bodily delivery   ....
      e. other   ....
      (please state) ....
      f. don't know   ....

source of birth data confirmation (especially with regard to time) ….. …………………….…… e.g. mother, midwife, older brother or sister, close family relative, birth certificate, etc.

Birth details of partner:

Age ………… Date of birth…………… Place of birth:: …………………… ……………

time of birth …………………….**(please state if this is the exact time and if not, please state if time given is to within 5 minutes, 10 minutes, 15 minutes, etc.)**
………………………………………………

37. If your partner is able to give his time of birth exactly is this the exact time for: (please tick or cross):

        a. his first breath   ………..
        b. his first sound/cry   ………..
        c. cutting of the umbilical cord ………..
        d. full bodily delivery   ………..
         (please state) ………………………………………………………………
        e. don't know   ………..
        f. other   ………..

source of birth data confirmation (especially with regard to time)…………………………………….
e.g. Mother, midwife, older brother or sister, close family relative, birth certificate, etc.

Name and address of clinic where IVF/ICSI/GIFT/IUI treatment is being received
As with all details in this questionnaire, the information here will be treated with utmost confidentiality. Your Clinic would not be contacted without your expressed written consent.

………………………………………………………………………………………………

………………………………………………………………………………………………

Name of consultant
………………………………………………………………………………………..

A summary of the study's findings will be available to any volunteer who would like a copy. Copies will be available for collection from the Clinic when the results are known.

Thank you for giving your time and effort to provide the information in this very detailed questionnaire together with your biographical details, all of which will be invaluable in helping to research possible factors which may be associated with the success and failure rates of infertility treatment for individual patients.

I would like to express my thanks to you for taking part in this study. Your time and patience in providing your data is much appreciated.

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield, Twyford, Nr. Winchester, Hants., SO21 1QR, U.K.
contact: Tel 0044 + (0)1962 713134   email: harris@interalpha.co.uk

Pregnancy and Birth Experiences Questionnaire

This questionnaire is to be completed by volunteers for the study who have had children and/or who are hoping to become pregnant or are expecting children without any fertility treatment intervention. The information given here will provide valuable comparable data for the conclusions of research into infertility problems.

All information provided on this questionnaire is treated with absolute confidentiality and any data used in publications of the study will be presented in anonymous form to protect the identities of the participants.

Volunteer's Name ……………………………………………… **Date** …………………………

Section 1
Some biographical details on you and your child/ren's father/s which will help in conducting the study

Address: ……………………………………………………………………………………………..

Tel: (day) …………….. (evening) ………………..

Email: ……………………………………………………

Occupation: ………………………………….Marital status ………………………………………

Ethnic origin……………………………….

Age:…………..Date of birth………………… Place of birth ………………………………

time of birth ……………………….. **(please give local time and if this is not the exact time, please state that it is to within 5 minutes, 10 minutes, 15 minutes, etc.)**
…………………………………

1. If you are able to give your time of birth exactly is this the exact time for: (please tick your choice):

        a. your first breath   ………..
        b. cutting of the umbilical cord   ………..
        c. your first sound/cry   ………..
        d. full bodily delivery   ………..
        e. other   ………..
        (please state) ………………………………………………………………….
        f. don't know   …………

source of birth data confirmation (especially with regard to time) ….. ………………………. e.g. mother, midwife, older brother or sister, close family relative, birth certificate, etc.

Birth details of child's/ren's father:

Age …………. Date of birth……………. Place of birth:: ………………….. ……………

time of birth …………………….**(if this is not the exact time please state if this is to within 5 minutes, 10 minutes, 15 minutes, etc.)** …………………………………………….

3. If your child's/ren's father is able to give his time of birth exactly is this the exact time for: (please tick or cross):

    a. his first breath   ....
    b. his first sound/cry   ....
    c. cutting of the umbilical cord   ....
    d. full bodily delivery   ....
      (please state) ....
    e. don't know   ....
    f. other   ....

source of birth data confirmation (especially with regard to time).....................................
e.g. Mother, midwife, older brother or sister, close family relative, birth certificate, etc.

IF THIS IS YOUR FIRST PREGNANCY OR YOU ARE STILL HOPING TO BECOME PREGNANT WITH YOUR FIRST CHILD, PLEASE GO STRAIGHT TO QUESTION 8.

Section 2
Some questions about your experiences having children and your attitudes toward the process giving birth. Some of the questions are very sensitive but if you can provide information on any of the events it will be very helpful to the overall aims of the study.

4. Have you ever experienced a miscarriage, stillbirth or abortion?   Yes ......   No........

    If yes, please give details of each experience:

Gender (male or female)	Event	Date of event

5. How many living children have you given birth to, to date?   Number ....

    Please give details:

Gender	Birth time	Birth date	birth place	father's birth date

5a. Were any of these children born early or late, i.e., before or after their due date?

If so, please give details for each one as follows:

due date	actual date of arrival

5b. Did you use astrology to:

(i) Find the years in which you were likely to have children   Yes ......   No ......

(ii) Plan the years in which you were likely to have children   Yes ....   No ......

If you answered yes to either of these questions please give details of the children to whom this applies.

6. Did you have difficulty in conceiving any of your children, e.g., experiencing a delay of several years before you became pregnant naturally?   Yes ......   No ....

If yes, please give details, e.g. date of birth of child and number of months or years for the delay or please give details of any other reason, e.g. medical reasons

7. Were any of the births difficult?   Yes ......   No ....

If yes, please give the date of birth/s experienced as difficult ....

Please describe briefly the sort of difficulty you experienced in each case:

(please use additional sheets if more space is needed)

8. Are you pregnant, at this time?   Yes .....   No ....

     If yes, what is your estimated date of delivery ....

     If no, are you hoping to become pregnant   Yes .....   No ....

If you answered "no" to the above, please go to Q. 10

9. Since when have you been trying to conceive (please give date to nearest month, if possible:

     Month ....   Year ....

10. Have you been prescribed any treatment/medication
    to help you conceive?   Yes ....   No ....

     b. If yes, please provide details e.g. type of medication, date you commenced taking it:

11.Are you still taking medication/receiving treatment
    to help you conceive?   Yes ....   No ....

     a. If no, when did you stop ....

     b.Why did you stop?

Section 3
Now, some questions about your attitude to astrology

12. Do you have any knowledge of astrology?   Yes ......   No ....

If so, please give a brief description of when, how and why you became interested in it..

13. The following options are designed to give some indication of your level of awareness of astrology: Please tick your choice/s and/or provide a brief description where requested:

(i) none whatsoever, e.g. you have never read, heard or seen any material in the media on astrology and do not know anything about it or what it means ....

(ii) confined to newspaper horoscopes, i.e., sun sign columns and sun sign material in general ....

(iii) popular books published which tell you about

    a. your sun in a particular sign   ....
    b. your relationships between different signs ....

(iv) knowing what a birth chart looks like:
    a. its appearance   ....
    b. where the ascendant is   ....
    c. what the ascendant symbolises   ....   (if chosen, please give brief description)
    ....
    d. where the midheaven is   ....
    e. what the midheaven symbolises   .... (if chosen, please give brief description)
    ....
    f. the names of all the planets in the chart   ....
    g. the names of all the signs of the zodiac   ....
    h. what aspects are   ....   (if   chosen,   please   give   a   definition)
    ....
    i. the way in which they describe the character and psychology of a person ....

(v) Other   ....
Please state ....

14. Have you ever consulted a professional astrologer for advice   Yes ......   No ....

If yes, did you find the advice (please tick your choice):

(i) Extremely helpful   ....

(ii)   only partially helpful   ....

(iii)   mostly unhelpful   ....

(iv)   not helpful at all   ....

(v)   damaging to some extent   .... (if chosen, please explain briefly why):
....
....

....

....

15. Have you studied astrology   Yes ....No ....
    If yes, please give details of any courses or tuition you have had and the names of the
    schools, institutions, etc., with which you studied astrology
              ....
    ....
    ....

16. Do you believe that astrology can help people to understand themselves better? Please select
one category by ticking your choice and completing where appropriate:

    a. Not at all   ....

    b. In certain areas of their lives ....   (please give examples)

    ....

    c. In most areas of their lives ....   (please give examples)

    ....

    d. In all areas of their lives. ....

17. What are your expectations from taking part in this study relating to Astrology? Please tick
    your choice:

    a. Astrology will probably have no effect.   ....

    b. Astrology may or may not have an effect, I do not know.   ....

    c. Astrological factors will help predict success and failure rates.   ....

18. Please tick **one** of the following options for the statement below:

    Using astrology to understand my own nature, its strengths and weaknesses emotionally,
    mentally and physically can help me to better health

    (a) not at all ....   (b) rarely ....   (c) sometimes ....

    (d) often ....   (e) always ....   (f) don't know ....

19. Have you used any non NHS/conventional healing methods to recover from illness, either
physical or psychological?

Yes   ....

No   ....

If yes, please state which ones, giving the dates when they were used, the type of illness being treated and whether or not you found them to be effective.

20. Would you consider yourself to be an anxious person (please tick your choice):

      a. Generally   ....

      b. only related to specific issues   .... (please give examples, e.g. about punctuality, flying, travelling alone, speaking in public, doing well in exams, the safety of one's family, etc.)

      ....

      c. No, I am fairly relaxed about most things in life   ....

21. Have you ever experienced a period of depression in your life   ......Yes   .... No

      If yes, please give details and date of experience, e.g. month/s and year/s and the events you believed to be associated with it or the cause of it.

(please use additional sheets if more space is needed)

A summary of the study's findings will be available to any volunteer who would like a copy. Please indicate below, whether or not you would like to receive such a report.

Yes   ……..   No   ………

Thank you for giving your time and effort to provide the information in this very detailed questionnaire together with your biographical details, all of which will be invaluable in providing data that will help in the research of possible factors that may be associated with the success and failure rates of infertility treatment.

I would like to express my thanks to you for taking part in this study. Your time and patience in providing your data is much appreciated.

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield, Twyford, Nr. Winchester, Hants., SO21 1QR, U.K.
contact: Tel 0044 + (0)1962 713134   email: harris@interalpha.co.uk

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield, Twyford,
Nr. Winchester, Hants. SO21 1QR.
Tel/Fax: 01962-713134 e-mail: harris@interalpha.co.uk

Date:

To.

Dear

Group 1: Women who are undertaking fertility treatment

I am a post-graduate student undertaking a PhD in the Application of Astrology to Health Psychology at the University of Southampton.   I am interested in three groups of women in particular: women who are considering any form of infertility treatment, women who are hoping to become pregnant and women who are already pregnant (these two latter categories without the aid of fertility treatment).

My research in psychology has shown that certain factors i.e., anxiety, depression and issues of control may have a bearing on the success and failure of fertility treatment or the ability to become pregnant without such treatment. In my work as a consultant astrologer, I have also noticed among my case files that timing of conception according to astrological factors may also be a contributing factor. I have put together a study to test all these areas and this study will form part of my thesis for my doctorate.

Thank you for expressing an interest in taking part in my study. This will involve the completion of a questionnaire designed especially for the study together with other psychological measures. The information you provide will be of great help in understanding possible factors that may be associated with successful conception and birth where infertility treatment is needed.

The questionnaires that are to be completed and returned to me are enclosed in two envelopes. The first envelope is marked **Phase 1** and contains:

PHASE 1 - First batch: (please return in the large stamped addressed envelope)

These questionnaires in the first batch are to be completed on receipt and returned as soon as possible:

1. Problems relating to infertility

2. The Fertility Problems Inventory

3. Health Locus of Control Questionnaire Form A

4. Perceived Health Competence Questionnaire

5.   Form BDI-II

6. Self evaluation Questionnaire (Y-2)

7. Self evaluation Questionnaire (Y-6 item)

The second envelope is marked **Phase 2** and contains:

PHASE 2 - Second batch: (please return in the small stamped addressed envelope)

These Questionnaires on green sheets of paper should be completed and returned together **only** if you undergo **further infertility treatment** after having completed and returned the first batch of seven questionnaires.

Questionnaire to be completed:

1. Self evaluation Questionnaire (y-6 item) - second copy on green paper.
The **second copy** of the Self evaluation Questionnaire (Y-6 Item) is to be **completed during your next IT treatment in the stage just after implantation of embryos or insemination but before results are known, i.e., positive pregnancy test** regarding success of replacement or insemination.

2. Additional infertility treatment record (on green paper)
Please also complete the green form titled **"Additional infertility treatment record"** when you know, whether or not, you have tested positive for pregnancy and then return these to me in the smaller stamped addressed envelope provided.

All the questionnaires in both Phase 1 and 2 are very straight forward and mainly involve circling a number or ticking a box. **If you have any difficulty completing any of the questionnaires please do not hesitate to contact me by phone, fax or email and I will be very happy to talk through the forms with you.**

If you agree to take part in the study you are guaranteed absolute anonymity and may withdraw from it at any time with the assurance that your treatment will not be affected now or in the future.

If you wish to take part please sign the enclosed copy of this letter containing the consent form and return it to me in the large stamped addressed envelope provided together with the first seven completed questionnaires.

I am very grateful to you for your interest in my study and would like to thank you for taking the time and trouble to consider making a contribution towards my research. It is my hope that this research will be of help in understanding and managing the health challenges with which women may be faced when considering parenthood.

Very best wishes,

Pat Harris, MSc., (Mrs.)
University of Southampton, Department of Social Work Studies, U.K.

(Supervisor - Professor Christopher Bagley)

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield, Twyford,
Nr. Winchester, Hants. SO21 1QR.
Tel/Fax: 01962-713134 e-mail: harris@interalpha.co.uk

Date:

To:

Dear

Group 2: Women who are hoping to become pregnant without the aid of fertility treatment at time of participating in the study

Thank you for contacting me about taking part in my research. Let me explain a little about myself and the nature of the study.

I am a post-graduate student undertaking a PhD in the Application of Astrology to Health Psychology at the University of Southampton. I am interested in three groups of women in particular: women who are considering any form of infertility treatment, women who are hoping to become pregnant and women who are already pregnant (these two latter categories without the aid of fertility treatment).

My research in psychology has shown that certain factors i.e., anxiety, depression and issues of control may have a bearing on the success and failure of fertility treatment or the ability to become pregnant without such treatment. In my work as a consultant astrologer, I have also noticed among my case files that timing of conception according to astrological factors may also be a contributing factor. I have put together a study to test all these areas and this study will form part of my thesis for my doctorate.

Thank you for expressing an interest in taking part in my study. This will involve the completion of a questionnaire designed especially for the study together with other psychological measures. The information you provide will be of great help in understanding possible factors that may be associated with successful conception and birth where infertility treatment is needed.

The questionnaires which need to be completed and returned to me, are as follows:

PHASE 1 - First batch: (please return in the large stamped addressed envelope)

These questionnaires in the first batch are to be completed on receipt and returned as soon as possible:

1. Pregnancy and Birth Experiences Questionnaire

2. Health Locus of Control Questionnaire Form A

3. Perceived Health Competence Questionnaire

4. Form BDI-II

5. Self evaluation Questionnaire (Y-2)

6. Self evaluation Questionnaire (Y-6 item)

PHASE 2:

This Questionnaire is on a green sheet of paper and should be completed and returned separately.

Please complete this questionnaire two days before your due period date at the end of a cycle (month) during which you hope to have become pregnant and then return the questionnaire together with a note of the outcome, i.e., onset of period or result of pregnancy test to me in the smaller stamped addressed envelope provided.

1. Self evaluation Questionnaire (y-6 item) on green paper

All the forms are very straight forward and mainly involve circling a number or ticking a box. If you have any difficulty completing any of the questionnaires please do not hesitate to contact me by phone, fax or email and I will be very happy to talk through the completion of the forms with you.

If you agree to take part in the study you are guaranteed absolute anonymity and may withdraw from it at any time with the assurance that your treatment will not be affected now or in the future.

If you wish to take part please sign the enclosed copy of this letter containing the consent form and return it to me in the large stamped addressed envelope provided together with the first six completed questionnaires.

I am deeply grateful to you for your interest in my study and would like to thank you for taking the time and trouble to consider making a contribution towards my research. It is my hope that this research will be of help in understanding and managing the health challenges with which women may be faced when considering parenthood in the future.

Very best wishes,

Pat Harris, MSc., (Mrs.)
University of Southampton, Department of Social Work Studies, U.K.

(Supervisor - Professor Christopher Bagley)

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield, Twyford,
Nr. Winchester, Hants. SO21 1QR.
Tel/Fax: 01962-713134 e-mail: harris@interalpha.co.uk

Date:

To:

Dear ,

Group 2: Women who are pregnant without the aid of fertility treatment at time of participating in the study

I am a post-graduate student undertaking a PhD in the Application of Astrology to Health Psychology at the University of Southampton.   I am interested in three groups of women in particular: women who are considering any form of infertility treatment, women who are hoping to become pregnant and women who are already pregnant (these two latter categories without the aid of fertility treatment).

My research in psychology has shown that certain factors i.e., anxiety, depression and issues of control may have a bearing on the success and failure of fertility treatment or the ability to become pregnant without such treatment. In my work as a consultant astrologer, I have also noticed among my case files that timing of conception according to astrological factors may also be a contributing factor. I have put together a study to test all these areas and this study will form part of my thesis for my doctorate.

Thank you for expressing an interest in taking part in my study. This will involve the completion of a questionnaire designed especially for the study together with other psychological measures. The information you provide will be of great help in understanding possible factors that may be associated with successful conception and birth where fertility treatment is needed.

These questionnaires should be completed on receipt and returned to me in the enclosed stamped* addressed envelope as soon as possible:

1. Pregnancy and Birth Experiences Questionnaire*

2. Health Locus of Control Questionnaire Form A

3.   Perceived Health Competence Questionnaire

4.. Form BDI-II

5.   Self evaluation Questionnaire (Y-2)

6. Self evaluation Questionnaire (Y-6 item)

All the forms are very straight forward and mainly involve circling a number or ticking a box. If you have any difficulty completing any of the questionnaires please do not hesitate to contact me by phone, fax or email and I will be very happy to talk through the forms with you.

If you agree to take part in the study you are guaranteed absolute anonymity and may withdraw from it at any time with the assurance that your treatment will not be affected now or in the future.

If you wish to take part please sign the enclosed copy of this letter containing the consent form and return it to me in the large stamped* addressed envelope provided together with the six completed questionnaires.

I am deeply grateful to you for your interest in my study and would like to thank you for taking the time and trouble to consider making a contribution towards my research. It is my hope that this research will be of help in understanding and managing the health challenges with which women may be faced when considering parenthood.

Very best wishes,

Pat Harris, MSc., (Mrs.)
University of Southampton, Department of Social Work Studies, U.K.

(Supervisor - Professor Christopher Bagley)

*already completed and returned to me
*international reply coupon/s enclosed where appropriate

**Would you like to help in research into
factors that may be linked with success and failure of fertility treatment?**

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Take time to decide whether or not you wish to take part.

The researcher has a master's degree in health psychology and is now a post-graduate health psychology PhD student at the University of Southampton. The results of this study will form an important part of her doctoral thesis.

Thank you for reading this.

Why is the study being conducted?
The study is looking into a number of factors that may have a bearing on the outcome of fertility treatment. Existing research suggests that anxiety and depression may be linked with success and failure of treatment. A better understanding of the way in which these particular types of stress may impact on the fertility treatment process would help us to give us more insight into what that link might be. The study will run from beginning of May to end- September and it is hoped that 80 patients will volunteer to take part. Once all the data is collected, the group will be divided into two sub-groups: group A women who have experienced successful conception/implantation of embryos and group B women who have not achieved this. Results of psychological measures relating to anxiety, depression and issues of control will be compared between the two groups to see if any of these factors correlates with success or failure of treatment outcome. One of the questionnaires, "Problems with Infertility", has been specially designed for the study in order to collect details about your past experiences relating to success and failure and it is hoped this information will also help in providing us with a better understanding of factors which may influence treatment outcome.

What are the possible benefits of taking part?
We hope that the results of this research will help you in future treatment cycles. However, this cannot be guaranteed. The information we get from this study may help us to develop strategies that reduce stress levels in the treatment process for future patients.

What's involved and what do I have to do?
If you would like to take part you can contact the researcher through one of the contact points listed below and request a questionnaire pack. There are several questionnaires. The first one will take about 25 minutes to complete and asks you for details of your experiences with fertility treatment and the problems you have encountered in the past when trying to become pregnant. The remaining ones are very short multiple choice tick box design and it will probably take no more than fifteen minutes in total to complete them all. You would need to find about forty five to fifty minutes of your own time in total to be able to take part and you would be able to complete the questionnaires in the comfort and privacy of your own home.

Astrology - a new approach
Astrologers have asserted for centuries that astrology can identify times in a woman's life when she is more likely to have children than at other times. The main questionnaire will ask you for details of your time, date and place of birth and similar details of any treatment cycles you have already undergone together with the outcome. This data will be examined to see if

/...Cont'd overleaf

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there is any link between astrological contacts to your birth horoscope and success and failure relating to the timing of treatment.

There will be a very short one side of a page six-item questionnaire and a treatment record sheet included in the pack for you to complete after you have returned the main questionnaires, when you undergo a further treatment cycle. This additional information, together with results of the treatment, will help to give a clear understanding of whether or not there is any relationship between astrology and fertility treatment and also what kind of role anxiety might play in the treatment process.

Will my taking part in this study be kept confidential?
Each questionnaire pack has its own number, sealed in a blank envelope and chosen at random on request. Your name and address will be written on the pack but there will be no way to match the number to your details should you decide to complete and return them. Stamped addressed envelopes are provided for the return of the questionnaires.

Will I be asked to sign a consent form?
In order to preserve the anonymity of participants in the study you will not be asked to sign a consent form. If you request a questionnaire pack and decide to complete it, your return of the completed questionnaires will be taken as your consent to take part in the study. If you receive a questionnaire pack and decide you do not wish to take part you can simply throw the pack away without any obligation whatsoever.

Your consultant has been contacted and given permission for patients at the Fertility Unit to be invited to take part in this study.

All information that is collected about you during the course of the research will be kept strictly confidential and you may withdraw from the study at any time without further obligation or any future treatment being affected in any way.

Results of the research
Results of the research should be available at the Fertility Unit from --------------------------.

If you are interested in taking part, please contact:
Pat Harris, MSc., 1 Highfield, Twyford, Nr. Winchester, Hants., SO21 1QR Tel: 01962 – 713134 email: harris@interalpha.co.uk

-o0o-

Multidimensional Health Locus of Control (MHLC) Scales

Name: ....   Date: ....

Form A

Instructions: Each item below is a belief statement about your medical condition with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you agree or disagree with that statement. The more you agree with a statement, the higher will be the number you circle. The more you disagree with a statement, the lower will be the number you circle. Please make sure that you answer **EVERY ITEM** and that you circle **ONLY ONE** number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

1=STRONGLY DISAGREE (SD)	4=SLIGHTLY AGREE (A)
2=MODERATELY DISAGREE (MD)	5=MODERATELY AGREE (MA)
3=SLIGHTLY DISAGREE (D)	6=STRONGLY AGREE (SA)

		SD	MD	D	A	MA	SA
1	If I get sick, it is my own behavior which determines how soon I get well again.	1	2	3	4	5	6
2	No matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3	Having regular contact with my physician is the best way for me to avoid illness.	1	2	3	4	5	6
4	Most things that affect my health happen to me by accident.	1	2	3	4	5	6
5	Whenever I don't feel well, I should consult a medically trained professional.	1	2	3	4	5	6
6	I am in control of my health.	1	2	3	4	5	6
7	My family has a lot to do with my becoming sick or staying healthy.	1	2	3	4	5	6
8	When I get sick, I am to blame.	1	2	3	4	5	6
9	Luck plays a big part in determining how soon I will recover from an illness.	1	2	3	4	5	6
10	Health professionals control my health.	1	2	3	4	5	6
11	My good health is largely a matter of good fortune.	1	2	3	4	5	6
12	The main thing which affects my health is what I myself do.	1	2	3	4	5	6
13	If I take care of myself, I can avoid illness.	1	2	3	4	5	6
14	Whenever I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
15	No matter what I do, I 'm likely to get sick.	1	2	3	4	5	6
16	If it's meant to be, I will stay healthy.	1	2	3	4	5	6
17	If I take the right actions, I can stay healthy.	1	2	3	4	5	6
18	Regarding my health, I can only do what my doctor tells me to do.	1	2	3	4	5	6

Appendix (xiii) Beck Depression Inventory II Form

BDI®-II

Date: _____

Name: _____ _____ Marital Status: _____ Age: _____ Sex: _____

Occupation: _____ Education: _____

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness
0 I do not feel sad.
1 I feel sad much of the time.
2 I am sad all the time.
3 I am so sad or unhappy that I can't stand it.

2. Pessimism
0 I am not discouraged about my future.
1 I feel more discouraged about my future than I used to be.
2 I do not expect things to work out for me.
3 I feel my future is hopeless and will only get worse.

3. Past Failure
0 I do not feel like a failure.
1 I have failed more than I should have.
2 As I look back, I see a lot of failures.
3 I feel I am a total failure as a person.

4. Loss of Pleasure
0 I get as much pleasure as I ever did from the things I enjoy.
1 I don't enjoy things as much as I used to.
2 I get very little pleasure from the things I used to enjoy.
3 I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings
0 I don't feel particularly guilty.
1 I feel guilty over many things I have done or should have done.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

6. Punishment Feelings
0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7. Self-Dislike
0 I feel the same about myself as ever.
1 I have lost confidence in myself.
2 I am disappointed in myself.
3 I dislike myself.

8. Self-Criticalness
0 I don't criticize or blame myself more than usual.
1 I am more critical of myself than I used to be.
2 I criticize myself for all of my faults.
3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes
0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10. Crying
0 I don't cry anymore than I used to.
1 I cry more than I used to.
2 I cry over every little thing.
3 I feel like crying, but I can't.

_____ Subtotal Page 1

Continued on Back

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11. Agitation

0 I am no more restless or wound up than usual.

1 I feel more restless or wound up than usual.

2 I am so restless or agitated that it's hard to stay still.

3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

0 I have not lost interest in other people or activities.

1 I am less interested in other people or things than before.

2 I have lost most of my interest in other people or things.

3 It's hard to get interested in anything.

13. Indecisiveness

0 I make decisions about as well as ever.

1 I find it more difficult to make decisions than usual.

2 I have much greater difficulty in making decisions than I used to.

3 I have trouble making any decisions.

14. Worthlessness

0 I do not feel I am worthless.

1 I don't consider myself as worthwhile and useful as I used to.

2 I feel more worthless as compared to other people.

3 I feel utterly worthless.

15. Loss of Energy

0 I have as much energy as ever.

1 I have less energy than I used to have.

2 I don't have enough energy to do very much.

3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern

0 I have not experienced any change in my sleeping pattern.

1a I sleep somewhat more than usual.

1b I sleep somewhat less than usual.

2a I sleep a lot more than usual.

2b I sleep a lot less than usual.

3a I sleep most of the day.

3b I wake up 1–2 hours early and can't get back to sleep.

17. Irritability

0 I am no more irritable than usual.

1 I am more irritable than usual.

2 I am much more irritable than usual.

3 I am irritable all the time.

18. Changes in Appetite

0 I have not experienced any change in my appetite.

1a My appetite is somewhat less than usual.

1b My appetite is somewhat greater than usual.

2a My appetite is much less than before.

2b My appetite is much greater than usual.

3a I have no appetite at all.

3b I crave food all the time.

19. Concentration Difficulty

0 I can concentrate as well as ever.

1 I can't concentrate as well as usual.

2 It's hard to keep my mind on anything for very long.

3 I find I can't concentrate on anything.

20. Tiredness or Fatigue

0 I am no more tired or fatigued than usual.

1 I get more tired or fatigued more easily than usual.

2 I am too tired or fatigued to do a lot of the things I used to do.

3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex

0 I have not noticed any recent change in my interest in sex.

1 I am less interested in sex than I used to be.

2 I am much less interested in sex now.

3 I have lost interest in sex completely.

789101112 ABCDE

_____ Subtotal Page 2

_____ Subtotal Page 1

_____ Total Score

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PHCS form

PERCEIVED HEALTH COMPETENCE SCALES

Name: ……………………………………………….. Date:
………………………………………

This is a questionnaire designed to determine the way in which different people view certain important issues related to their health. Each item is a belief statement with which you may agree or disagree. Under each statement is a scale which ranges from strongly disagree (1) to strongly agree (5). Respond to each of the following items by blackening one number on your answer sheet for each, using the response choices listed below. Please try to respond to each item separately in your mind from each other item. Choose your answers thoughtfully and make your answers as true FOR YOU as you can. Please answer every item. There are no "right" or "wrong" answers. so choose the most accurate answer for YOU--not what you think most people would say or do.

1. It is difficult for me to find effective solutions for health problems that come my way.

Strongly disagree   Strongly Agree

   1   2   3   4   5

2. 1 find efforts to change things 1 don't like about my health are ineffective.

Strongly disagree   Strongly Agree

   1   2   3   4   5

3. 1 handle myself well with respect to my health.

Strongly disagree   Strongly Agree

   1   2   3   4   5

4. 1 am able to do things for my health as well as most other people.

Strongly disagree   Strongly Agree

   1   2   3   4   5

5. 1 succeed in the projects 1 undertake to improve my health.

Strongly disagree   Strongly Agree

   1   2   3   4   5

6. Typically. my plans for my health don't work out well.

Strongly disagree   Strongly Agree

    1   2   3   4   5

7. No matter how hard 1 try. my health doesn't turn out the way 1 would like.

Strongly disagree   Strongly Agree

    1   2   3   4   5

8. I'm generally able to accomplish my goals with respect to my health.

Strongly disagree   Strongly Agree

    1   2   3   4   5

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name_____Date_____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate value to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

ALMOST NEVER   SOMETIMES   OFTEN   ALMOST ALWAYS

21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

STAIS-AD Test Form Y

Self-evaluation questionnaire (Y-6 item)
created by Theresa M. Marteau and Hilary Bekker

Name: ……………………………………………….. Date: …………………………

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the most appropriate umber to the right of the statement to indicate how you feel **right now, at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately	Very Much
1. I feel calm	1	2	3	4
2. I am tense	1	2	3	4
3. I feel upset	1	2	3	4
4. 1 am relaxed	1	2	3	4
5. I feel content	1	2	3	4
6. I am worried	1	2	3	4

Please make sure that you have answered **all** the questions.

Self-evaluation questionnaire (Y-6 item)
created by Theresa M. Marteau and Hilary Bekker

PLEASE NOTE; This second copy of the Self-evaluation questionnaire (Y-6 item) on green paper is <u>to be completed two days before the due date of your expected period.</u>

PLEASE RETURN THIS FORM WHEN YOU KNOW WHETHER OR NOT YOU ARE PREGNANT: see below:*

Name: ……………………………………………….…….. Date: …………………………

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the most appropriate umber to the right of the statement to indicate how you feel **right now, at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately	Very Much
1. I feel calm	1	2	3	4
2. I am tense	1	2	3	4
3. I feel upset	1	2	3	4
4. 1 am relaxed	1	2	3	4
5. I feel content	1	2	3	4
6. I am worried	1	2	3	4

Please make sure that you have answered **all** the questions.

+OUTCOME:

Pregnant   ……… Yes   ……… No

Date: …………………………………………….

Research Proposal (Revised Version): Pat Harris, MSc., 16 September, 2003.

The Problem: Some one in six couples in the UK seek medical help in conceiving a child. In the period beginning 1 April 2000 to 31 March, 2001 there were 5513 live births out of 25273 treatment cycles started (IVF and ICS) – 21.8%. (HFEA website, Patients' Guide to IVF Clinics 2002:(HFEA website: www.hfea.gov.uk)

Psychological factors such as anxiety may have a bearing on conception rates (Demyttenaere et al.,1988)and IVF success and failure rates (Johnston 1985, Smeenk et al., 2001). Anxiety in IVF patients may correlate inversely with levels of self esteem once pregnancy has been achieved (Klock & Greenfeld, 2000) and oocyte fertilisation failure correlates with a subsequent increase in state anxiety (Ardenti et al., 1999).

The presence of certain astrological factors, i.e., Venus and Jupiter are considered by some astrologers (Davison 1979) to be associated with times in a woman's life when there is an increased likelihood that she will have children.

Proposed Design:
A group of women (n = 80) undergoing treatment cycles will provide details, where known, of times, dates and places at which commencement of treatment and embryo transplantation were administered or undertaken. The Fertility Sister will keep a record of the names of the patients against the number given to the questionnaire pack to enable the researcher to identify which successful fertility treatments resulted in live births. The Clinic will not have access to the questionnaires and the researcher will not be given the name of the patient whose fertility treatment resulted in a live birth, only the information that patient number ..... has had a live birth. This will preserve and protect the anonymity of the patient.

This is not a multi-centre study.

Recruitment:
Numbered (to protect patient anonymity) questionnaire packs will be available at ---------------- Fertility Unit. Postage and packing provided for questionnaires' return.

Group A – those who achieve embryo replacements through IVF and other fertility treatments
Group B - those who are unsuccessful

There are a greater number of clinical pregnancies than resulting live births and, allowing for this, it is expected that between 25% and 30% (HFEA Annual Report 2000) of the patients will achieve successful embryo transfer.

Questionnaires:
Problems Relating to Infertility questionnaire
Spielberger Trait Anxiety measure (before treatment and between embryo implantation and pregnancy test outcome. A4 posters will be displayed at the Unit to remind participants about this second measure).
Beck Depression Inventory II

Anxiety levels at these two stages will be compared between groups A and B and may provide further understanding of their possible relationship to outcome. The Beck Depression Inventory II will ascertain presence and level of depression.

Sample size calculation is based on detecting a difference in mean scores on the six-item short form of the Spielberger State Anxiety scale for women who do and do not achieve clinical pregnancy in

the cycle in which anxiety levels are measured. An estimate of the means and standard deviation clinical scales for the general population, and of clinically significant changes in anxiety scores was taken from Marteau and Bekker (1992). To detect a difference of 10 points with 80% power and a 5% significance level, a minimum of 19 cases are needed in each group. Statistics provided by the Human Fertility and Embryo Association (2000) show that 28.6% of women undergoing treatment achieve clinical pregnancy and therefore a total sample size of 67 is required to provide an expected 19 in this group.

22 out of 80 women would be expected to achieve clinical pregnancy which would allow us to detect a difference of 9.3 in mean anxiety scores but the number of participants who will not return the completed questionnaire and each of the three measures in the packs is unknown.

Null Hypothesis:
The Null Hypothesis is that none of the psychological factors outlined above will predict success or failure in IVF treatments, other factors controlled, i.e., age, medical condition and number of attempts, including the astrological factor, i.e., timing of the IVF procedures noting that one study has shown that the timing might be crucial (Millard 1993).

Source of Population:
.

Duration of study

Pat Harris, MSc., D.F.Astrol.S.,
1 Highfield,
Twyford,
Nr. Winchester,
Hants.,
SO21 1QR.
Tel/Fax: 01962-713134
e-mail:pat.harris@btconnect.com

Date ....

To: ....

Dear Mr ....,

I would like to thank you and your team for agreeing to allow me to conduct research among your patient population into factors that may or may not be associated with fertility treatment outcome,

The aims and objectives of the study are to find out if there are any psychological factors, i.e., anxiety and depression that correlate with success and failure of treatment and to find out if astrological factors, i.e., timing of treatment correlate with treatment outcome.

The study is constructed as follows:

Patients are required to complete a set of questionnaires. These are:

1. Problems with Infertility Questionnaire (designed for the study and modified by you).
2. Beck Depression Inventory Mark II (BDI(MK II))
3. Spielberger Trait Self Evaluation Questionnaire Y2
4. Marteau and Bekker short form version of the Spielberger state Self Evaluation Questionnaire Y 6
5. Marteau and Bekker short form Y 6, as above, on green paper.

Patients attending the ----------------- Fertility Clinic will be able to pick up information sheets about the study in the waiting room while waiting for their appointments. If they wish to participate, numbered packs of questionnaires will be available from the reception desk on request. There will be copies of a poster on display promoting the study that informs them of this.

The packs will be numbered to protect the anonymity of the patients. Patients who complete the questionnaires will be instructed how to do so through an instruction sheet provided in the pack and will be able to return the questionnaires by post directly to the researcher in the stamped addressed envelopes provided. They will be reminded not to put their names and addresses anywhere on the questionnaires.

They will be required to return the first four questionnaires as soon as possible and before a treatment cycle begins but the remaining questionnaire should be completed just after embryo transfer/insemination but before the result of the pregnancy test is known. This second anxiety measure (Qu. No. 5) will be useful in measuring anxiety states in relation to treatment outcome. There will be a reminder leaflet and spare copies of the second anxiety measure sheet, which will

be handed out by the nurses to the patients attending for fertility treatment at ---------- Fertility Clinic, following their preparation for treatment at Bournemouth.

The reminder leaflet will remind patients who are taking part that they may wish to bring this last questionnaire with them to the Clinic when they arrive for their embryo transfer/insemination appointment. They could then complete the second anxiety questionnaire at the end of their appointment. The patients will be informed on the leaflet that the results will be available at the ------ and ----------- Fertility Clinics from --------------------.

The information sheet will say that if patients do not wish to proceed, once they have seen the questionnaires, they can simply throw the pack away and forget about it.

All patients taking part are guaranteed absolute anonymity and any data collected is protected and secured, accessible only to the researcher. It will not be necessary to have access to any medical records.

I will provide you and the team at the Fertility Clinics with progress reports about the research during the time when it is being conducted at the Clinics, from ………….. to ……………... I will also ensure that you and the team see drafts of any papers I may write for publication in order that you may approve the content prior to presentation at conferences, submission to journals, etc.

My results should be available for interested patients at the Fertility Unit from …………

I have sent copies of the questionnaires and literature for the study to the fertility clinic nurses at ……………………….. and ……………….. Fertility Clinics.

I am very grateful, indeed, to you for your support and help with my research and comments on my study design.

I would be obliged if you would reply to this letter acknowledging that you understand its contents so that I may submit this reply with the ELCHA forms to the appropriate ethics committee.

Very best wishes,

Pat Harris, (Mrs.)

Would you like to help in research into astrological and psychological factors that may be linked with success and failure of fertility treatment? Invitation to participate in a research project

You are being invited to take part in a research study at ------------ Fertility Unit. Mrs. Pat Harris, a health psychology PhD student at Southampton University, is conducting this research. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Take time to decide whether or not you wish to take part. Thank you for reading this.

Why and when is the study being conducted?

The psychological factors: existing research suggests that anxiety and depression may be linked with success and failure of fertility treatment outcome. This research hopes to provide a better understanding into this apparent relationship. Timing of treatment: the astrological factor. Astrologers have asserted for centuries that astrology can identify times in a woman's life when she is more likely to have children than at other times so you will be asked to provide details of your time, date and place of birth along with information about your experiences with fertility treatment.

The study will run from September 2003 to September 2004 and it is hoped that 80 patients will volunteer to take part.   Once all the data is collected results of psychological measures relating to anxiety and depression will be compared between women whose treatment has succeeded and those whose treatment has not.

What are the possible benefits of taking part?

The information we get from this study may help us to develop strategies that reduce stress levels relating to anxiety and depression in the treatment process for future patients although the research cannot offer any particular benefits to those taking part.

What's involved and what do I have to do?

If you would like to take part you can complete the questionnaires in the questionnaire packs available on request at the Fertility Unit Reception desk and post them back to the researcher in the stamped and addressed envelopes provided. The questionnaires take about 30 minutes altogether to complete and you will be able to complete them at home if you wish.

Will my taking part in this study be kept confidential?

Each questionnaire pack has its own number, sealed in a blank envelope and chosen at random. Stamped addressed envelopes are provided for the return of the questionnaires. .

Where can I get the questionnaires and can I get help completing them for the study?

You can ask for a questionnaire pack at the Fertility Unit reception desk. You will be able to contact the researcher at the University for help with the questionnaires if you need to do this.

Will I be asked to sign a consent form?

Your return of the completed questionnaires will be taken as your consent to take part in the study. If decide you do not wish to take part you can throw the questionnaire pack away without any obligation. Your Consultant has given permission for patients to be invited to take part in this study. If you do decide to participate, all information that is collected about you during the course of the research will be kept strictly confidential and your future treatment will not be affected in any way.

Further Information about the study

Please contact Mrs. Harris at the Department of Social Work Studies, Southampton University: telephone 023 80 595000. Please do not give your name, if you decide to do this, so that your anonymity can be protected.

Results of the research

Results of the research should be available at the Fertility Clinic from --------------------

Research into psychological and astrological factors (anxiety, depression and timing of treatment) that may or may not correlate with success and failure of treatment outcome
----------------- Fertility Unity, from ------------- to -------------

Guidelines to completing the questionnaires for the study

IMPORTANT: **Please do not put your name and/or address anywhere on any of the questionnaires. This is to protect your anonymity throughout the study.**

When and how to complete Questionnaires no. 1 to 4

The **first four questionnaires** should be **completed straight away, before you begin a treatment cycle,** and sent back to the researcher in the **large stamped addressed** envelope. They are:

1. Problems Relating to Infertility

2. Form BDI-II

3. Self Evaluation Questionnaire (Y6) on white paper

4. Self evaluation Questionnaire (Y2) (20 questions on this form numbered. 21 to 40)

When and how to complete green Questionnaire no. 5:

5. Self Evaluation questionnaire on **green paper**

Please complete the questionnaire section after you have received your embryo transfer but before you know the result of your pregnancy test.

 Do not return the questionnaire until you have filled in the pregnancy test result in the space provided in the bottom section of the form.

When both sections have been completed you should send the **green form** back to the researcher in the small stamped addressed envelope that has been provided for it.

If you need further information about the research, you can contact the researcher, **Mrs. Pat Harris, by telephone at the Department of Social Work Studies, Southampton University on 023 80 595000.** Please remember not to give your name if you choose to contact her. Again, this is to protect your anonymity.

Thank you for taking the time and trouble to provide details of your experiences for the study. Your support for the research is greatly appreciated.

Results of the research will be available at the Fertility Unit from.......... .

-o0o-

PROBLEMS RELATING TO FERTILITY

General Questionnaire for women having undergone/undergoing/preparing for treatment to gather data for a study in factors which may or may not relate to the success and failure of fertility treatment

All information provided on this questionnaire is treated with absolute confidentiality and any data used in publications of the study will be presented in anonymous form to protect the identities of the participants. Please <u>do not</u> put your name and/or address anywhere on this form.

Volunteer's number:..................................... Date ....

Section 1:

Your treatment

1. How long had you been trying to conceive before seeing your GP for referral for further investigation?

Number of years ....   Number of months ....

2. Did you already have a child or children?   Yes ....   No ....

If yes, please give gender and dates of birth: ....

....

3. Were any of these children the result of

    a. Natural conception   Yes ....   No ....

    date of birth of each child ....

    b. IVF   Yes ....   No ....

    date birth of each child ....

    c. ICSI   Yes ....   No ....

    date of birth for each child ....

    d. FET (Frozen Embryo Transfer)   Yes ....   No ......

    date of birth and type of treatment resulting in FET for each child

    ....

    e. IUI (Intra Uterine Insemination)   Yes ....   No ....

    date of birth for each child ....

4. How many fertility treatments have you had, to date?

Please list:

Type of Treatment
(e.g. IVF, ICSI, FET
IUI: partner or donor, etc.)

Exact Date (if known)
e.g. 23 Sept 01
if exact date not
known please give
month and year for
each treatment

Outcome
Please choose a number:
   1. live birth
   2. miscarriage
   3. ectopic pregnancy
   4. not pregnant

5. Please give details of personal gynaecological and infertility history relating to need for IVF//ICSI/Frozen Embryo Transfer (FET)/IUI treatment. (i.e., what is the cause for your infertility?)

(please use additional sheets if more space is needed)

6. a. Have you suffered from depression at any time in your life?

        Yes ....   No ....

If yes, please give details:
dates of duration of depression and reasons believed to be the cause of it.

c. If you answered yes, was the depression diagnosed as clinical, at any time (i.e. confirmed by a doctor)?

Yes ………..   No ………

If yes, please give date (or approximate date if known) of diagnosis …………………………….

Section 2:
Your reasons for choosing to undergo fertility treatment and your feelings about the experience

7. Were you able to choose which month you were treated?

Yes …...   No …….

8. How did you feel about undergoing treatment before it actually happened?

9. How do you feel now that you have undertaken it or are in the process of it?

10. Was anything disturbing/upsetting/difficult/uncomfortable about the process that made you unhappy in any way?

Yes ....   No ....

If yes, please specify:

11. Is there anything in the fertility treatment process that gives you a sense of anxiety?

Yes ......   No ....

If yes, please specify:

12. What, if any, aspect of the treatment process gives you the **greatest** sense of anxiety, i.e., what is/was the most difficult part of the treatment process?

13. Do you think anything could be done to improve the treatment process, i.e., make it more comfortable, less disturbing, less stressful?

Yes ....   No ....

If yes, your suggestions would be welcome:

14. Are there any other factors in your life that you may consider stressful, such as financial difficulties, unemployment or family relationship problems? Please give details of any stressful factors you are experiencing at present:

Section 3:
Some questions about counselling advice available before and during treatment

15. Have you ever had any counselling sessions during previous treatment cycles?

        Yes ....   No ....

16. Are you having counselling sessions during your current treatment cycle?

        Yes ......   No ......

If yes (please tick your choice):

    a.   was it a "one off " session   ....

    b. once a week throughout treatment   ....

    c. other   ....

        please specify ....

Section 4: alternative therapies or complementary medicines:

17. Have you ever had any of the following to help you in **past** fertility treatment cycles

        a. acupuncture   ....

        b. reflexology   ....

        c. aromatherapy   ....

        d. massage   ....

        e. homeopathy   ....

        f. herbal medicine   ....

        g. hypnotic relaxation   ....

        h. Dietary advice (i.e., foresight)   ....

        i. other   ....

        (Please give details: ....)

18. Have you ever had any of the following to help you during your **present** fertility treatment cycle? Please tick, if/where appropriate:

      a. acupuncture   ....

      b. reflexology   ....

      c. aromatherapy   ....

      d. massage   ....

      e. homeopathy   ....

      f. herbal medicine   ....

      g. hypnotic relaxation   ....

      h. dietary advice (i.e., foresight)   ....

      i. other   ....

      (Please give details: ....)

Section 5:

Now, some questions about your awareness of astrology

19. Do you believe that astrology can help people to understand themselves better? Please select one category by ticking your choice.
-

      a. Not at all   ....

      b. In some areas of their lives   ....

      c. In most areas of their lives   ....

      d. In all areas of their lives.   ....

20. Do you think using astrology to choose the time to have treatment will increase chances of success? Please tick your choice.

      d. Yes   ....

      e. No   ....

      f. Don't know   ....

Section 6:

Further details on yourself that will help in conducting the study

What is your marital status: (please tick)

Single ……..

Married ……. Number of years ……….. months ……….

Divorced …….

How long have you been in your present relationship?

Years ……….. Months ………..

Is this relationship: (please tick)

Heterosexual ……….

Homosexual ……….

Other ……….. (please state)

Is your current treatment: (please tick the appropriate choice)

Provided by the NHS ………..

Paid for by yourselves ………..

Other ……….

(please specify …………………………………………………………………………..)

Age:…………..Date of birth…………………

Place of birth (please give town/city and country)………………………………

time of birth ……………………….. (if known)

If you know your time of birth please state how accurate this is, e.g., "known to within five minutes/half an hour/exactly ……." etc.

From whom or where did you obtain the information about your birth details? Please tick one of the following:

mother	………
father	………
midwife	………
older brother or sister	………
close family relative	………
birth certificate	………
Other (please state)	………
Don't know	………

A summary of the study's findings will be available to any volunteer who would like a copy. Copies will be available for collection from the Clinic when the results are known.

Thank you for giving your time and effort to provide the information in this very detailed questionnaire together with your biographical details, all of which will be invaluable in helping to research possible factors which may be associated with the success and failure rates of infertility treatment for individual patients.

I would like to express my thanks to you for taking part in this study. Your time and patience in providing your data is much appreciated.

Pat Harris, MSc., D.F.Astrol.S., Department of Social Work Studies, University of Southampton, Highfield, Southampton, Hampshire, SO17 1BJ. Tel: (023 80) 595000 Email: pat.harris@btconnect.com

Self-evaluation questionnaire (Y-6 item)
created by Theresa M. Marteau and Hilary Bekker

PLEASE NOTE: the <u>first part</u> of this form must be completed <u>after transfer of embryos/insemination</u> <u>but before</u> you know whether or not you are pregnant
Please enter your number (from earlier questionnaires) if none is indicated below:
Number .... Date: ....

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the most appropriate umber to the right of the statement to indicate how you feel **right now, at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately	Very Much
1. I feel calm	1	2	3	4
2. I am tense	1	2	3	4
3. I feel upset	1	2	3	4
4. 1 am relaxed	1	2	3	4
5. I feel content	1	2	3	4
6. I am worried	1	2	3	4

Please make sure that you have answered **all** the questions.

Type of Treatment: i.e. IVF/ICSI/FET (frozen embryo transfer)/IUI) Intra Uterine Insemination (partner or donor)

Please state: ....

Details of embryo transfer or insemination:

Time: .... (if known)   Date: day............ month..................... year.....................

Outcome of pregnancy test: (please tick and give date)

Pregnant   ....   Not pregnant   ....   Date when result known ....

In this, <u>your current attempt to become pregnant</u>, how many treatment cycles have you had so far, including this one:

Number of treatment cycles ....

Please return this form to the researcher :Mrs. Pat Harris, MSc., DFAstrolS., 1 Highfield, Twyford, Nr. Winchester, Hants.,SO21 1QR.

Would you like to take part in a study researching factors that may be related to success and failure of fertility treatment?

Pat Harris, a PhD student at Southampton University, is researching factors that may be associated with the success and failure of fertility treatment outcome.

Psychological factors:

Anxiety and Depression

Existing research has shown some link between anxiety and depression and fertility treatment outcome but more research is needed for a better understanding of this relationship.
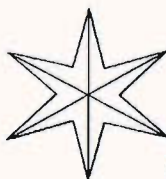
Timing factors:

Astrology and the time at which the treatment is undertaken

Ancient Astrological tradition asserts that there are certain years in a woman's life when she is more likely to have children than at other times. Is this true? Research is needed to test this assertion.

If you would like to take part, your involvement will be totally anonymous.

If you would like to know more about the study, information leaflets are available at reception and in the waiting room area giving more details on what is involved. The study takes place at --------------- Clinic from September 2003 to September 2004.

Thank you for your time in reading and considering this.

RESEARCH INTO PSYCHOLOGICAL AND ASTROLOGICAL FACTORS, (ANXIETY, DEPRESSION AND TIMING OF TREATMENT) WHICH MAY OR MAY NOT HAVE A BEARING ON FERTILITY TREATMENT OUTCOME

----------------------------- FERTILITY UNIT, September 2003 TO September, 2004

Reminder Notice

IF YOU HAVE DECIDED TO TAKE PART IN THIS STUDY AND HAVE COLLECTED A QUESTIONNAIRE PACK FROM THE FERTILITY UNIT

This is a reminder that:

You will need to complete your six-item green self-evaluation questionnaire just after embryo transfer/insemination during the time when you are waiting for the result of your pregnancy test. You may wish to bring the green form with you so that you can write the date and time of embryo transfer in the space provided on the form.

Thank you for your help and support and the time you have given in order to take part in this study. It is very much appreciated.

∧∧∧

IF YOU HAVE NOT YET TAKEN PART AND WOULD LIKE TO KNOW MORE, INFORMATION SHEETS ARE AVAILABLE IN THE WAITING ROOM. QUESTIONNAIRE PACKS CAN BE COLLECTED AT RECEPTION ON REQUEST.

∧∧∧

Results of the study will be available at the Fertility Unit in
Mrs. Pat Harris, MSc., DFAstrolS.,
Department of Social Work Studies,University of Southampton,
Highfield, Southampton,Hampshire, SO17 1BJ.
Tel: (023 80) 595000   Email: pat.harris@btconnect.com

RESEARCH INTO
PSYCHOLOGICAL AND ASTROLOGICAL FACTORS, (ANXIETY, DEPRESSION AND TIMING OF TREATMENT) WHICH MAY OR MAY NOT HAVE A BEARING ON FERTILITY TREATMENT OUTCOME

Fertility Clinics ----- 200- to 200-
Reminder Notice

IF YOU HAVE DECIDED TO TAKE PART IN THIS STUDY AND HAVE COLLECTED A QUESTIONNAIRE PACK FROM THE FERTILITY CLINIC

This is a reminder that:

You will need to complete your six-item green self-evaluation questionnaire just after embryo transfer/insemination during the time when you are waiting for the result of your pregnancy test. You may wish to bring the green form with you so that you can write the date and time of embryo transfer in the space provided on the form.

Thank you for your help and support and the time you have given in order to take part in this study. The information that you are able to provide will help the search for a better understanding of the possible relationship between some factors and fertility treatment outcome. It is very much appreciated.

Results of the study will be available at ------------------- and --------------------- Fertility Clinics in -------------- 2005.

<div align="center">

Mrs. Pat Harris, MSc., DFAstrolS.,
Department of Social Work Studies,
University of Southampton,
Highfield, Southampton,
Hampshire, SO17 1BJ.
Tel: (023 80) 595000
Email: pat.harris@btconnect.com

</div>

Stress: challenging aspects: conjunction (0 deg separation, square (90 degrees), opposition (180 degrees).

Poor position: weak by house: 6th, 8th or 12th sector of the horoscope. In detriment, fall, peregrine.

Definitions:

Astrological conditions associated with general reproductive problems
When in under some sort of stress or in a poor position, the planets Sun, Moon, Venus, Mars, Saturn and Uranus, and the signs Virgo, Libra and Scorpio are associated with reproductive problems.

Ovary related problems:
The planets: Sun, Moon and Venus, Venus and Pluto in hard aspect (i.e., 45, 90, 135 and/or 180 degree angular relationship), Moon with Uranus

The signs: Taurus, Libra and Scorpio

Planets in signs: Saturn afflicted (in a poor position) in Taurus or Scorpio, Mars afflicted in Scorpio, Uranus, Saturn, Mars or Mercury afflicted in Scorpio, Sun or Moon afflicted in Scorpio. Moon afflicted in Scorpio especially when in Taurus, Scorpio and fixed signs, Venus afflicted in Scorpio, Venus in Scorpio and afflicting (in poor contact with) the Moon or Asc, Venus afflicted in Scorpio in the 6th house (the 30 degree segment of the birth chart relating to health).

The 6th house
The 30 degree segment of the birth chart associated with health.

The 7th house (this is the 30 degree segment of the birth chart associated with passing out of life and is therefore linked with the process of abortion)

Cyst formation (PCOS):
Hard aspects, i.e., semi-square, square or opposition, to Venus d

Fallopian Tube problems:
The planets: Mars, Saturn, Uranus, Neptune.

Signs: Afflictions in Libra

Planets in signs: Pluto in Libra. Moon in challenging aspect in Libra

Uterine problems:
Planets: Moon and Venus

Signs: Cancer and Virgo, afflictions in Scorpio

Planets in signs: Uranus in Scorpio

Fibroids:
Moon and Pluto in conjunction or in hard aspect: semi-square, square or opposition.

Medical Condition	Astrology
Ovaries	**Moon, Venus, Libra and Scorpio**
Right ovary	**Sun**
Left ovary	**Moon**
Ovum	**Venus**
Ova affected by	**planets in cardinal signs**
Ablation (suppression of)	**Saturn afflicted in Taurus or Scorpio**
Abscess of	**Mars afflicted in Scorpio**
Pains in	**Uranus, Saturn, Mars or Mercury Afflicted in Scorpio**
Afflicted ovaries Diseased	**Sun or moon afflicted in Scorpio. Moon afflicted, especially when in Taurus, Scorpio and fixed signs Venus afflicted in Scorpio Venus in Scorpio and afflicting the Moon or Asc. Venus afflicted in Scorpio in the 6th**
Fallopian Tubes	**Libra**
Inflammation of	**Malefics + afflictions in Libra**
Dropsy of	**Moon afflicted in Libra**
Womb	**Moon + Venus, to some extent Cancer 6th house + Virgo**
Abortioins + all diseases	**7th house**
Defectst of	**Afflictions in Scorpio**
Deformity of	**Uranus in Scorpio**

Medical Condition	Astrology
Ovaries	Venus
Cyst formation	hard aspects to Venus
Graafian follicles (mature eggs just before being released at ovulation	Sun and Venus aspects
Inflammation (oophoritis)	Fixed signs (Taurus + Scorpio)
Disturbed function	Saturn in Taurus
Ovulation	Venus + Pluto in hard aspects
Ovulatory pain	Moon – Uranus

Example birth chart
Natal Chart
24 May 2005
21:08:15 BST −1:00
London, ENG
51°N30' 000°W10'
Geocentric
Tropical
Placidus
True Node
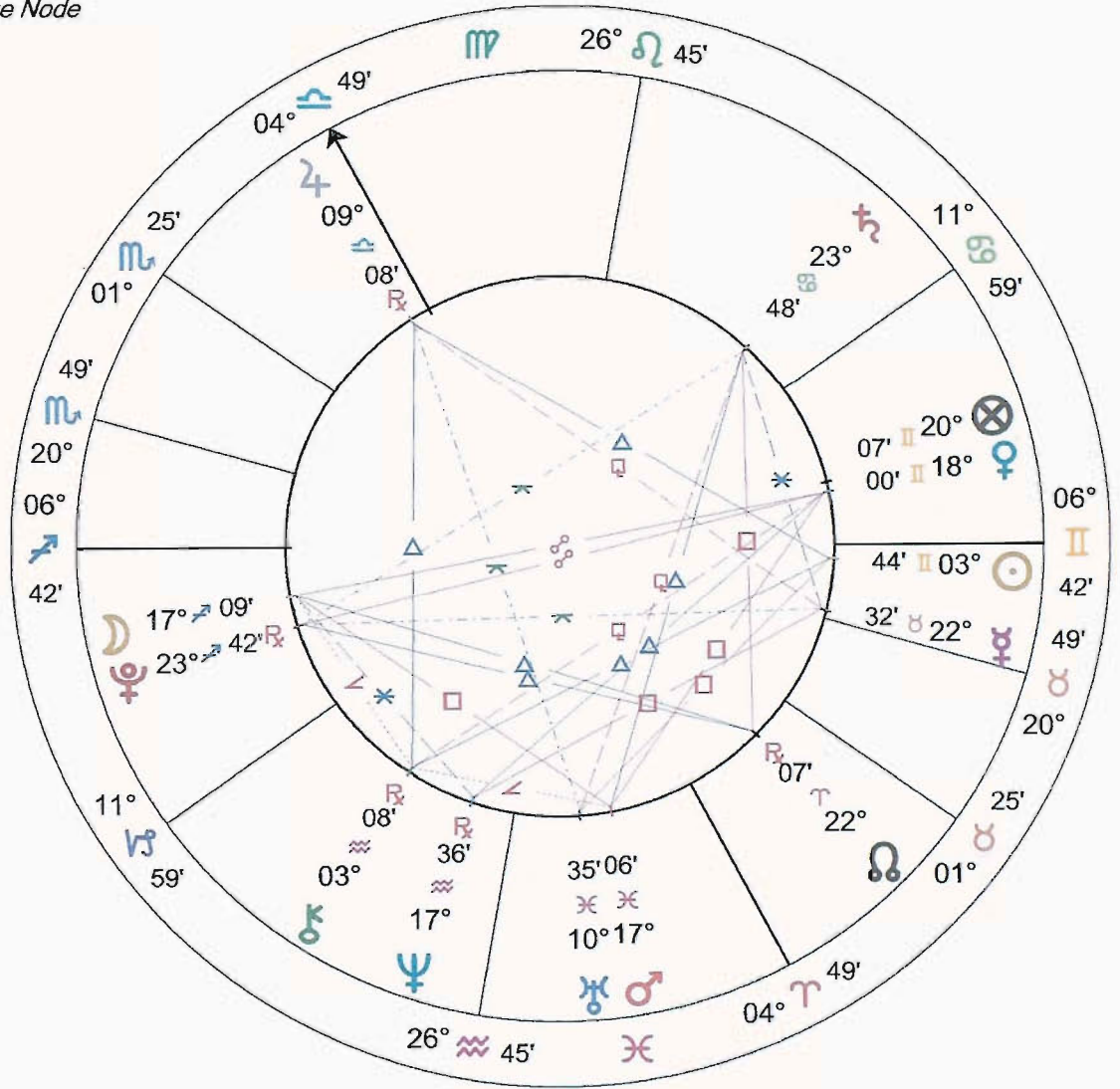
Astrological definitions on orbs of aspect used in this research and types of aspect used

Astrological forecasting systems used in the studies contained in this thesis:

Secondary Progressions

Each day after birth is taken to represent a year of life, e.g., the third day after the birth day would correspond to the third year in the life and any planetary relationships formed between planets on this third day and the actual day of birth would be called Progressions. Mars on the birthday is called natal Mars and Mars on the third day after birth, would be called progressed Mars (Davison 1979).

Transits

This term refers to the actual position of the planets in the sky in the present and their relationship with the position of planets in the birth chart at time or on the day of birth. For example, Mars in the birth chart, natal Mars, can receive a transit from Mars in the sky at the actual time of an experience in the life. The planet making the contact to natal Mars might also be Mars but would be distinguished as Transiting Mars (Ruperti 1978).

The following angular relationships have been used in this study:

Angular distance between planets on a 360 degree circle	Astrological term	Orb +/- Between birth/natal planets	Orb +/- between birth/natal planets and progressed and transiting planets
0	conjunction	8	1*
45	semi-square	2.5	1
60	sextile	4	1
90	square	8	1
120	trine	8	1
180	opposition	8	1

*Aspects made by progressed and transiting planets to the birth planets are +/- one degree.

The orbs presented here are standard and not identical to those used in the research presented in the doctoral thesis.

Angular: Near the horizon or meridian. Said to impart maximum influence.

Aspects: specified angles e.g. 0, 60, 90, 120, 180° between two points, usually planets. Said to blend their respective principles in either qa harmonious or stressful manner. Aspects are usually geocentric (Earth-centred) but can be heliocentric (Sun-centred).

Ascendant: Where the eastern horizon cuts the ecliptic. Where the 1st house usually begins. Said to be of major importance and to indicate outer personality.

Descendant: The point opposite the Ascendant, where the 8th house usually begins..

Elements: The four traditional natures, Fire, Earth, Air and Water. The signs are alternately FEAW, making three of each element.

Gauquelin plus zones: -6° (below) to +30° (above) at the eastern horizon in the diurnal circle, and -6°/+30° at the MC. Observed to be regions of maximum influence.

Houses: Twelve divisions of the diurnal circle usually starting from the Ascendant. Said to indicate personal circumstances. There are many methods of House division: examples are Placidus, Koch, Equal House, Gauquelin sectors.

MC (Medium Coeli or Midheaven): Where the upper meridian cuts the ecliptic. same as the Sun's position at noon. Said to indicate career..

Orb: the permissible inexactness of an aspect.

Signs: Twelve equal divisions of the ecliptic. Named after the zodiacal constellations. Said to indicate personality and other personal attributes.
Zodiac: The circle of signs along the ecliptic. The sidereal zodiac is used mostly in the East and is tied to the stars. The tropical zodiac is used mostly in the West, is tied to the seasons, and is currently 24.5° ahead of the sidereal zodiac. The difference is increasing by 1° every 72 years.

(taken from the Astrological Association research journal, Correlation)

National Statistics

Clinic Information	Patient Information	Clinic Statistics	National Statistics

Percentage of ICSI (44%) vs IVF (56%) accross the clinics.
Below are the national average figures for all clinics for the period 01/04/02-31/03/03

These statistics are based treatments carried out between 1st April 2002 and 31st March 2003.

How to read this information (pdf 255K)

† Percentages are not calculated where there are less than 50 cycles or live births in each category.

* No treatments carried out during the reporting period for this age category/treatment type.

IVF & ICSI fresh embryo transfers using own eggs

	Below 35	35-37	38-39	40-42
Cycles started	27.6% (3590/13030)	22.3% (1521/6835)	18.3% (640/3499)	10.0% (274/2735)
Egg collections	28.8% (3590/12452)	23.6% (1521/6442)	19.8% (640/3232)	11.0% (274/2497)
Embryo transfers	31.2% (3590/11498)	25.3% (1521/6022)	21.3% (640/3001)	12.0% (274/2284)
Singleton live births	71.5% (2566/3590)	77.8% (1183/1521)	82.5% (528/640)	90.5% (248/274)
Twin live births	28.2% (1011/3590)	21.8% (332/1521)	16.3% (104/640)	9.1% (25/274)
Triple & higher live births	0.4% (13/3590)	0.4% (6/1521)	1.3% (8/640)	0.4% (1/274)

IVF & ICSI frozen embryo transfers using own eggs

	Below 35	35-37	38-39	40-42
Thaw cycles	15.4% (514/3344)	14.5% (255/1757)	14.0% (131/935)	10.7% (72/673)
Embryo transfers	17.0% (514/3032)	16.4% (255/1558)	15.7% (131/832)	12.2% (72/591)
Singleton live	81.5%	79.6%	82.4%	87.5%

Twin live births	17.9% (92/514)	20.4% (52/255)	17.6% (23/131)	11.1% (8/72)
Triple & higher live births	0.6% (3/514)	0	0	1.4% (1/72)

Donor insemination transfer
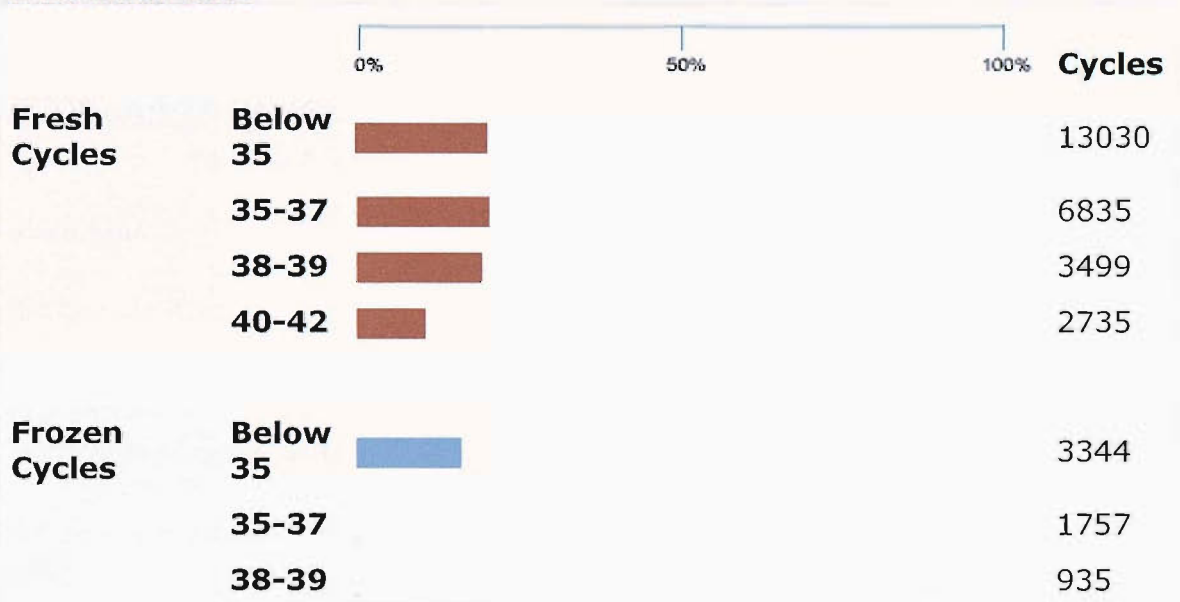
	Below 35	35-39	40-42
Treatment cycles	13.6% (492/3620)	9.2% (243/2653)	4.5% (32/709)
Singleton live births	93.1% (458/492)	95.1% (231/243)	(32/32) †
Twin live births	5.9% (29/492)	4.9% (12/243)	0
Triple & higher live births	1.0% (5/492)	0	0

Treatments using donated eggs

	Fresh embryos	Frozen embryos

Live Birth rate

		0% 50% 100%	Cycles
Fresh Cycles	Below 35	▉▉▉	13030
	35-37	▉▉▉	6835
	38-39	▉▉▉	3499
	40-42	▉▉	2735
Frozen Cycles	Below 35	▉▉▉	3344
	35-37		1757
	38-39		935

2002 Assisted Reproductive Technology (ART) Report: 2002 Fertility Clinic Report by State: National Summary

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A comparison of clinic success rates may not be meaningful because patient medical characteristics and treatment approaches vary from clinic to clinic.

2002 ART CYCLE PROFILE

Type of ART[a]

IVF	>99%	**Procedural Factors:**	
GIFT	<1%	With ICSI	53%
ZIFT	<1%	Unstimulated	<1%
Combination	<1%	Used gestational carrier	<1%

Patient Diagnosis

Tubal factor	13%	Other factor	7%
Ovulatory dysfunction	6%	Unknown factor	10%
Diminished ovarian reserve	9%	*Multiple Factors:*	
Endometriosis	6%	Female factors only	13%
Uterine factor	1%	Female & male factors	18%
Male factor	17%		

2002 PREGNANCY SUCCESS RATES

Type of Cycle	Age of Woman			
Fresh Embryos from Nondonor Eggs	**<35**	**35–37**	**38–40**	**41–42[c]**
Number of cycles	37,591	19,110	17,454	7,733
Percentage of cycles resulting in pregnancies	42.5	36.4	27.5	17.3
Percentage of cycles resulting in live births [b]	36.9	30.6	20.5	10.7
Percentage of retrievals resulting in live births [b]	40.7	35.1	24.7	13.4
Percentage of transfers resulting in live births [b]	43.0	37.1	26.4	14.7
Percentage of transfers resulting in singleton live births	26.3	24.0	19.3	11.9
Percentage of cancellations	9.2	12.6	16.8	19.9
Average number of embryos transferred	2.7	3.0	3.3	3.5
Percentage of pregnancies with twins	33.2	28.9	22.6	15.5
Percentage of pregnancies with triplets or more	7.2	8.2	5.1	3.0
Percentage of live births having multiple infants [b]	38.9	35.4	26.9	18.6

Frozen Embryos from Nondonor Eggs

Number of transfers	7,680	3,463	2,327	699
Percentage of transfers resulting in live births [b]	27.9	24.1	20.0	16.6
Average number of embryos transferred	2.8	2.8	2.9	3.1

	All Ages Combined [d]	
Donor Eggs	**Fresh Embryos**	**Frozen Embryos**
Number of transfers	8,394	3,476
Percentage of transfers resulting in live births[b]	50.0	28.8
Average number of embryos transferred	2.7	2.9

CURRENT CLINIC SERVICES AND PROFILE

Total number of reporting clinics: 391

Services offered:

Donor egg	90%	Gestational carriers	72%
Donor embryo	60%	Cryopreservation	97%
Single women	85%		

Clinic profile:

SART member	91%
Verified lab accreditation	
Yes	92%
No	4%
Pending	4%

[a] Reflects patient and treatment characteristics of ART cycles performed in 2002 using fresh nondonor eggs or embryos.

[b] A multiple-infant birth is counted as *one* live birth.

[c] See national summary statistics for women older than 42.

[d] All ages (including ages >42) are reported together because previous data show that patient age does not materially affect success with donor eggs

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