INTRA-SEX DIFFERENCES IN HUMAN SEXUAL STRATEGY: AN EVOLUTIONARY PERSPECTIVE

A thesis submitted for the degree of Doctor of Philosophy

By

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ABSTRACT

Ten empirical studies were employed to investigate intra-sex differences in human sexual strategy at the genetic, psycho-physiological and psychological levels, all from an evolutionary perspective. The first five studies considered male intra-sex differences. Chapter 7 investigated intra-sex differences in sexual orientation at a genetic level and discovered that averaged gay male faces were perceived as more attractive and less aggressive than averaged straight male faces. Chapters 8 and 9 investigated intra-sex differences at a psycho-physiological level, finding shorter males to be less restricted in sociosexual behaviour than taller males, although no relationship was found between height and potential parental investment. 2D: 4D digit ratio and sociosexuality was also investigated, in which negative relationships were found with sociosexual desire and attitude, but not behaviour. Chapter 10 considered male intra-sex differences at a psychological level and found that sociosexuality was negatively correlated with potential parental investment and positively correlated with self-perceived attractiveness, although no significant relationship was found between potential parental investment and self-perceived attractiveness. Chapter 11 ascertained that there was a significant gender difference in self-perceived attractiveness and sociosexuality. The remaining studies investigated female intra-sex differences at a psycho-physiological and psychological level. Chapter 12 established a significant relationship between a physiological correlate of anxiety, diastolic blood pressure, and cosmetic usage. It also used multilinear regression to provide a model for the prediction of cosmetic usage through personality variables. Additionally, Chapter 13 found no relationship between cosmetic usage and self-perceived attractiveness but a significant relationship between cosmetic usage and sociosexuality. In all empirical studies evolutionary explanations were offered focussing, in the main, on the tenets of Conditional Mating Strategy Theory and Strategic Pluralism as well as Parental Investment Theory and the Multiple Fitness Model. Substantial support was offered for evolutionary explanations of intra-sex diversity within human sexual strategy

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ACKNOWLEDGMENTS

I would firstly like to thank all of those participants who have willingly offered their time to participate in the experimental studies, and without whose involvement this thesis would not have been possible. Thanks, too, go to George for the encouragement to embark on this thesis, without which I would not be here now. Thanks also for the many hours shared in discussion and debate. To Trevor, too, my heartfelt thanks for the discussions, debate, and hours and hours of reading and comment; your guidance has been invaluable. And finally, my thanks to all friends and family for their endless support and encouragement.

AUTHOR'S DECLARATION

The first of the empirical studies in male sexual strategy (Chapter 9) involved the creation of composite images, enabled through the use of a specialised software package called Psychomorph. The software, designed by St. Andrews University, was kindly lent to me by Professor David Perrett for use in this respect. The experimental study was, however, conducted solely by myself, Julia Robertson, at Buckinghamshire New University. I would like to thank David Perrett and his team for allowing me the use of their software.

The first of the empirical studies in female sexual strategy on cosmetic usage and psychophysiology was enabled by a research grant from L'Oreal Recherché, France, a division of L'Oreal devoted to research in matters connected to cosmetics. This enabled the purchase of the semi-continuous blood pressure monitor (Vasotrac AMP205A) as well as a research bursary. Again, however, the study was designed and implemented solely by myself at Buckinghamshire New University, and there was no conflict of interest. I should like to thank L'Oreal for their support in this research.

FORWARD

The primary goal of this thesis has been to investigate a largely under-researched aspect of human sexual strategy from an evolutionary perspective. More specifically, that aspect of human sexual strategy to be researched is phenotypic diversity within the sexes, or, as it is more commonly referred to, intra, or within, sex differences. The rationale, if not the methodology, for so doing is relatively straightforward. As Buss (1998:19) stated, “In sexually reproducing organisms, no domain is more closely linked with the engine of the evolutionary process than sexuality”. It is not surprising, therefore, that human sexual strategy has been a target for research within evolutionary psychology. However, whilst between sex differences have received extensive empirical attention, within sex differences have been, until relatively recently, largely disregarded (Buss, 1998; Gangestad and Simpson, 2000).

This is not to level criticism at the achievements of evolutionary psychologists to date. Within a relatively short period of time, arguably, perhaps, within the last three decades, an impressive volume of literature has been written, with an equally impressive corpus of empirical research conducted. The result has seen the penetration of evolutionary psychology into possibly every other field of psychology. Indeed Buss (1995), in the introduction to ‘The Handbook of Evolutionary Psychology’, exemplifies how an evolutionary understanding of just one psychological adaptation, ‘stranger anxiety’, provides an over-arching explanatory framework through which so many other sub-disciplines within psychology can benefit, from developmental to cognitive, from social to personality, from clinical to biological.

Nevertheless, though much progress has been made, the theoretical progress in our understanding of contingent mating strategies has ensured that the study of intra-sex differences is beginning to assume a more prominent role in evolutionary research. This research attempts, in a modest way, to provide further empirical explanation for such differences in human sexual strategy. It is based, in the main, upon the tenets of Conditional Mating Strategies and Trade Offs and Strategic Pluralism, as more comprehensively described in Chapter 5.

Specifically, the thesis investigates intra-sex differences in human sexual strategy at the genomic, psycho-physiological and psychological levels.

Methodological considerations.

Before embarking on the empirical research, however, however, it was felt appropriate to consider the methodological issues surrounding research from an evolutionary perspective, in terms of both specific methodological strategies (by which is meant ‘theory driven’ or ‘observation driven’ methodologies, considered in Chapter 6), as well as the methodological issues surrounding the practical study of human sexuality, and the potential difficulties in using self-report measures in the investigation of sensitive issues (see appendix h).

It was also felt important to review and analyse the Revised Sociosexual Orientation Inventory (R-SOI). Sociosexuality has been defined as the degree to which emotional commitment is desired before embarking on a sexual relationship (Simpson and Gangestad, 2001). Thus, someone of high sociosexuality has a proclivity towards more casual sexual relationships, in which love and commitment is not a pre-requisite. By contrast, those of low sociosexuality are more concerned with establishing a committed relationship before embarking on such a relationship. The established measure of such has, for some time, been the Sociosexual Orientation Inventory (Simpson and Gangestad, 2001). However, there has, more recently, been some criticism of the measure on a number of grounds, both theoretical and empirical (Jackson and Kirkpatrick, 2007; Penke and Asendorpf, in press; Webster and Bryan, 2007). As a result, the research in this thesis has been conducted with the aid of a new revised Sociosexual Orientation Inventory (Penke and Asendorpf, in press), the R-SOI. It was therefore felt necessary to investigate how satisfactorily the new R-SOI addresses the limitations of the original measure. Additionally, it was felt necessary to ascertain the potential for the tool to discriminate between potentially contradictory factors, sociosexual desire, sociosexual attitude and sociosexual behaviour. This is more fully discussed in Appendix i.

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The research questions.

The organisational construction of the empirical studies is demonstrated in Figure 1.

The results obtained from all of the experiments are reported and discussed in each chapter. However, the final chapter reviews the complete empirical corpus in the context of the relevant theories. By so doing it hopes to point to the existence of possible psychological adaptations promoting context-dependant tactics in human sexual strategies. It is therefore hoped that through undertaking these investigations, this project may be able to shed just a little more light on the relatively under-researched area of intra-sex differences in human sexual strategy.

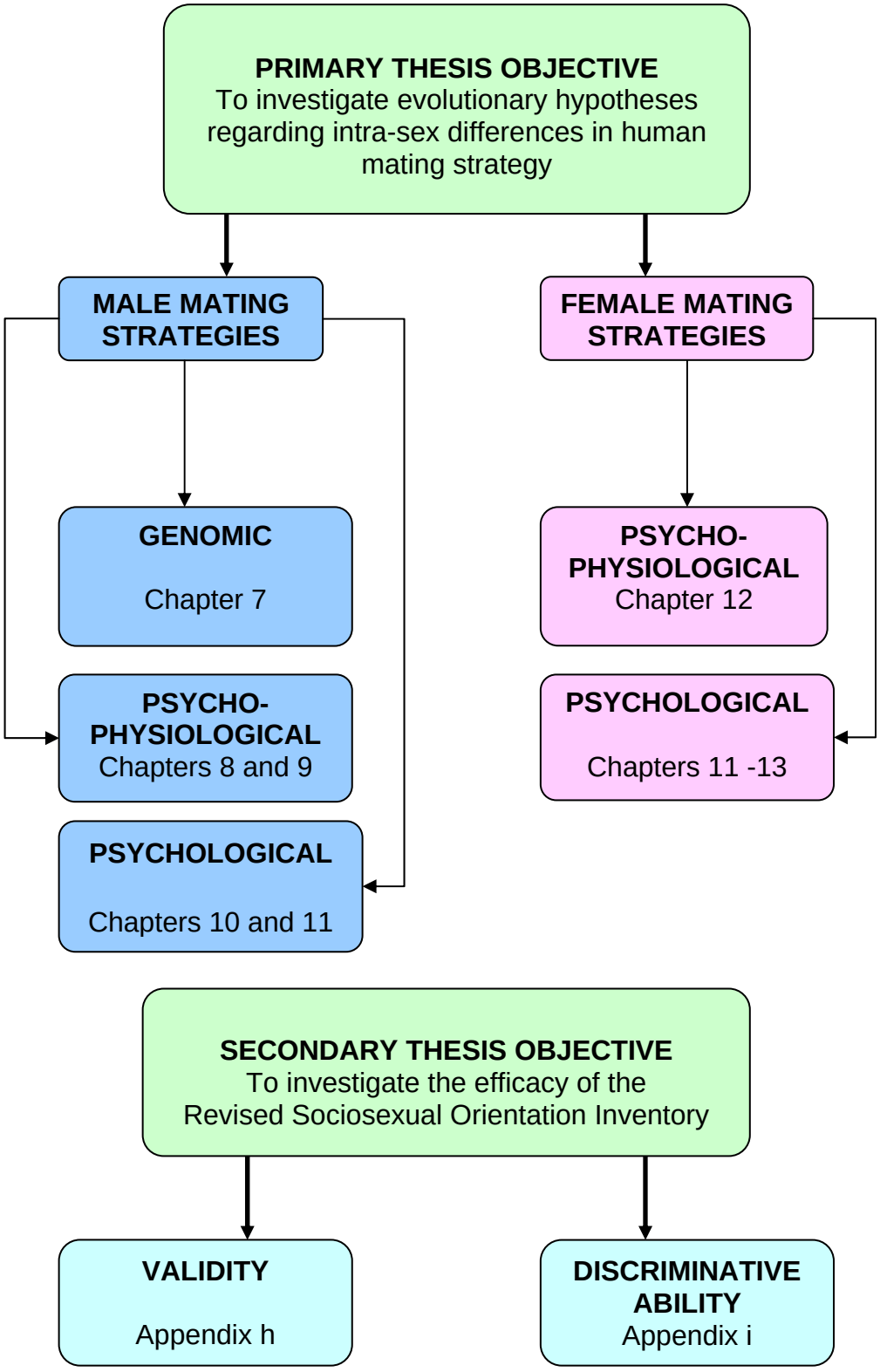


Figure 1

Flow chart indicating the organisational structure of the empirical studies.

1. Evolution and Sexual Selection

In order to proceed with research within an evolutionary framework, it may be useful to begin by providing a broad outline of the research area, by clarifying some of the basic terms and issues and setting the scene for the empirical studies to come. The first three chapters attempt to do just that, albeit in an abbreviated format, in order to provide such a suitable 'backdrop'. This chapter begins by considering perhaps the most basic question, that being 'Why have sex?' Sexual reproduction is not the only means, after all, by which to produce offspring, and in many ways it is more costly to the individual than asexual reproduction, so what is it that makes sexual reproduction the 'preferred' option in so many species? Further, one needs to understand the mechanisms that drive evolution – natural selection and sexual selection - in order to provide a convincing rationale for such research. This chapter therefore begins by asking "Why have sex?", before moving on to consider the fundamental principles of both natural and sexual selection.

1.1 Sexual and Asexual reproduction: Why have sex?

Sexual reproduction is a fundamental feature of evolution. It is the driving force behind sexual selection and the inspiration for much, if not most, of human behaviour. But why do humans engage in sexual reproduction at all? Sexual reproduction is, after all, a costly affair. Not only does the sexual being have to find a mate, which can be both time consuming and potentially hazardous, but it dilutes an individual's genes by half - an enormous cost when one considers that an individual's driving genetic imperative is to pass on his (or her) own genes to his offspring and future generations to come, not those of his partner (Zimmer, 2002).

What would be the benefit of pursuing such an enterprise, therefore, when another, apparently less costly alternative exists? Asexual reproduction is the alternative form of biological reproduction, requiring neither the pursuit of a partner, nor any dilution of genes in the production of offspring. It is therefore simple and avoids any inherent hazard (Halliday, 1980). Furthermore, it can be

achieved in a variety of ways – the simplest being the division into two as practiced by many protozoan organisms, a process known as *binary fission*. Slightly more complex is the process of reproduction through the production of buds, which become detached from the parent once the new individual is fully formed. This is the one of the processes used by the Hydra. In addition, a process called *parthenogenesis* or 'Virgin birth' can be employed, in which an egg is produced, much as in sexual reproduction, but which does not require fertilisation for it to mature into a full adult. This can occur in two ways, either through mitosis in which the egg retains a full, diploid, complement of chromosomes (e.g. with aphids), or through meiosis, therefore bearing a halved, haploid, number of chromosomes which are, nevertheless, capable of developing without the process of fertilisation (e.g. in male bees).

With these huge advantages, why do all living organisms not reproduce in this way? If, indeed, this is a superior form of reproduction, why has evolution not phased out the alternative mode? It seems that the answer can be found by considering the organisms' relationship with an ever changing environment, and by considering the nature of the offspring produced by these differing modes of reproduction, as follows.

Asexual reproduction is the biological process which results in a new individual genetically identical to that of the parent organism (save for an occasional mutation). This type of reproduction, therefore, results in genetic stability. Indeed, Pawlowska and Taylor (2004) found that the modern form of fungi, *arbuscular mycorrhizas*, are morphologically identical to fossils from 460 million years ago. Sexual reproduction, on the other hand, produces an individual with a genetic combination from two different individuals, through the combination of haploid gametes. As a result, this type of reproduction results in much greater genetic diversity. So which is better?

As we have seen, asexual reproduction does not need a partner, and therefore reproduction can occur more quickly and with less energy exerted. Furthermore, without the need for a partner a single organism can establish a new population if it lives in a sparsely populated area, or if it lives on the fringes of a habitat.

Asexual reproduction also produces a clone of the parent which, as the parent has been fit enough to survive and reproduce in the first place (in the Darwinian sense of the term), would suggest that the progeny will be similarly fit, inheriting the same proven combination of genes.

However, this very advantage in a stable environment can also become the organisms' greatest disadvantage in a less stable environment requiring genetic diversity. In contrast to asexual reproduction, the genetic re-shuffling that goes on in sexual reproduction, through the formation and then the union of gametes, results in offspring that are neither identical to their parents nor their siblings. As natural selection posits many more offspring are produced than can survive, the greater diversity between the offspring the greater the likelihood of survival and continuation of the parent genes.

Thus, it is perhaps primarily the environment which dictates the efficacy of one or other mode of reproduction. In an environment which remains stable asexual reproduction should be the mode of 'choice', whereas an unstable environment will require the genetic diversity offered through sexual reproduction. Of course for most organisms, the mode of biological reproduction is fixed. There are, however, a number of species that can employ either method, dependant on the environment and these provide good support for this position. *Hydra*, for example, will reproduce asexually through budding when conditions are good, but when conditions deteriorate they change to sexual reproduction producing fertilized eggs.

For humans (and, indeed, many other species), perhaps the biggest, single environmental risk is the continuing arms race between human and pathogen (Nesse and Williams, 1995). As the human develops defences against the pathogen, so the pathogen develops counter-defences, as well as new weaponry of its own. Without constant genetic reshuffling, the pathogen would soon win this war. Indeed, for any organism the ability to change and adapt to the environment is essential if it is to avoid the risk of extinction if a new environmental challenge were to come along.

Adaptation is therefore a key element in the understanding of natural selection, sexual selection and in the mode of reproduction itself. But how does adaptation fit into the study of Evolutionary Psychology?

1.2 Fundamentals of Evolution by Natural Selection

For most people, many scientists included, natural selection and sexual selection have been lumped together, so that natural selection has become an all encompassing term describing adaptations as a result of either survival or reproductive advantage. For most this has meant that sexual selection has been subsumed, leaving people asking only what might have been the survival value of a particular adaptation (Miller, 2000). This research project returns, for the purpose of clarity and accuracy, to the Darwinian definition of the terms, whereby natural selection occurs though the competition for survival and sexual selection occurs though competition to reproduce. This distinction is important as what may be advantageous from a survival point of view may be disadvantageous from a reproductive one, and vice versa. Indeed, as Darwin himself found, an adaptation advantageous to reproductive success could, in fact, be deleterious to survival.

So, simply put, natural selection is one of the two basic mechanisms of evolution. It starts with the observation that more offspring are produced than can survive due to finite resources such as food. There is therefore a struggle for survival in which only some individuals succeed. Individuals vary in all sorts of ways that influence their survival, and some of these will be heritable. Those individuals most favourably suited to their environment will be more likely to survive than those less favourably suited individuals. Assuming those favourable characteristics are heritable, more of the advantageous genes will be passed into the next generation than the deleterious genes. This results in a higher proportion of individuals in each generation displaying whatever the advantageous characteristic was that enabled their parent to survive, and thus the species gradually changes. Natural selection is therefore the process in which advantageous adaptations improve the survival success of individuals.

1.3 Fundamentals of Evolution by Sexual Selection.

Sexual selection is the process by which advantageous adaptations improve the reproductive success of individuals. This was the basis of Darwin's second evolutionary theory as first mentioned in 'Origin of Species' but fully developed in "The descent of man and selection in relation to sex" (1871). Prior to the book's conception the difficulty for Darwin was that there seemed to him to be too many anomalies in his theory of natural selection. The peacock's tail, an appendage of enormous metabolic cost as well as an obvious predation risk, was one such example. How could such a costly structure have evolved? Such was his anguish over the issue that he was to write in his personal letters to Asa Gray (an important American botanist of the 19th century), "The sight of a feather in a peacock's tail, whenever I gaze at it, makes me sick! " (1860, cited in Darwin, 1887: 43). His conclusion was that such a structure would only remain if it proved to be such an enhancement to mating success that it outweighed its detrimental effects (or, at the very least, equaled them).

The theory of sexual selection offers two potential routes by which such a process could occur. The first route is through intrasexual selection, in which members of one sex compete with each other to mate with the opposite sex. For example, if the possession of a territory were to influence mating success, intrasexual selection would operate on those characteristics involved in the outcome of territorial disputes, such as stature (a physical characteristic) or aggression (a behavioural characteristic).

The second route for sexual selection is through intersexual selection, or the form of sexual selection in which individuals are differentially attractive to members of the opposite sex. This occurs through the evolution of secondary sexual characteristics which are differentially attractive to the choosing sex (generally the female), and would include such characteristics as the bewildering peacock's tail (a physical characteristic) or an empathic manner (a behavioural characteristic).

Before concluding this chapter, two further points should be made. Firstly, natural selection and sexual selection are not the only processes by which genetic change may occur. Another process which should be mentioned for completeness is that of “Genetic Drift” or “The Sewell Wright Effect”. This is the process by which chance affects the survival (or otherwise) of alleles and their subsequent representation in future generations. This occurs generally when organisms have been relatively isolated and is distinct from natural selection due to the absence of advantage over other alleles. Additionally, “Neutral Drift” can occur- meaning that many of the changes that occur through evolution are selectively neutral (Kimura, 1968). In other words, the changes do not affect the fitness of the individual, either positively or negatively, and thus the frequencies of these genes within a population simply drift up and down. It is argued that as these genes are not subject to selection, neither can they be explained by it.

Secondly, it should be appreciated that though natural selection and sexual selection are, for reasons already explained, to be seen as separate processes, they are both part of the same essential process, that being the differential reproductive success of an organism as a result of its adaptive differences (Buss, 1999). This research will draw upon those adaptations that evolved due to the reproductive advantage they conferred, as it is these adaptations that will be central to the study of human mating strategies generally and intra-sex differences in human mating strategy in particular.

2. What is evolutionary psychology?

Psychology is, of course, that discipline that interests itself in mind and behaviour. Of central importance to the evolutionary psychologist is, therefore, an understanding of mental and psychological characteristics as products of natural and sexual selection. So, for example, a preference for high status males is potentially a functional psychological adaptation in human females in just the same way that the green camouflage of a leaf insect or the hollow bone of a bird is a functional structural adaptation elsewhere in the animal kingdom.

The study of human mating strategies, whether directly or indirectly genetically 'determined' (for want of a less controversial term), is based upon our understanding of adapted behaviours, and the concept of the human mind as a collection of evolved psychological mechanisms. The previous chapter asked "Why have sex?", before moving on to consider the fundamental principles of both natural and sexual selection and the functional product of selection – adaptations. This chapter aims to consider those adaptations most relevant to the psychologist in more depth. It begins by considering the brain as a set of functional mechanisms. It then considers the properties of a psychological adaptation. Finally it considers the human mind as a collection of evolved psychological mechanisms and considers the issues of domain specificity versus domain generality.

2.1 The mind as a set of functional mechanisms.

In "Controversies surrounding Evolutionary Psychology", Hagen presents the body as "a set of tightly integrated but distinct mechanisms that function to enable and facilitate the survival and reproduction of the individual organism" (2005:146). He argues that should a previously undiscovered structure be detected in the body, it would be more than reasonable to assume that it, like all other structures in the body, exists to serve some specific function which would aid in either that organism's survival or reproduction. This is true of all organs - the heart, lungs, intestines, blood vessels, bones, skin, womb, ovaries, testes – all have evolved to perform some specific function or functions involved in that

organism's survival or reproduction. For this reason, he argues, the brain should be explored as a set of mechanisms to solve specific functional problems – particularly when one appreciates that the brain is involved in many activities responsible for survival and reproduction – vision, audition, motor control and so on. Function, therefore, provides a potent and logical principle for the study of the mind – if, as Buss says, "… two components of the mind perform different functions, they can be regarded as separate [psychological] mechanisms" (1999:53)

2.2 What are Evolved Psychological Mechanisms (EPMs) or psychological adaptations?

An Evolved Psychological Mechanism (EPM) or psychological adaptation is a mental or psychological characteristic that has evolved, through environmental pressures, to serve some specific function. Or as Barkow, Cosmides and Tooby state in their seminal text 'The Adapted Mind', EPMs are "adaptations, constructed by natural selection over evolutionary time" (1992:5). The EPM, therefore, challenges the notion of the tabula rasa (or blank slate), the epistemological theory popular in the twentieth century that individuals are born 'blank' and free of any innate 'knowledge'. According to Buss (1999: 50-51), an EPM must include the following properties: That an EPM exists in the form that it does because it solved a specific problem of survival or reproduction recurrently over evolutionary history; that an EPM is designed to take in only a narrow slice of information;that the input of an EPM tells an organism the particular adaptive problem it is facing; that the input of an EPM is transformed through decision rules into output; that the output of an EPM can be physiological activity, information to other psychological mechanisms, or manifest behaviours, and lastly, that the output of an EPM is directed toward the solution to a specific adaptive problem.

An EPM, therefore, is a mechanism involving design features that are specifically suited to performing a functional task, that being the resolution of a particular problem regularly presented in the Environment of Evolutionary Adaptedness (EEA). For humans, the EEA equates to the Pleistocene, the

period from 1.8 million to 12,000 years ago and is distinct from our modern environment.

Further, the EPM takes in only a narrow slice of information. So, for example, rotten, rancid smell prompts the psychological (and potentially physiological) reaction ‘disgust’ (Nesse and Williams, 1995). This may have warned our ancestral forebears of the possible danger arising from the consumption of bacteria laden, potentially toxic substances– the same cues trigger the disgust response in humans today.

The EPM also tells the organism of the adaptive problem it is facing. The rotten, rancid smell tells the organism that it is facing a specific survival problem – one of food selection. This input then allows the organism to respond appropriately. In this example, the likely response will be avoidance. If this fails, physiological responses may intervene (through gagging, vomiting or diarrhoea). Thus, input is transformed into output – information to other psychological mechanisms (disgust), manifest behaviour (avoidance) and physiological activity (gagging, vomiting or diarrhoea). Thus, the output from the EPM has served to ensure an appropriate solution to the adaptive problem faced – it is unlikely, as a result of this Evolved Psychological Mechanism, that the organism will become ill or die through consumption of rotten food teeming with toxin producing bacteria.

2.2.1 The mind as a collection of evolved content specific psychological mechanisms.

When a plumber sets to work on plumbing in a new bathroom he will utilise an assortment of tools, each suited to the specific task in hand. He may, for example, have a hammer to break up an old bath, a drill to drill a hole for the waste pipes, a freeze kit to prevent a flood when taking out a radiator and so on. Flexibility arises from the variety of tools over one “general tool”. In the same way an individual needs many EPMs to address the many different types of adaptive problems he or she will face. Such problems would be those involved in both survival (finding sufficient and appropriate foods, shelter and protection from predators, forming social alliances etc.) as well as reproduction

(selecting and attracting an appropriate mate, fending off competition and ensuring adequate parental investment in offspring etc.) For some (e.g. Pinker, 2002) the argument is that a 'general problem solver' will not be adequate to meet these specific requirements. For example, a possible general solution to the fore-mentioned problems might be "copy the actions of your nearest relative". In some situations this might work. "Eat what brother eats" might, for example, result in the consumption of a tasty meal. However in other situations this could be disastrous. For example, "mate with first available partner" might solve the reproductive problems of the male sibling, but could potentially be disastrous if pursued by the female sibling.

General problem solvers, it is argued, are therefore potentially costly to the individual (Symons, 1992). They may fail to lead the individual to an appropriate solution, and they may result in costly errors along the way. What is required, therefore, is not one 'cover-all' solution, but a large number of content- sensitive adaptive mechanisms which will be relevant to the specific adaptive problem in hand. We arrive at a counter-intuitive conclusion. The larger the number of innate psychological mechanisms an individual possesses, the greater the flexibility he has in manifest behaviour. The argument that innate mechanisms create behavioural inflexibility may therefore be mistaken.

However, there is a fundamental flaw with this argument. The issue is that a general problem solver is not the same thing as a 'general solution' to all problems. It is rather one that is actually capable of addressing a large number of problems and is, by its very nature, flexible. Thus true flexibility, it could be argued, might best be achieved by incorporating a mixture of both domain specific and domain general mechanisms, a possibility considered in the following section.

2.2.2 Domain Specific versus Domain General Mechanisms.

Evolutionary psychology, as noted, frequently sees the mind as a collection of evolved content or domain specific psychological mechanisms (Pinker, 2002; Cosmides and Tooby, 2002; Kirkpatrick, 1996), and many reject the possibility

of domain-general mechanisms – according to Cosmides and Tooby “jacks of all trades are masters of none. They achieve generality only at the price of broad ineptitude” (2002:170). That is not to say that all evolutionary psychologists reject the possibility of such mechanisms (Geary and Huffman, 2002; Chiappe and MacDonald, 2005). There are many that argue that domain-general mechanisms can co-exist and support domain-specific mechanisms. Indeed, the founder of the concept of modularity, Fodor (1983), himself proposes the existence of both encapsulated, domain specific mechanisms, as well as unencapsulated, domain-general mechanisms under ‘executive’ or voluntary control. Such mechanisms would be responsible for higher cognitive faculties, including “thought” and “problem solving” which allow humans to cope with the many novel problems that they face. In other words, the development of generalised psychological mechanisms are the result of adaptation to change itself – a psychological mechanism that is open to experience can solve the problems associated with novelty and unpredictability (Geary and Huffman, 2002).

Mithen, on the other hand, building on Fodor’s modularity of mind, Gardner’s multiple intelligences, and Barkow, Cosmides and Tooby’s theories supporting modularity, in addition to Karmiloff-Smith’s developmental approach, argues for an architecture of the mind analogous to a cathedral having undergone various stages of development (1996). He sees general intelligence as the nave, or central structure of the cathedral, with various other specialised intelligences analogous to the chapels added later. Further, he argues for four types of specialised intelligences – technical, social, natural history and possibly a linguistic intelligence.

There are also those who criticise the concept of *any* genetically determined mechanisms. For them the complexity of behaviour is a result of development, “specialisation builds up gradually and is actually the product of child development, not its starting point….. In other words, domain-specific outcomes do not necessarily entail domain-specific origins” (Karmiloff-Smith, 2000: 147). Further, the notion of total encapsulation for domain specific mechanisms (as proposed by Fodor) is also criticised – adaptations must interact in order to

produce optimal results. Hunger state, the sight of food and the smell of food all provide information to psychological mechanisms which must interact before the decision “eat or not to eat” is made.

This research follows the well- established lead of the many eminent scientists who would argue for both domain- general and domain- specific mechanisms whilst recognising the important role of domain specificity in uncovering significant psychological mechanisms. It takes as its guiding principle the notion of functionality with regard to psychological adaptations, but must leave the debate to join another – the nature of our evolutionary legacy – what life was like in our Environment of Evolutionary Adaptedness.

3 Adapted – but to what?

We have specified that an EPM exists in the form that it does because it solved a specific problem of survival or reproduction recurrently over evolutionary history (though any “starting point” in an evolutionary story is, of course, arbitrary). But what would those problems have been? The problems that we face today are not those that were faced by our ancestral forebears. The distinction, then, between adaptations and modern day adaptiveness, is an important one. If, therefore, we are to form hypotheses based on the functions of mechanisms in solving specific survival and reproductive problems, then we must have some notion as to what these problems might have been.

By and large, evolutionary psychologists refer to the Pleistocene as the period encompassing our Environment of Evolutionary Adaptedness or EEA. In other words, the Pleistocene is the environment to which our particular EPMs evolved. (The EEA may be defined as the environment in which specific selection pressures acted to produce a given psychological or physical adaptation). But our understanding of the origins of human life is constantly evolving as new archaeological and palaeontological discoveries are made, with the arrival of ever more sophisticated technology, and with the advances and conceptual integration of a variety of disciplines including molecular biology, palaeontology, primatology and anthropology (see Bradshaw, 1997, and Stringer, 2002, for a review of the main models of human phylogeny). For example, recent studies of mitochondrial DNA and the mismatch in modern African populations, coupled with a succession of new archaeological discoveries in Africa point to factors which could have led to a major demographic expansion of certain African groups, ultimately leading to the dispersal of anatomically and genetically ‘modern’ human populations across Europe, Asia and Australasia (Mellars, 2006). Nevertheless, through the work of palaeontologists it is possible to create an account of human phylogeny which, whilst not complete, affords us a reasonable understanding of the environmental pressures of the EEA.

3.1 From Prosimian primates to *Homo Sapiens.*

Modern human origins may be usefully traced back to the anthropoid primates, or Old World monkeys about 50 million years before present (mybp) and on to the Hominoid line which split from the Old World monkey line about 15 mybp (Whitfield, 1993). It is off this most recent line that the best transitional candidate, *Australopithecus afarensis*, appears, approximately 4 million years ago. Indeed *Australopithecus afarensis* appears to be our first fully competent bipedal ancestor, a development of vital significance in the evolution of EPMs (See 3.3 'The importance of Bipedalism'). Bipedalism, therefore, as measured by the appearance of *Australopithecus afarensis* can be traced to approximately 4 mybp, approximately midway through the Pliocene epoch (Hay and Leakey, 1982), towards the start of the Quaternary period (i.e. the period encompassing the Pleistocene and Holocene, and taking us to the present day).

However, most modern human evolutionary history, as previously mentioned, is traced to the geological epoch known as the Pleistocene, a period of history spanning almost two million years (from 1.8 million years ago to about 12,000 years ago). At the beginning of this period, our ancestors (*Homo habilis*) were relatively short, had long arms and a "non-human like" skeleton, and a cranial capacity of about 500-650cc. They would have made simple tools, had no language and nothing in the way of cultural artefacts. By the end of the period our 'modern ancestors' (*Homo sapiens*) had modern skeletons, and were identical to us in cranial capacity, about 1200-1700cc, they had language, and were rich in culture. And vitally, these ancestors were now influenced by the same psychological adaptations that post industrial man is influenced by today. Holocene behaviour, motivation, desires – Holocene psychology – is driven by our Pleistocene legacy.

3.2 Our Pleistocene legacy – life on the Savannah.

Pleistocene life essentially meant life in sub-Saharan Africa, as it is generally accepted that our ancestors only started their migration out of Africa towards the end of this era. How *Homo sapiens* then evolved is one of the most hotly

debated areas of paleoanthropology. In brief, there are two schools of thought. The first, the Multiregional Continuity Model, argues that *Homo erectus* left Africa for various regions of the Old World, and these regional populations developed independently into modern humans. The second, the Out of Africa Model, argues for a single origin for all modern humans, and is perhaps the most popular model (Johanson, 2001). What does seem to be generally agreed upon is that *Homo erectus* evolved in Africa about 1.9 mybp and then spread out of Africa into Asia about 1 mybp. Homo sapiens (evolved from *Homo heidelbergensis*, who in turn evolved from *Homo erectus*) appeared in Africa around 200,000 ybp and moved out of Africa around 100,000 ybp. The debate, though interesting, is regrettably outside of the scope of this thesis.

Nevertheless, we can be moderately sure of the basics of life for our Pleistocene ancestors. They lived a nomadic existence in the essentially open plains of Savannah grassland, not in the densely forested lands of their ancestors, but with odd trees dotted around the landscape which were used for shelter as well as defence against predators. In fact, the predation rate of early humans was approximately 6 – 10%, a percentage analogous to the predation rate of savannah antelope today, suggesting to some that early humans were arguably more prey than predator (Sussman and Hart, 2005).

3.3 The importance of hunting

So hominins were eaten, but it is also likely that they preyed upon the herds of herbivorous mammals such as antelope, pigs and cattle. There is ample evidence to support the “The Hunting Hypothesis” (Tooby and DeVore, 1987), from the wear on human tooth fossils, to archaeological discoveries of bones bearing cut marks, to the supporting evidence from modern hunter gatherer societies. However, contradictory evidence now also suggests that the physiology of the human gut is not specialised for meat eating. Rather the human species has been redefined as an unspecialised frugivore, with a flexible diet including meat and seeds. It is proposed that availability of foods would have dictated the diet and this could have resulted in swings from vegetables to meat dependant upon circumstance (Hladik and Pasquet, 2002). There is also

the possibility that some scavenging occurred (the Scavenging Hypothesis) though evidence has been ambiguous and has not, until recently, supported the likelihood that scavenging was a primary source of meat (Tooby and DeVore, 1987). Nevertheless, research drawn from the Olduvai Gorge in Tanzania now challenges this position, citing scavenging as the major source of meat procurement amongst hominids between 2 and 1.7 million years ago (Shipman, 1986).

The predation of larger animals had implications for human societies and evolution. Firstly, it had implications for the development of better tools and weapons used for both attack and defence. It also had implications for the development of the social characteristics that exemplify human groups. For example, co-operative behaviour and enhanced communication would be required in order to facilitate the co-ordinated behaviour necessary when hunting big game. Sharing behaviour, also, would have occurred as large game is most conducive to sharing outside the immediate family (Gibbons, 2004). Hence, social hierarchies would have developed with the greater need for social co-operation as well as the resultant impact upon sexual selection and mate choice. In other words, Pleistocene hominids were subject to the same social pressures that humans face today.

Hunting behaviour, then, was important in evolutionary terms, particularly with regard to the impact on the evolved characteristics of group behaviour. Another critical development in the emergence of modern psychological adaptations was the transition to Bipedalism.

3.4 The importance of Bipedalism

The evolution of Bipedalism brought with it many advantages to our hominin ancestors. For a start, bipedalism represented a more energy efficient form of locomotion when walking than quadrupedalism (Sellers, Cain, Wang and Crompton, 2005). It also freed up the arms and more specifically the hands, paving the way for fine manual dexterity (Young, 2003) and enormous growth in the use of tools and weapons, such that tool use was to become a part of the

everyday life of our hominid ancestors (Jolly, 1970; Kohn, 1999). In addition bipedalism may have answered the need to avoid solar radiation by minimising the surface area exposed to the sun (and may even have evolved as a response to this environmental challenge). It has also been suggested that it may have developed as an effective way of improving gestural communication (see MacWhinney, 2002).

Bipedalism, therefore, created many advantages, but it also brought with it new evolutionary challenges. As a result of bipedalism and the resultant changing shape and narrowing of the birth canal and pelvic inlet, an important evolution in the birth process was to take place. With increasing cranial capacity, supporting as it did the ever increasing complexity of the cranial cortex, human offspring were born more and more prematurely. And with the increasing dependency of the neonate came an increasing need for parental investment, a critical factor in the mating strategies of both males and females (See Chapter 4.3 for a more comprehensive account). So the transition to bipedalism and the subsequent impact on childbirth and parental investment were of vital significance in the development of EPMs.

Psychological adaptations, and the resultant EPMs, evolved over a great period of time, then, as a result of the recurring pressures of life on the African savannah – the need to find food and shelter, the need to find and attract mates, the need to reproduce and ensure the survival of the offspring and so on. What we must take away from this chapter is that the structure of the human mind has evolved to address the challenges of the Pleistocene hunter- gatherer way of life, and not to address the challenges of modern post-industrial society. As Barkow et al (1992:5) point out:

> The few thousand years since the scattered appearance of agriculture is only a small stretch in evolutionary terms, less than 1% of the two million years our ancestors spent as Pleistocene hunter-gatherers. For this reason it is unlikely that new complex designs… could evolve in so few generations.

Thus, many of the factors that one might assume to have had an impact on the evolution of our minds have not. The Holocene, encompassing all of recorded history from agriculturalism, through pastoralism and industrialisation to the modern post industrial world, has been “historically crucial but evolutionarily unimportant “(Miller, 2000; 180). If adaptations had occurred rapidly over hundreds as opposed to thousands of years, one would expect to see differences between the evolved psychological mechanisms of traditionally agricultural populations and those of populations who have, until much more recently, practiced a hunter gatherer way of life. No such differences have been found. (Barkow, 1980)

The next chapter considers how Pleistocene life dictated more specific EPMs – those being the EPMs relevant to Sexual Strategy.

4. Sexual Strategy

The previous chapters explained how Evolved Psychological Mechanisms or psychological adaptations evolved, through specific selection pressures, to serve some specific function. This chapter considers what selection pressures influenced the evolution of differential psychological mechanisms between males and females in their mate preferences and how empirical evidence supports these claims.

4.1 Intersexual selection and mate preference as evolved psychological mechanisms.

It is both logical and valid to comment that humans today are the result of only those ancestors who chose their mates judiciously and hence passed their genes on into the next generation. All those who failed to choose shrewdly are no longer part of our gene pool. It is as a result of thousands of generations of selection pressures that humans today have the mating preferences that we do – these served in the EEA (and probably continue to serve) very important functional purposes.

It is also important to note that the selection pressures applicable to males are not necessarily those that are applicable to females, particularly when considering intersexual selection (though undoubtedly many selection pressures were the same – the need to find a partner who would be kind and thoughtful, for example, would have been relevant to both sexes). Males and females faced differing adaptive problems over their evolutionary history, and for that reason have evolved differing psychological mechanisms. It is for this reason that this chapter begins by considering the selection pressures generating male and female long-term mate preferences separately.

4.2 Adaptive problems encountered by males in long-term mate choice.

Perhaps one of the most obvious questions when considering male long-term mate choice is to ask why males have long-term relationships at all? If the

ultimate point of reproductive effort is to ensure as many surviving offspring as possible, why do males not pursue as many females as possible, leaving them after mating to search for new opportunities elsewhere? According to Buss (1999), there are a number of explanations.

One of the most important explanations is this. Ancestral females chose their sexual partners, and they chose them carefully. As Trivers's (1972) theory of parental investment points out, the sex that invests more in offspring will be choosier, and the sex that invests less will be more competitive for sexual access. Females, in short, are a valuable reproductive resource, and "reproductive resources… are not allocated indiscriminately" (Buss, 1999:107). So, if there was no suggestion of commitment from the male, the female would simply not have sex. For this reason, the majority of males who pursued a short-term mating strategy alone would simply not have found themselves a partner. Female mating preferences have therefore driven male mating strategy. In the same way, the best females could afford to be the choosiest. Thus, if a male wanted to mate with the best female, then he would have had to respond to her preferences or risk being rejected.

Another very important explanation for the willingness for males to invest in long-term relationships is the issue of paternal uncertainty. Whereas the female can always be certain of her maternity, males cannot be certain of their paternity. Such uncertainty is compounded by the concealed ovulation of human females, unique amongst the apes. Concealed ovulation is believed to be a mechanism that encourages mate bonding and therefore the likelihood of both parents remaining together over a longer period of time (Power and Aiello, 1997). It does mean, however, that unless the male can ensure that no males have access to 'his' female at any time, he cannot know whether her offspring are also his. By committing long-term to the female in question, the male enjoys both increased, and probably exclusive, sexual access. Thus, his commitment to her results in the increased likelihood of her bearing his children as opposed to another's. Furthermore, it is likely these offspring would have increased survival chances as a result of having two parents to provide for and

look after them. The risk of infant mortality in the ancestral environment would have been significantly higher if the mother were the sole carer.

So long-term commitment was a strategy that would have been beneficial to the majority of ancestral males. It should be noted, however, that such long-term matings would not necessarily have precluded the possibility of covert disloyalty, or opportunistic matings, when an appropriate opportunity arose. This is discussed in more depth when considering Gangestad and Simpson's "Trade Offs and Strategic Pluralism" theory in the following chapter. But what would have been the factors that would have driven his mate selection? Well, one of the most immediate problems encountered by males in mate choice was the identification of females of high reproductive value – i.e. the number of children a person is likely to have in the future (as opposed to fertility which is defined as actual reproductive performance). A male who chose badly and committed himself to a female of low reproductive value would see his reproductive potential reduced. But how could he tell which female had a high reproductive value?

According to Buss (1992), it would have been necessary to glean what information he could from the female with regard to reproductive value by looking at observable information correlated with reproductive capacity. One of the factors most highly correlated with fecundity is age (Buss, 1999). Of course, in the ancestral environment actual age would not have been known, so it was necessary to look for clues to age. Buss offers three useful guides. Firstly, the man could look at physical signals (clear skin, absence of wrinkles and grey hair, shiny thick hair etc). Secondly, he could observe behaviour (lively, agile manner, high energy levels etc). Thirdly, he could listen to clues from others (knowledge about age and health, sexual history and so on). Thus, over many generations, these qualities would become correlated with what are cross culturally accepted as attractiveness (Langlois, Kalakanis, Rubenstein, Larson, HaUam, and Smoot, 2000; Cunningham, Roberts, Wu, Barbee, Druen, 1995; Thornhill and Grammar, 1999). Looking for attractive females has therefore become an important adaptation in the search for fecund partners.

So, access to females of high reproductive value was one of the biggest problems that ancestral man had to solve. However, he also had to ensure that the mate he committed to would be sexually faithful, as choosing a woman who was likely to stray could result in the potentially costly mistake of investing resources and time in another man's child. Thus clues to fidelity would be important. Psychological mechanisms should therefore have evolved which would reduce the likelihood of cuckoldry.

The issue regarding chastity is rather more complex. Whilst the advantages of chastity are clear (i.e. no risk of paternal uncertainty), the desire for chastity may be counterbalanced by proof of fertility. Whilst this seems intuitively unlikely, this proposition is supported by Miller who argues that "exclusive lifelong monogamy was practically unknown. The more standard pattern would have been 'serial monogamy'…" (2000: 186). For this reason he goes on to argue that it would not have been unusual for a Pleistocene male to be involved with a woman who had already proved her fertility through previous relationships. Empirical evidence supports this possibility. Whilst cross cultural data shows that chastity is valued by males more than females, there is wide variation in male desire for chastity (Buss, 1990). Chastity is also cross culturally deemed less important than fidelity, with unfaithfulness being regarded as the least desirable characteristic in a wife (Buss and Schmitt, 1993 – see 4.5 for further discussion). If such a thesis is true, of course, this would have important ramifications for the issue of paternity uncertainty and reluctance to maintain another man's child. It would, however, be consistent with the fact that it has been estimated that children living with one genetic parent and one step parent are roughly forty times more likely to be physically abused than children living with both biological parents (Daly and Wilson, 1985).

4.3 Adaptive problems encountered by females in long-term mate choice.

The adaptive problems that females faced when seeking a long-term mate are quite different to those that males faced, and different psychological mechanisms therefore evolved. For example, the preference for attractiveness

is not *as* important for females for a number of reasons. Firstly, access to fertile mates is not the issue for females as it is for males, as it is the females who carry the reproductive burden and are therefore choosier (Trivers, 1972). Furthermore, fertility in males is not as highly correlated with age as it is for females, and thus male fertility is harder to assess through physical appearance.

However, whilst females do not have as great a problem in gaining access to fertile males, they do have the resultant issues of parental investment to address. Unlike the potentially minimal male investment in an act of sexual intercourse, the costs of gestation, parturition, lactation and childcare represent a huge obligatory investment in time and energy for the female, at the same time preventing any opportunity of contiguous reproduction.

For the female, then, ability and the willingness to invest both time and resources in herself and her offspring would be vital, and she will have evolved psychological mechanisms to help her in this quest. With regard to ability to invest, it was perhaps a relatively easier task for the female to ascertain external resources (e.g. territory, meat from the hunt etc) than for the male to ascertain reproductive value, though, of course, ability to invest is not necessarily the same as willingness to invest. It was also important that females could gauge the future potential of a partner. It would therefore have been necessary to consider clues that would probably indicate future resources. Two such indicators might well have been evidence of intelligence as well as evidence of ambition and industriousness (Willerman, 1979).

Ability to invest would also be influenced by social status (or an individual's relative position in a social group), as the higher his status the greater his ability to control available resources (Ellis, 1992). As Ellis points out, forming a partnership with a high status male would enhance a woman's survival and reproductive success through enhancing her own social status, ensuring material benefits and securing long-term access to social and economic resources. So signs of status should greatly enhance a male's attractiveness.

Another indicator of ability to invest is in the age of the male, as the older the male, the more likely it is that he will have been able to accrue resources. Thus increased age is not the hindrance to males as it is to females, though there is a small sting in the tail. Substantially older males are at greater risk of dying, with the resultant risk to future provisioning. Further, substantially increased age may lead to a potential reduction in ambition and drive, resulting in diminishing status and therefore diminishing attractiveness.

Ability to invest is not, however, the only relevant factor. Willingness to invest time and resources is equally important, and therefore females have looked for clues to such willingness through signs of dependability, kindness, altruism, expression of love and commitment and through positive exchanges with children. Such attributes would also, importantly, have been relevant to parenting (Buss, 1989).

Also of importance, but to a less degree than the afore-mentioned requirements, would be the need to secure a partner who was both healthy and able to protect both the female and her offspring. Therefore seeking physical size and strength, athletic ability and symmetry (an indicator of health) would all have been adaptive solutions to these problems (Buss, 1989).

4.4 The impact of preferences on intrasexual competition.

As Darwin (1871) posited in his theory of sexual selection, two processes are important to sexual success. Firstly, intersexual selection and the selective choices of one sex for characteristics in the opposite sex is an intrinsic element of sexual selection, as just discussed. The second vital element of sexual selection is that of intrasexual competition and the selection for characteristics that lead to greater success over conspecifics in their competition for access to members of the opposite sex. (One example of the latter has previously been mentioned, that being the need for males to provide indicators of their willingness to commit as a response to the female preference for long-term commitment before the granting of sexual access. Males who failed to provide such indicators similarly failed to attract willing partners). Males should therefore

have evolved to compete with each other in the acquisition of resources and the display of characteristics discussed earlier. Females should have evolved to compete with each other in displays of youth and attractiveness (as indicators of reproductive value), as well as in displays of chastity and fidelity (as indicators of restricted or exclusive sexual access).

It is also important to remember that a mate gained is not necessarily a mate retained. Effective retention strategies for males would have required the fulfilment of the female preference for ability and willingness to invest, as well as to protect and to participate in parenting. Effective retention strategies for females would have required the willingness to grant exclusive sexual access with high reproductive capacity. The failure of either to deliver would be to risk losing one's partner in intrasexual competition.

An abundance of empirical research has been conducted which exhibits the reality of mate preferences as discussed. Much of this can be gleaned from the enormous, cross cultural International Mate Selection Project (IMSP) conducted by Buss, which investigated mate preferences in populations across 37 cultures, all five continents and involving 9,474 participants (Ellis, 1992). The following paragraphs provide just a taster of the wealth of empirical evidence now available in support of the hypotheses regarding proposed mate preferences and the resultant domain specific psychological adaptations.

4.5 Empirical evidence for differential mate preferences – male preferences.

With regard to male preferences, psychological adaptations should have evolved which would enable the male to find and attract a fecund female. They should therefore respond (for the reasons previously specified) to females who are young and physically attractive. Compelling evidence for this has been provided by Baize and Schroeder (1995) who investigated the responses of males and females to personal ads placed in two areas in the United States. They found, as predicted, that younger females received significantly more responses than older females, and that mention of physical attractiveness

produced significantly more responses for females than it did for males. Furthermore, as males get older, they prefer increasingly younger females – in another study of personal ads, Kenrick and Keefe (1992) found that males in their thirties looked for females on average five years younger, whereas males in the fifties looked for females ten to twenty years younger. Similarly, as a response to male mating preferences, Pawlowski and Dunbar (1999a) found that females were more likely to withhold age in personal ads as they got older. Finally, research also shows that regardless of sexual orientation, males rate older females as less attractive than do females (Nash, Fieldman and Hussey, 2005).

Further evidence for age preference comes from the IMS project which investigated the cross cultural age differences between brides and grooms. In accord with expressed choices by both males and females, males were on average three years older than their brides (Buss, 1989, 1990). In each of the 37 countries investigated, males preferred younger brides, though the strength of the preference varied from country to country (and according to mating system). An interesting exception to the youthful preference comes from an investigation into the mate preferences of 103 male and 106 female teenagers in which it was found that though the females preferred the predicted preference for older males, males also preferred females approximately five years older than themselves. It is suggested that it is not age per se, but rather features associated with reproductive value that are sought, as slightly older females in this case have somewhat higher reproductive value than their more youthful conspecifics (Kenrick, Keefe, Gabrielidis, and Cornelius, 1996).

The sex differences placed on preference for age and physical attractiveness have found cross cultural consistency, and yet this has not been found in male preference for chastity. In this case there appears to be a large cross cultural spread (Buss, 1989, 1990), and only 62% of the cultures showed a significant difference between the sexes. Nevertheless, wherever a difference was found, it was always males who placed greater importance on chastity than females. However, with regard to fidelity the results were much clearer. Cross cultural evidence shows that males across all cultures regard unfaithfulness as the least

desirable quality in a woman, scoring -2.93 on a scale of 3 (most desirable) to -3 (most undesirable). Although cross cultural evidence for faithfulness is not available, evidence that does exist supports the notion that males place a similar importance on fidelity, scoring +2.85 on the same scale. Indeed, of 67 traits rated for desirability, fidelity was the highest on the list (Buss and Schmitt, 1993). Consistent with male mate preferences, females are also significantly more likely to derogate other females with regard to sexual fidelity than are males – the conclusion being again that females appear to be sensitive to male's long-term preferences and their concern regarding paternity uncertainty (Buss and Deden, 1990).

Despite the fact that evidence regarding chastity does not seem to be entirely consistent with evolutionary theory, the arguments proposed by Miller (2000) could explain such a result. He argues that combining courtship and parenting was a fact of life for most Pleistocene hominids, with females passing through a number of monogamous relationships during their reproductive life. Most relationships were conducted with children from previous relationships around. Male mate choice "almost never had the luxury of favouring a woman who did not yet have any children" (Miller, 2000: 193). If this were the case, the emphasis would quite reasonably not have been upon chastity, but rather fidelity for the life of the relationship.

4.6 Empirical evidence for differential mate preferences – female preferences.

With regard to female preferences, psychological adaptations should have evolved which would enable the female to find and attract a male who is both willing and able to invest in herself and her offspring, through high status and resources and who is willing and able to protect her and her offspring.

Again, the IMS project provides a wealth of evidence in support of the supposed emphasis placed by females on availability of resources. For example, of the 37 cultures considered, 36 showed females placed greater desirability on "good financial prospects" than males. Additionally, and as hypothesised earlier,

females place “good financial prospects” above “good looks” (Buss, 1989). This was consistent with the study conducted by Gregerson who studied 300 cultures (mostly non-urban and non-Western) and concluded that “For females the world over, male attractiveness is bound up with social status, or skills, strength, bravery, prowess, and similar qualities” (1982: 186).

Age is also another factor in female mate preferences as this is another clue to his potential resources. The converse of the empirical evidence regarding male preference for younger females has been found to be true. As stated, females prefer older males as marriage partners across all 37 cultures without exception, with an average preferred difference of three and a half years and an average actual difference of three years, showing that marriage decisions are consistent with stated preferences.

Females should also favour ambition and industriousness as indicators of potential for accruing resources. Again, the IMS project showed that females value ambition and industriousness significantly more than males do. Ratings were characteristically between important and indispensable. Further evidence shows that females are more likely to end a relationship with a male who shows himself to be lazy, lacking in ambition or who loses his job (Betzig, 1989).

Willingness to invest such resources is also an important mate preference, and one expected to be addressed through a preference for kindness and dependability. Empirical evidence again supports this hypothesis. For example, Howard, Blumstein and Schwartz (1987) conducted a large research project in the United States. They found that the factor *expressiveness* (encompassing affectionate, compassionate, expresses feelings and romantic) was the strongest female preference, scoring 7.34 on a 9 point scale. Similarly in the IMS project, Buss found that collapsed across the 37 samples the following characteristics were rated most highly (scores being form 0 – 3, with 0 being unimportant and 3 being indispensable): mutual attraction-love (2.87), dependable character (2.69), emotional stability and maturity (2.68) and pleasing disposition (2.52).

The nature – nurture debate has, predictably, raised its head regarding sex differences in sexual attraction. Many social scientists argue that the differences in sexual attraction may be attributed to what has been called “structural powerlessness and sex role conditioning” (Buss and Barnes, 1986). This argues that females seek in males characteristics associated with status and power, because they lack power. Social conditioning “maintains and reinforces the whole process, inculcating sex-role appropriate values from generation to generation” (Ellis, 1992: 273). However, if this were the case, it has been hypothesised that as the socioeconomic status (SES) and economic independence of females increases, they should become less sexually selective and less concerned about the status and power of their mate. In fact, evidence argues to the contrary. As female SES and economic independence increases, so too does her requirement for a male of even higher status and power. In other words, contrary to the expectations of social scientists, “females’ sexual tastes become more, rather than less discriminatory as their wealth, power and social status increases” (Ellis, 1992: 273).

Physical dominance, athletic ability and attractiveness have also been hypothesised to be of relevance with regard to female mate preference, as an indication both of the male’s ability to protect her and her offspring, and as an indicator of health and fertility. In line with predictions, “good health” was rated as highly important (+2.28), but still just below the ratings for mutual attraction-love (2.87), dependable character (2.69), emotional stability and maturity (2.68) and pleasing disposition (2.52). Similarly, research has shown that symmetry (an indicator of developmental stability) is correlated with health, in psychological, physiological and emotional terms (Shackleford and Larsen, 1997; Jones, Little, Penton-Voak, Tiddeman, Burt and Perrett, 2001), and that facially symmetric males are judged to be more attractive than their asymmetric counterparts. Lastly, in an experiment by Johnston, Hagel, Franklin, Fink and Grammer (2001) females were asked to make judgements on hundreds of males in a QuickTime movie both for the most attractive face and subsequently for the healthiest face – there was remarkable consistency between these factors.

The preceding paragraphs do not do justice to the considerable evidence that supports the hypothesised development of functional psychological mechanisms aiding sexual selection. Nevertheless, it is hoped that it is sufficient to indicate the importance of such research in our understanding of sexual strategy and the development and maintenance of sexual relationships. It is with this background that we go on to consider more recent theories in the study of sexual strategy, those being the theories proposed by Gross (1996), Conditional Mating Strategies, and Gangestad and Simpson, “Trade Offs and Strategic Pluralism” (2000).

5. Conditional Mating Strategy, Trade-Offs and Strategic Pluralism.

Until the turn of the century, research into evolutionary explanations for mating and parental behaviour had been dominated by Trivers' Parental Investment Theory (1972), and by Buss and Schmitt's Sexual Strategies Theory (1993). The former clarified the reasons why males and females pursue differing reproductive strategies, explaining why females tend to be more discriminating than males, both when choosing mates and in their sexual behaviour. The latter put the flesh on the bones with respect to human mating strategies, extending much of the work initiated by Trivers and providing a wealth of empirical support for the research hypotheses. However, and as Buss himself highlighted, Sexual Strategies Theory has focused primarily on sex differences in sexuality, with the shared features of human sexuality being largely disregarded (Buss, 1998). In addition, Sexual Strategies Theory has paid little attention to individual differences within sex, which, it has been argued, may be greater than between sex differences (Gangestad and Simpson, 2000).
More recent work by Gangestad and Simpson (2000) took up the gauntlet laid down by Buss. Sexual Strategies Theory showed that males, more than females, tend to pursue a short-term mating strategy when possible, and that females more than males a long-term strategy. However, it also acknowledged that both sexes pursue mixed strategies involving both long and short-term matings. Gangestad and Simpson extended this theory to investigate how mixed strategies may be dependant upon environmental cues, and how this accounts for the great variation within both sexes (Gangestad and Simpson, 2000). What drives decisions about mating strategy, they argue, at either the conscious or the subconscious level, would have been an assessment of the "Trade Off" between costs and benefits of pursuing either strategy.

5.1 Benefits, Costs and Trade Offs.

For many years adaptations have largely been considered in terms of the benefits that they confer upon the individual. Primary consideration is given to the adaptive functionality of mechanisms, both structural, physiological or psychological, often with little consideration of its associated costs (except, of

course, when such adaptations bestowing reproductive advantage carried a cost in survival terms, the peacock's tail being the prime example; Cronin, 1991). However, due consideration must also be afforded to the costs attached to such adaptations. Surviving, reproducing and rearing offspring is a costly enterprise involving time, energy and effort. Importantly, effort expended in one area might have been employed elsewhere (a concept known as "opportunity costs"). For example, an individual engaging in parental effort must weigh up the benefits (increased survival chances of offspring) against potential costs (lesser opportunity to devote to extra-pair matings). So as Gangestad and Simpson (2000:576) state, "a fundamental goal of evolutionary analysis is to specify the cost-benefit "trade-offs" that led individuals to allocate their time, energy and effort to activities in ways that increased their ancestor's inclusive fitness".

The example above is an important one in considering human mating strategies. According to Trivers (1972) parental investment may be defined as any investment in ones offspring which at the same time reduces the available resources (time, energy or effort) to invest in other, including future, offspring. Implicit within this definition, therefore, is a trade-off. Whilst an individual expends time and energy investing in existing offspring, he is increasing the survival probability of that offspring. However, he is also reducing his investment potential in other offspring. He might, for example, be expending this time, energy and effort in short-term matings with the potential for future reproduction that such a strategy might afford. As Gangestad and Simpson put it, "Costs include the lost benefits of potentially productive yet foregone activities" (2000: 577).

Importantly, the fitness gains arising from multiple matings for females is negligible. Females can only produce one child as a result of sexual intercourse (save for the occasional multiple birth), foreclosing other productive mating opportunities for a minimum of nine months. A single act of intercourse for males, on the other hand, presents no such future restriction on further reproductive potential. Thus it may make little sense for females to expend energy in multiple matings, whereas there are clear fitness gains for males in

investing a greater proportion of their time and energy in pursuing mating opportunities. Thus trade-offs are implicit in the hypothesis that male and female reproductive strategy should be different. However, it is also expected that males and females should differ from their conspecifics in the balance of the trade-off that they make between parental investment and mating – and these differences will arise as a result of environmental cues.

5.2 Conditional Strategies.

Recent theoretical and empirical work has begun to recognize the importance of such trade-offs, and their impact on mating strategies (Gangestad and Simpson, 1993). Further, it is now acknowledged that the environmental context and its influence over mating trade-offs means that there can be no one best mating tactic for males or females. Rather, the 'best' strategy is contingent upon context. These are known as conditional strategies.

According to Gross (1996) conditional strategies must satisfy five main criteria as follows:There must be a choice of different behavioral tactics. These choices are made (at either the conscious or the subconscious level) as a result of environmental cues or features. The environmental cue is frequently the attractiveness or status of the individual relative to others, and the resultant impact on his mate value. Next, all individuals must be genetically designed to enact the same behaviour given identical cues (a concept known as genetic monomorphism). *Alternate* conditional strategies require the same behavioural tactics as a response to the same cues, but with the allowance for a difference in the conditions under which the behavioural tactic will be enacted. (For example, a conditional mixed mating strategy may allow a male in a long-term partnership to engage in an extra-pair mating if his primary mate has been absent for a period of time. An *alternative* conditional mixed mating strategy would allow differences in the time limit elapsed before extra-pair matings would be pursued). Next, except at a crossover point, there must be different adaptive values to the different behavioral tactics. Lastly, the chosen behavioral tactic must yield greater fitness benefits than the alternative tactics.

Different males will therefore find that different tactics are appropriate in different contexts, and these tactics should normally be continuously distributed (i.e. most males will exhibit a balance between mating and parental effort. Non-continuous distribution occurs, unusually, when certain males invest all of their time in mating effort and none of it in parental investment, or vice versa).
It is worth noting at this point that genetic monomorphism (or the genetic blueprint to enact the same tactics under identical situations) is central to the concept of Conditional Mating Strategies. Behaviour will vary according to the environmental cue. However, that is not to say that genetic polymorphism does not exist and does not drive alternate strategies (genetic polymorphism being when two or more clearly different phenotypes exist in the same population of a species, an excellent example of such being sexual dimorphism). In other words, differing tactics may be enacted as a result of genetic polymorphism, independent of environmental context. It is the former, however, which is of interest when considering trade-offs and strategic pluralism.

So what are the contexts, the environmental cues, which will influence mating tactics for males and females? According to the Strategic Pluralism model, the proportion of effort an individual male will commit to short-term mating strategies will be contingent upon how well he can meet the short-term mating requirements of females. Thus female choice dictates male strategy. According to Gangestad and Simpson (2000), females' short-term preferences should have been influenced by Good Genes Sexual Selection (or GGSS).

5.3 Good Genes Sexual Selection

Good Genes Sexual Selection can explain how females from many species choose their mates, especially when there is little or no bi-parental involvement. According to such models, females have evolved to prefer indicators of good condition and viability, or markers of heritable fitness, that might be passed on into the next generation, thus proffering survival and reproductive advantages to the offspring. Variance in heritable fitness must be inferred as there are no infallible markers of fitness. This must operate through honest signaling (Zahavi, 1975). An attribute can remain an 'honest marker' when those individuals who

are more susceptible to pathogenic disease, or who have sufficiently deleterious alleles, are unable to maintain or develop the attribute due to the prohibitive costs involved. Only those who are less susceptible to pathogens and have few deleterious alleles will be able to develop or maintain the marker.

Arguably one of the best existing markers or advertisements of heritable fitness is Fluctuating Asymmetry (FA). FA, defined as the random difference between two sides as opposed to the sometimes deliberate differences in some species, can be a sign of instability, either in embryonic development or, indeed, over the lifespan of the individual, and is partly heritable (Thornhill and Moller, 1997). It has been the subject of a vast amount of research, with meta-analyses showing that greater FA is associated with poorer survival, slower growth and reduced fecundity (Thornhill and Moller, 1997). Bilateral symmetry, as a marker of heritable fitness, should, therefore, confer increased mating success. And this is, indeed found in a number of research studies. For example, more symmetrical European barn swallows “are the main beneficiaries of extra-pair mating, yet they do not provide material benefits that enhance the reproductive success of their female mates” (Moller, 1994).

There is now considerable research to suggest that humans, too, use FA as a marker of heritable fitness (and therefore that humans also use GGSS as a means of mating strategy). For example, Thornhill and Gangestad (1994) showed that more symmetrical males had more lifetime partners than asymmetrical males. Conversely, as there is no advantage for females in seeking increased number of lifetime partners (Trivers, 1972), no difference between symmetrical and asymmetrical females was expected and none has been found (Sharma, Frisch, Schulz, Gangestad and Thornhill, 1997). Similarly, research shows that females’ olfactory preference for males’ scent tends to favour the scent of more symmetrical males (Gangestad and Thornhill, 1998). Interestingly the same study found that neither social status nor resources predicted extra-pair mating.

It should also be noted that FA is correlated with attractiveness which is consistent with the notion that if perceptions of attractiveness evolved as a

product of GGSS, attractiveness should also be correlated with such markers of heritable fitness. A number of studies have investigated this hypothesis, and have generally found small but significant correlations (Scheib, Gangestad and Thornhill, 1999). However, the expected correlations between female FA and attractiveness have not been found – an unexpected finding which warrants further investigation (Gangestad, Thornhill and Yeo, 1994).

It has been argued (Kirkpatrick and Ryan, 1991) that more symmetrical males might experience greater success in short-term matings as a result of other advantages conferred through greater viability. For example, it is likely that more symmetrical males accrued greater material benefits and were more successful in intra-sex competition than less symmetrical conspecifics. However, this should be argued with caution. For example, Baker and Bellis (1995) conducted research into the female orgasm and the symmetry of their partner, and found that females had more orgasms, and more importantly, more high sperm retention orgasms, the more symmetrical their partner. As Gangestad and Simpson point out, these findings are consistent with GGSS. They are also difficult to explain by any other theory.

Further evidence for GGSS may be gathered from self-reported female preferences for characteristics in a long or a short-term partner. Contrary to the conclusion reached in Sexual Strategies Theory (that females use short-term matings primarily as testers for long-term matings), some empirical evidence suggests that females place greater emphasis on attractiveness in short-term matings (Buss and Schmitt, 1993) and for extra-pair matings (Scheib, 1999).

5.4 The importance of good genes to Strategic Pluralism and adaptive variation in male mating tactics.

Strategic Pluralism argues that mating strategy should be contingent upon contextual cues. It also argues that where possible males will pursue a short-term mating strategy. However, their success will be dependent upon their ability to satisfy the short-term mating preferences of females, and hence will be contingent upon his ability to demonstrate heritable fitness and viability through

such honest markers as bilateral symmetry. For this reason, those males able to demonstrate genetic fitness through honest signaling should be more successful in short-term mating. The trade-off for females will be reduced effort in child rearing. Conversely, males less able to demonstrate heritable fitness should invest more heavily in long-term partnerships and increased parental investment in order to attract partners.

5.5 Strategic Pluralism and female mating tactics.

Strategic Pluralism suggests that males of high genetic fitness should be less willing to provide the material benefits (in terms, potentially, of long-term commitment and parental investment) than their conspecifics of lower genetic fitness. Male trade-offs are therefore between short-term mating effort and long-term parental investment. Therefore females seeking genetic benefits might have to trade off long-term commitment for a short-term or extra-pair mating. In addition, should she attract a long-term mate of higher genetic fitness, she might have had to have traded the material benefits. Conversely, females seeking increased material benefits might have to trade-off such gains against genetic benefit, by refraining from short-term or extra-pair matings. Female trade-offs are therefore between genetic fitness and mate investment, and it is these that the female must weigh up producing the variation in female mating tactics.

Empirical research supports the hypothesis that females who seek high genetic fitness should be more open to short-term mating. For example, Simpson and Gangestad (1992) conducted two experiments, the first showing that more ‘restricted’ females (i.e. females who are less willing to have short-term matings) are less interested in a man’s physical appearance than less restricted females, and the second showing that when given a choice between a partner who is attractive but less loyal or less attractive but more loyal, less restricted females chose attractiveness over loyalty, whereas more restricted females chose loyalty over attractiveness.

If the trade-off for females, therefore, is a choice between increased genetic fitness with lower investment, or higher investment but decreased genetic fitness, the environment in which she makes her choice will be a vital element of the decision making process (again, perhaps, at a subconscious level). So, if bi-parental care was critical for the survival of offspring, females should have favoured investment more strongly than genetic quality. Conversely, if the environment in which the mother was raising her offspring was heavy with pathogens, genetic fitness should have taken precedence. Thus trade-offs should have been contingent upon specific environmental conditions, and these decisions might therefore have differed both within populations and between them.

A number of studies exist supporting the thesis that females should prefer males of high genetic quality in environments where pathogens were widespread. Firstly, Gangestad and Buss (1993) collected data from 29 countries, including preference for attractiveness (as discussed under GGSS, 5.3) and pathogen pressure at each location. As predicted, both males and females were more likely to rate attractiveness highly in high pathogen environments. In these locations females were also more likely to trade off indicators of investment, e.g. dependable character, emotional stability and maturity etc (Gangestad, 1993) as well as the preference for exclusive male investment – a factor evidenced by degrees of polygyny and pathogenic prevalence (Low, 1990a)

Evidence supporting the thesis that females should prefer males who are prepared to invest more when bi-parental care is crucial (particularly when a female's access to personal resources is low) also comes from a number of sources. Firstly, female control of resources should reduce the need for parental investment, and this has been found when looking at the prevalence of polygynous societies, polygyny being more common the greater the access to personal resources (Low, 1990b). Furthermore, research shows that females are more interested in extra-pair mating as their personal resources increase, suggesting that they become more interested in genetic fitness and less in investment in this situation (Gowaty, 1992, though note the conflicting findings

of Ellis, 2000). Furthermore, female preference for attractiveness has been found to be positively correlated with the proportion of females participating in the economy (Buss, 1989). Additionally, female preference should influence male mating behavior – when bi-parental investment is crucial, males should expend greater effort on parenting investment and less on short-term mating. Conversely, when bi-parental investment is less crucial, an increase in short-term mating effort should be seen, even with those males of lower genetic quality. There is currently little empirical evidence available to either support or refute this hypothesis.

Lastly, but importantly, it should be noted that market value also has an impact on human mate choice. For example, Pawlowski and Dunbar (1999b) argue that market value as a partner is relatively straightforwardly determined by age-specific factors, for females related to fecundity, and for males related to income and future survival -the lower the market value, the lower the demands that are placed on potential partners. Thus whilst trade-offs remain important regarding preference, mate value must also play a part when making mate choices.

5.6 Conditional Mating Startegies and the empirical studies of this thesis.

The model of mating proposed by Gangestad and Simpson (2000) has therefore addressed many of the questions left open by Sexual Strategies Theory. However, whilst much has been achieved, it is acknowledged that there is still much to do (Buss, 1993; Gangestad and Simpson, 2000), both with respect to investigation into between-sex similarities and investigation into individual differences, or intra-sex differences, and mating strategies. This thesis attempts, in a very modest way, to address the latter. It therefore aims to investigate individual differences in the way that sexually relevant characteristics (for example, beauty in females and good genes in males) influence a variety of psycho-physiological and psychological variables, at a conscious or a subconscious level, in order to address opposite sex mate preferences. In other words, this thesis considers, primarily, various products of genetic monomorphism, by considering the various behavioral strategies made,

at either the conscious or the subconscious level, as a result of environmental cues or features.

How these studies are to be conducted, from a broad methodological perspective, forms the basis of the next chapter.

6 Research methodologies in Evolutionary Psychology

Empirical research into evolutionary explanations of psychology may be conducted via two, distinct methodological strategies. These are variously known as top down, theory driven (Buss, 1999) or predictive methodology (Ferguson, 2002), and, in contrast, bottom up, observation driven (Buss, 1999) or explanatory methodology (Ferguson, 2002). This chapter begins with a critical examination of both, before setting out the methodologies employed in this research.

6.1 Theory Driven or Predictive Methodology.

Theory driven or predictive analysis begins either with an existing theory or with a particular adaptive problem that would have been faced during our EEA. It then predicts the types of psychological mechanisms that might have evolved to solve such a problem. Such predictions would then be tested, and the empirical results evaluated. Directional analysis is, therefore, from the general to the specific.

Such is the sort of heuristic research that has been carried out on a very large scale over the last twenty years, the largest of such being the IMS project, as discussed in Chapter 4. In this study, Buss (1999) identified the distinctive reproductive problems faced by both males and females in their EEA, and derived specific testable hypotheses from these adaptive problems. For example, Buss reasoned that ancestral males would have faced reproductive dilemmas regarding the issue of paternity uncertainty. In order to protect against this eventuality, it could be hypothesised that males should have developed stronger feelings of jealousy in the face of sexual infidelity than females. On investigation it was demonstrated that males do, indeed, experience greater distress over the thought of *sexual* infidelity in their partner than females, and, indeed, females, experience greater distress over the thought of *emotional* infidelity in their partner than males (Buss, Larsen, Westen and Semmelroth, 1992; Todd, Shackleford, Buss and Bennett, 2002).

Predictive strategies are therefore useful in providing frameworks for the guidance of research in specific, non arbitrary directions. They may also be used in conjunction with other existing fields of research, including evolutionary biology, thus providing corroboration for the evolved nature of psychological mechanisms whilst also supporting the growing desire for conceptual integration in the behavioural and social sciences. And perhaps most importantly for the acceptance of evolutionary psychology as a valid and scientific discipline, predictive strategies answer the accusation of post hoc story telling. As Barkow et al point out, “The researcher has predicted in advance the properties of the mechanism” (1992:11).

Nevertheless, such strategies are not without their problems. They rely, for example, on an appreciation of the adaptive problems faced by our ancestors living in an environment very different from the environment we live in today. Although much is known about how life was lived as a nomadic, hunter-gatherer, it is difficult to be certain *exactly* what problems our ancestors faced. It is also important to be sure that there is no circularity of argument. For example, to base predictions about male distress regarding sexual fidelity on sound functional reasoning, and not on the observation that males appear to be more distressed about sexual infidelity than females, as the latter results in mere proof of what has been observed, without basis in evolutionary principle.

6.2 Observation Driven or Explanatory Methodology.

An alternative to predictive methodology is an explanatory methodology. Such research begins with a psychological observation which appears to be both universal and useful. Hypotheses are then constructed regarding the possible adaptive problems such a psychological mechanism might have evolved to overcome. Directional analysis is, therefore, from the specific to the general. By conducting research in this way it is possible to explain *why* certain observable phenomenon exist and what they do.

A good example of this sort of research has been provided by Profet (1992) in her research into pregnancy sickness (or the collection of symptoms including

nausea, vomiting, food aversion and olfactory sensitivity during the first trimester of pregnancy). Profet amassed a range of empirical evidence regarding the nature of pregnancy sickness – that it appears to be cross cultural (Fessler, 2002), that it occurs during organogenesis, or. the period during which all the major organ systems and limbs are formed (Eskes and Nijdam, 1984), that the foods pregnant females find repugnant seem to be those carrying the highest doses of toxins e.g. meats (Fessler, 2002), and vegetables like brussel sprouts, cauliflower and cabbage which contain the carcinogen allylisothiocyanate (Buttery, Guadagni, Ling, Seifert, and Lipton, 1976), that those who experience pregnancy sickness are at a lower risk of spontaneous abortion than those who experience no pregnancy sickness (Profet, 1992) and so on. She concluded that “pregnancy sickness exhibits many features of an adaptive design to deter maternal ingestion of teratogens” over a period of time which coincides with greatest embryonic vulnerability to teratogens (i.e. any agent or substance that can cause damage to the foetus). (1992:354).

Explanatory methodology, however, is also not without its problems. For example, the observation of behaviour as a starting point can be misleading as behaviour is not driven wholly by genetic drives. The environment, too, plays a significant role in the choice of behaviour employed to solve a particular adaptive problem. Mating strategies, for instance, will vary according to mate availability, opportunity and many other contextual effects as discussed in Chapter 4. In other words, phenotypic differences may arise not as a result of genetic difference, but as a result of environmental input.

Furthermore, behaviours which may not appear to be adaptive in the novel environment may have been adaptive during their EEA. For example, a preference for fatty foods may well have been advantageous when fats were always in short supply (Nesse and Williams, 1995). However, a preference for fatty foods in today’s environment of easy availability and reduced exercise is no longer advantageous. Lag time therefore creates difficulties in observing present day behaviour as a starting point for evolutionary research due to the potential for the changed environment to influence the functionality of the behaviour observed.

It should also be recognised that not all behaviours, preferences etc are necessarily the result of adaptation. Occasionally, beneficial traits or features occur as a result purely of by products, or ‘spandrels’, of an actual adaptation (Gould and Lewontin, 1979). In other words, these traits or features do not serve an adaptive purpose and are not therefore functionally ‘designed’. Nevertheless, if they confer benefits to the individual, it may be that they are subsequently selected for, and these then, arguably, become adaptations in their own right (Grafen, 1997).

Lastly, an over reliance on observation driven methodology should be avoided in order to quell the familiar criticism of evolutionary research – the accusation of ‘just so’ story telling. It is proposed, therefore, that an eclectic approach to evolutionary research is best placed to address the limitations of pursuing any one approach. For example, one might start with a recognised phenomenon from which evolutionary explanations can be posited (i.e. an explanatory approach). Predictive methodology may then be integrated in a number of ways – through ethnography, through the comparison of male and female responses and preferences, through the comparison of individuals within a species between age groups, socio -economic status (SES), cultures and so on, and through experimental research. Triangulation is useful, therefore, in providing corroborating evidence for evolutionary hypotheses.

6.3 The problem with evolutionary research methodologies.

There are, of course, many who are opposed to an evolutionary approach to understanding human psychology. Much of this is based on misunderstandings tied up with political and social concerns, and the misconception that evolutionary psychologists are either advocating a moral viewpoint, or that they support the view that human behaviour is genetically determined. This is not necessarily so. Nevertheless, it is incumbent upon evolutionary psychologists to satisfy the genuine concerns of potential critics by addressing a number of concerns. For example, they must ensure that evolutionary explanations are either consistent with or are as good as explanations offered by other

disciplines. This must be achieved empirically, and not through force of argument or personal conviction. Quantitative data must be supportive of the hypotheses proposed. Circularity must also be avoided, both through careful consideration and through triangulation of studies both within and across disciplines.

The evolutionary psychologist must also be aware of the Popperian demarcation between science and non-science. According to Popper (1980), all hypotheses must be capable of being empirically tested and subject to the possibility of falsification. A theory can never, therefore, be fully verified as it is always possible that some future observation may yet contradict it. This, the falsification principle, is at the heart of a hypothetico-deductive approach. For this reason, many reject the notion of a theory based on observation (our explanatory methodology) as unscientific. Nevertheless, there is hope for the evolutionary psychologist yet.

Cook and Campbell (1979) offer a view on scientific epistemology which is more in line with the nature of research carried out by social scientists as opposed to the pure scientists. They argue that as many important facets of psychological research cannot be measured in the manner required adopting a positivist epistemology; a less stringent approach is justifiable. This post- positivist approach has been called critical realism, and it argues that the purpose of science is to try to understand the world through a variety of means. It specifically advocates the pursuit of triangulation and it argues that the positivist deductivist approach is inadequate. Scientific knowledge is better achieved through both deduction (predictive methodology) and induction (explanatory methodology), or in other words, by combining both explanatory and predictive methodologies.

The following chapters provide the empirical corpus of this thesis, offering, it is believed, a mix of methodologies appropriate to the research question, but with full consideration given to the advantages of a triangulated, post-positivist approach.

7. The gay and straight male: Are gay males more attractive?

7.1 Synopsis

The first of the empirical studies into human sexual strategy and intra-sex differences investigates homosexuality from an evolutionary perspective and offers a putative explanation for at least one sub type of homosexuality. It argues that a genetic trade off may be made through a combination of genetic linkage and female advantage outweighing male disadvantage (i.e. sexual antagonistic theory). As a result it is argued that females carrying the homosexual gene are more attractive (probably through being more feminised) than those not carrying the gene. These females are therefore more reproductively successful than females not carrying the homosexual gene. This would also be true for males, though their reproductive advantage through being more attractive (feminised) is negated by their limited desire for sexual relationships with females. Results indicate that male homosexuals are, indeed, rated more highly for attractiveness and less highly for aggressiveness, suggesting that the male homosexual has a more feminised phenotype than the male heterosexual.

7.2 Literature Review

For evolutionary psychologists same sex sexual orientation has long presented an evolutionary conundrum. As McKnight (1997) rightly points out, through natural selection those individuals who carry genes which disadvantage them in terms of survival or reproduction over their conspecifics will be gradually eliminated from the gene pool, leaving behind those who are now our more reproductively successful ancestors. So, if we can accept that at least some sub-types of homosexuality have a genetic basis (a question to be considered shortly), how can homosexuality have survived the passage of evolutionary time, when by its very nature homosexuality should produce fewer offspring than heterosexuality? This is returned to under section 7.2.3.

Before considering the existing theoretical and empirical arguments for a genetic basis of some forms of homosexuality, however, clarification on a number of points is worthwhile. Firstly, in order to reflect a more biological aetiology, this study proposes to adopt the term sexual orientation as opposed to sexual preference (as discussed more fully in Appendix a - i). It is also worth considering how we measure sexual orientation, an issue more fully addressed in Appendix a - ii. Lastly, it is important to be aware of and consider the various and many theories surrounding the aetiology of homosexuality, (as more fully discussed in Appendix b - i), as well as research on the putative genetic links between attractiveness and beauty (as more fully discussed in Appendix b - ii).

7.2.1 The Darwinian Paradox: Evolutionary explanations of male homosexuality

As we have said, a theory explaining the aetiology of homosexuality has arguably presented the biggest challenge for evolutionary psychologists. After all, natural selection should have been ruthless in weeding out any genes which represent a disadvantage in terms of reproduction. One potential and recurring explanation is that of Kin Altruism (Wilson, 1975), which argues that if homosexuals invested heavily in genetic relatives, this might offset the costs incurred through their own lack of reproduction. However, there is no empirical evidence to support this hypothesis. In fact it has been shown, conversely, that heterosexual males are more likely to provide for siblings (and by implication their offspring) than homosexual males, a fact possibly explained by greater familial estrangement particularly with fathers and elder siblings (Bobrow and Bailey, 2001).

Alliance formation has also been offered as a potential explanation, that being the idea that homoerotic behaviour between males boosted alliances which favoured younger males, “reinforc[ing] alliances that contributed directly to male survival [through a higher status] and indirectly to male reproduction [through greater sexual access to females]” (Muscarella, 2007: 275). Again, however, empirical evidence is not forthcoming. There appears to be no evidence that homoerotic behaviour is more successful in terms of forming alliances than

same sex non-sexual alliances, which are, indeed, the predominant form of alliance formation. Furthermore, there is no evidence to suggest that such formations improve status, and hence also that they improve sexual access to females.

Perhaps a more convincing hypothesis comes in the form of the overdominance theory, otherwise known as heterozygote advantage, in which the phenotype (or the observed expression of an organisms' genotype) of the heterozygote is fitter than the phenotype of either homozygote. Simply speaking alleles (versions of a gene) encode for alternative versions of the same inherited characteristic. So, for example, there is a gene that controls for eye colour, but the actual eye colour will depend upon the combination of alleles. For each of these inherited characteristics an organism inherits two alleles, one from the mother and one from the father. It is these which may be homologous (e.g. RR or rr) or heterozygous (Rr or rR). In terms of overdominance and homosexuality, the argument is that offspring carrying one 'homosexual' allele (let's call it Hh) may be more reproductively successful than those who are homozygotic (either HH or hh) for that condition.

Alternatively, sexual anatagonistic theory may provide an explanation for a biological basis for sexual orientation. The theory posits that traits that are advantageous to one sex may be deleterious to the other. In this case, genes may provide fitness gains for females but fitness losses for males. The fitness gain in the females would ensure that their offspring would be over represented in the next generation to such an extent that this would counteract the reproductive loss associated with male homosexuality. There is, in fact, some empirical evidence to support this possibility with research showing female maternal relatives of homosexual males having higher than average reproductive fitness (Corna, Camperio-Ciani and Capiluppi; 2004). Furthermore, this research has also been supported in a recent study which showed elevated reproductive fitness in both maternal aunts of white homosexuals and all female maternal relatives of non-white homosexuals (Rahman, Collins, Morrison, Orrells, Cadinouche, Greenfield and Begum, 2007). Nevertheless, whilst this may account for male homosexuality, it cannot, by definition, account for both

male and female homosexuality. As there is, without doubt, some genetic influence over female homosexuality, albeit at a lower level of incidence than for males, this may weaken the argument.

7.2.2 Genetic modelling of homosexuality.

Support for the above hypothesis comes, nevertheless, from a recent theoretical paper which uses population genetic modelling to explain how a gene predisposing an individual to reduced reproduction could remain resistant to the forces of natural selection (Gavrilets and Rice, 2006). By looking at a single gene with two alleles Gavrilets and Rice examined the evolution and frequency of these alleles in a large population and concluded that both overdominance (heterozygote advantage) and sexual antagonistic theory (advantage for females outweighing disadvantage to males) could lead to a stable population when the homosexual gene is located on either autosomes (non-sexual chromosomes) or on the X chromosome. However, genetic modelling did not support the Kin Altruism theory, that being the theory posited by Wilson (1975) discussed earlier. Of overdominance versus sexual antagonistic theory, Gavrilets and Rice find marginally in favour of the latter, though they admit that it is too early to be sure.

Pursuing a similar idea, it may be possible that genetic linkage could provide some explanatory input (genetic linkage being the process by which alleles for genes are inherited jointly). Perhaps the allele for homosexuality is linked to another, reproductively advantageous, allele? And perhaps, for example, this allele was instrumental in enhancing the attractiveness of the individual. If that were the case those carrying the gene for same sex sexual orientation may, through linkage, also be more attractive. Whilst this would not be reproductively advantageous if the bearer of the linked alleles were to exhibit a homosexual phenotype, carriers of the homosexual allele who were did not exhibit the homosexual phenotype would have been advantaged by increased attractiveness over and above those who did not carry the linked genes. (See Appendix b - ii for a more comprehensive discussion of the link between genes and attractiveness).

7.2.3 The Hypothesis

In trying to explain sexual orientation from an evolutionary perspective it was postulated that there might simply a link between homosexual orientation and attractiveness as a partner. Might homosexual male faces, indeed, be more attractive? And if so, how would this impact on evolutionary explanations of same sex sexual orientation?

One possible genetic mechanism is proposed here, though it is offered as a possibility only. There may be other, better explanations. However, we shall make a number of assumptions:

1. The homosexual gene(s) is linked to a gene(s) for attractiveness of the phenotype. (We shall call them a gene from now on for the sake of simplicity, though it is highly likely that there is more than one gene involved).
2. The homosexual gene is recessive. Thus heterozygotes carrying the gene will not be homosexual.
3. The attractiveness gene is dominant. Thus heterozygotes will be more attractive than the homozygotes not carrying the 'attractiveness' gene.
4. The gene for homosexuality is carried on the X chromosome (perhaps Xq28). Then:
5. Males could be:
    i) Homozygous for the propensity for homosexuality / attractiveness
    ii) Homozygous not carrying the genes.
    iii) As they cannot have two X chromosomes they cannot be heterozygous for the condition and hence they cannot be more attractive but not homosexual.

    Females, on the other hand, could be:
    iv) Homozygous not carrying the genes (and therefore not more attractive)
    v) Heterozygous (and hence more attractive with sexuality unaffected)

vi) Homozygous carrying these genes (and therefore, like males, carrying a predisposition towards enhanced attractiveness and potentially sexuality affected).

Figure 2 Examples of possible inheritance of X linked genes (denoted by ^{A}, where ^{A} indicates presence of the dominant gene for attractiveness and the recessive gene for homosexuality)

1) Affected father X^AY XX

may produce: X^AX X^AX YX YX

i.e. 2 more attractive daughters, sexuality unaffected

2) Affected mother XY X^AX

may produce: X^AX XX YX^A YX

i.e. 1 more attractive daughter, sexuality unaffected and 1 more attractive, homosexual son

3) Both parents affected X^AY X^AX

may produce: X^AX^A X^AX YX^A YX

i.e. 2 more attractive daughters, with sexuality potentially affected in one, one heterosexual son and one more attractive, homosexual son.

So: a) of six sons - two will be both more attractive and homosexual, four will be unaffected.

b) of six daughters – five will be more attractive with sexuality unaffected, one will be more attractive with sexuality potentially affected and one will be unaffected.

The question regarding the effect of the ‘homosexual’ gene on female sexuality is unclear. It may be that the carrying of the homosexual gene has the potential to ‘switch’ sexual orientation from heterosexual to homosexual preference. In this case, female carriers of such homozygous genes would be predisposed to become homosexual. Alternatively, carrying the gene may have the potential,

as with males, to feminise sexual choice, producing “ultra-females”. If this were the case, these females might be more inclined than the average woman to want sex with males. Further research would be useful in this respect.

Nevertheless, the main hypothesis, as just set out, accounts for a number of factors. Firstly, it accounts for the proposition posited by sexual antagonistic theory that females should have a reproductive advantage, a theory borne out in the evidence as earlier discussed (Camperio-Ciani et al, 2004; Rahman et al, 2007; Gavrilets and Rice, 2006). This would be achieved through their increased attractiveness, and also, potentially, through the increased interest in sexual relationships with males. Secondly, it accounts for the putative positioning of the homosexuality gene on the long arm of the X chromosome (Turner, 1995). Thirdly, it *may* account for female homosexuality, and furthermore at the reduced incidence widely accepted (Janus and Janus, 1993; Mosher, Chandra and Jones, 2005). However, it cannot account for the surety of homosexuality in either those males or those females presenting that gene. There is, almost without doubt, an environmental element necessary for this gene to be activated, as discussed earlier.

This research, therefore, seeks to investigate the possibility that homosexual males are perceived to be more attractive to both sexes than their heterosexual conspecifics. It also seeks to investigate the possibility that homosexual males are perceived to be less aggressive to both sexes than their heterosexual conspecifics as a psychological by-product of a possible feminisation effect.

7.2.3.1 Experimental hypotheses.

1. It was predicted that there would be a significant difference in the ratings of attractiveness of the averaged homosexual male and the averaged heterosexual male, with the homosexual male face being perceived as more attractive by both male and female raters.

2. It was predicted that there would be a significant difference in the ratings by females of attractiveness of the averaged homosexual male and the

averaged heterosexual male, with the homosexual male being perceived as more attractive.

3. It was predicted that there would be a significant difference in the ratings by males of attractiveness of the averaged homosexual male and the averaged heterosexual male, with the homosexual male being perceived as more attractive.

4. It was predicted that there would be a significant difference in the ratings of aggression between the averaged homosexual male and the averaged heterosexual male, with the homosexual male being perceived as less aggressive by both male and female raters.

5. It was predicted that there would be a significant difference in the ratings by females only between the averaged homosexual male and the averaged heterosexual male, with the homosexual male being perceived as less aggressive.

6. It was predicted that there would be a significant difference in the ratings by males only between the averaged homosexual male and the averaged heterosexual male, with the homosexual male being perceived as less aggressive.

7.3 Methodology

7.3.1 Design

This experiment used a quantitative questionnaire methodology. A repeated measures design was applied, asking the same participant group to rate an averaged photograph of homosexual males against an averaged photograph of heterosexual males for aspects of attractiveness and perceived aggression.

7.3.2 Materials

In order to create the stimulus material 13 self-labelling homosexual males and 13 self-labelling heterosexual males were approached for their photographs. As the homosexual group were predicted to be the more difficult to find they were the first to be sought. In order to achieve the best matched group possible, a larger number of heterosexual photographs were taken (23 in total) and then the 13 who were closest in age to the homosexual participants were chosen (M age 23.93 and 22.93, and S.D. 5.81 and 4.57 respectively). It was important, particularly in view of the aim of the study to rate the attractiveness of both images, to ensure that the same number of participants were averaged in both the homosexual and heterosexual groups. This is because the greater the number of participants averaged together, the more attractive the image can become, as the image both becomes increasingly symmetrical and individual anomalies (potentially indicative of developmental instability) are lost (Mealey, Bridgstock and Townsend, 1999; Simmons, Rhodes, Peters and Koehler, 2004).

A potential methodological issue was, however, introduced into the final sample of homosexual males due to the difficulty in attracting participants. Although a number were found through advertising, six homosexual males were found through approaching hairdressers as this was considered to be a potential area for finding participants. This proved to be the case. However, if there were a clear delineation between “butch” (‘more male’) and “femme” (‘more female’) male homosexuals, one that is imprinted in genes or even through a physiological nature born of differences in prenatal androgen exposure or exposure to protein antibodies (as previously discussed), then the results of this study may be skewed in favour of the ‘femme’ homosexual. This is further considered under Methodological Constraints, section 7.4.4.

Once recruited, images were taken as digital colour images. Participants faced forwards and were asked to assume a neutral expression whilst being photographed. These were then transformed using the specialised software package “Psychomorph” (see appendix c for more information) into one

composite image, to create ‘stereotypical’ homosexual and ‘stereotypical’ heterosexual faces. (See Figure 3).

Figure 3 Stimulus materials created using Psychomorph 8.3: Image on left, the homosexual composite and on the right the heterosexual composite.

In order to standardise the background and the hairstyles (as the latter held socio- specific cues), Adobe Photoshop CS3 was utilised to manipulate these elements.

Presentation of the photographs was simultaneous, but positioning was alternated at each showing in order to control for the left hand bias (Nicholls, Orr, Okubo, and Loftus, 2006).

Assessment of the composite images was through a purpose written questionnaire (see appendix d and 7.3.5.1. for more statistical information). Scores were from 1 to 7 with a high score indicating positive attitude. Question 4 ("…this man looks as though he could be aggressive") was reverse scored.

7.3.3 Procedures

Male and female participants were asked whether they would be interested in participating in the main part of the study on a voluntary basis. As questions of a personal nature were asked (see appendix d) it was explained that these were an essential part of the study but that responses would be kept both anonymous and confidential. Participants were also reassured that they could discontinue their involvement in the investigation at any point, and that they could omit any questions if they felt the need to do so.

To begin, participants completed a range of demographic questions (age, sex, nationality and for females questions regarding their reproductive status – see appendix d). Participants were then shown both photographs simultaneously and asked to complete the twelve item questionnaire (six matching questions per photograph). Participants were not told the nature of the experiment until the questionnaire had been completed at which point an informal debriefing discussed the broad nature of the investigation and answered any questions the participants may have had. Participants retained an information sheet with contact details for future use if required.

7.3.4 Participants

In terms of the main study, 55 participants were recruited, of whom most were university students and a number were recruited through opportunity sampling. Twenty-one males (M age 25.19, S.D 11.25) and 34 females (M age 28.5, S.D 10.8) took part. Normality of the distribution of the ages through Kolmogorov-Smirnov analysis indicated that there was a violation of the assumption of normality for both males and females. However, this was felt to be acceptable as the trimmed means were close to the original means (24.16 and 27.78

respectively) indicating that this had not had a strong influence on the mean. A boxplot of the distribution of the ages indicated no outliers for females and four outliers for the males (three extreme, i.e. more than three box lengths from the edge of the plot). Again, however, it was decided to include these in the final analysis as they appeared to have had little impact.

7.3.5 Results

7.3.5.1 Principal Components Analysis and reliability.

The 6 items of the Attractiveness Ratings Questionnaire were subjected to Principal Components Analysis (PCA) independently, firstly for the averaged homosexual averaged photograph and then for the averaged heterosexual photograph in order to gauge how many factors were being considered. Results are reported as such with the results from the analysis of the averaged heterosexual photograph following the results from the analysis of the averaged homosexual photograph and in parentheses. Prior to performing PCA the suitability of the data for Factor Analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Keyser-Meyer-Oklin value was .77 (.6) reaching the recommended value of .6 (Kaiser, 1970) and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance .001 (.001), supporting the factorability of the correlation matrix.

Principal Components Analysis revealed the presence of two components with eigenvalues exceeding 1, explaining 57 (56) and 76 (73) per cent of the variance respectively. An inspection of the screeplot revealed a clear break after the second component. Using Catell's (1966) screetest, it was decided to retain both components for further investigation. Investigation of the Component Matrix (see appendix e) showed that the loadings for each of the items in the two components (using the Kaiser criterion) load strongly (all above .74 and .731 respectively). This supports the decision from the screeplot (see appendices h and i) to retain the two factors for further investigation.

To aid in the interpretation of these two components, Varimax rotation was performed. The rotated solution (presented in Tables 1 and 2) revealed the presence of simple structure (Thurstone, 1947) and all variables loading substantially on only one component. The two factor solution explained a total variance of 75.9% (72.9%) of the variance with Component 1 contributing 57.8% (55.3%) of the variance and Component 2 contributing 18.1% (17.6%). The interpretation of the two components was consistent with expectations and supports the decision to analyse as two separate scales.

Table 1 Varimax Rotation of Two Factor Solution for Homosexual Attractiveness Items

Item	Component 1 Positive characteristics	Component 2 Negative characteristics
GLTR	.902	
GPhysAttr	.886	
GSTR	.816	
GKind	.809	
GGoodChil	.742	
RGAgg		.922

Table 2 Varimax Rotation of Two Factor Solution for Heterosexual Attractiveness Items

Item	Component 1 Positive characteristics	Component 2 Negative characteristics
SLTR	.875	
SSTR	.831	
SPhysAttrac	.831	
SKind	.826	
SGoodChild	.697	
RSAgg		.971

To check for the reliability of the scales Cronbach's Alpha was performed on both. Good internal consistency was shown with a Cronbach alpha coefficient of .83 (Homosexual Attractiveness) and .76 (Heterosexual Attractiveness).

7.3.5.2 Group analysis to evaluate the difference in attractiveness and perceived aggressiveness ratings between the averaged homosexual and averaged heterosexual photographs.

Once the construct and reliability analyses were complete it was possible to analyse the two factors. Nonparametric tests were used because the ranking scale was ordinal rather than true ratio scale. Firstly Wilcoxen's signed rank sum test was conducted to evaluate the difference in attractiveness ratings between the homosexual averaged and heterosexual averaged photographs. There was a statistically significant difference between the homosexual scores (M=19.32, S.D. =7.52) and the heterosexual scores (M=12.66, S.D. =5.91), Z=-5.77, p<.0005, (Effect size = 1.06) indicating a significantly greater score for attractiveness for the homosexual photograph as compared to the heterosexual photograph.

Similarly, Wilcoxen's signed rank sum test was conducted to evaluate the difference in aggression ratings between the averaged homosexual and averaged heterosexual photographs. There was a statistically significant difference between the homosexual scores (M=2.35, S.D. =1.34) and the heterosexual scores (M=4.35, S.D. =1.65), Z=-5.25, p<.0005, (Effect size = -1.11), indicating a significantly lower score for perceived aggression in the homosexual photograph as compared to the heterosexual photograph.

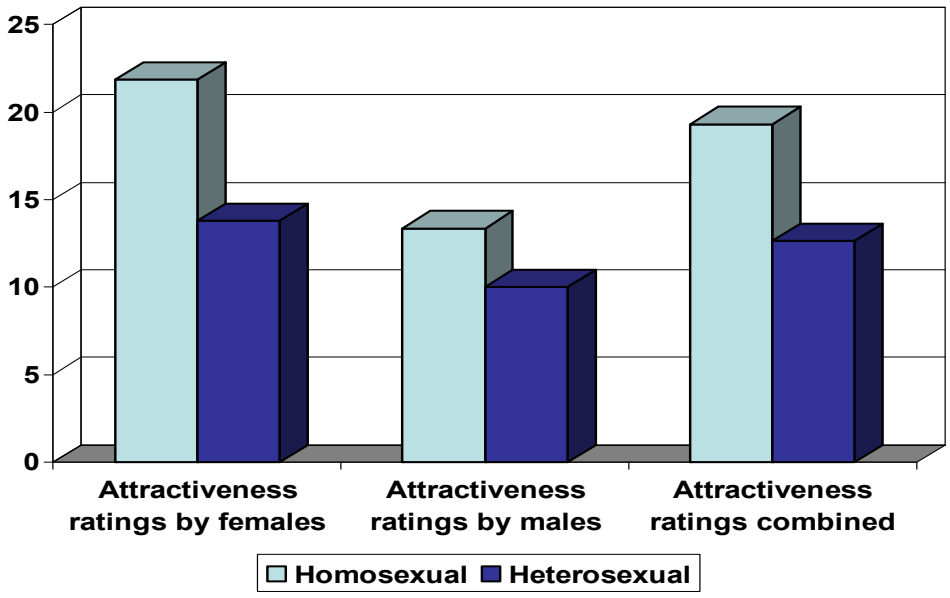
7.3.5.3 Evaluation of the difference in attractiveness and perceived aggressiveness ratings between the homosexual averaged and heterosexual averaged photographs by gender.

In order to assess whether males and females responded to the images in the same way, Wilcoxen's signed rank sum test for the same factors were carried out for each gender independently.

Firstly, Wilcoxen's signed rank sum test was conducted to evaluate the difference in attractiveness ratings between the homosexual averaged and heterosexual averaged photographs. For females there was a statistically significant difference between the homosexual scores (M=21.85, S.D. =6.76) and the heterosexual scores (M=13.79, S.D. =6.12), Z=-4.89, p<.0005, (Effect size = 1.06), indicating a significantly greater score for attractiveness for the homosexual photograph as compared to the heterosexual photograph.

For males there was also a statistically significant difference between the homosexual scores (M=13.36, S.D. =5.76) and the heterosexual scores (M=10.00, S.D. =4.51), Z=-3.09, p<.005, (Effect size = 0.63), indicating a significantly greater score for attractiveness for the homosexual photograph as compared to the heterosexual photograph. See Figure 4.

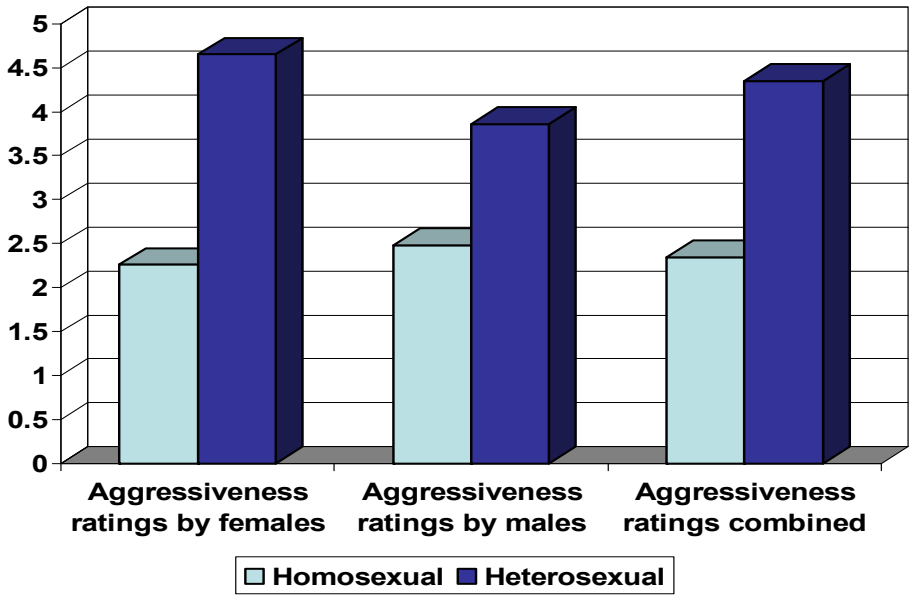
Figure 4 Bar chart depicting the ratings for males, females and combined ratings for the attractiveness of the Homosexual and Heterosexual composite images



Similarly, Wilcoxen's signed rank sum test was conducted to evaluate the difference in aggression ratings between the composite homosexual and composite heterosexual photographs by gender. For females there was a statistically significant difference between the homosexual scores (M=2.26, S.D. =1.4) and the heterosexual scores (M=4.65, S.D. =1.61), Z=-4.295, p<.0005, (Effect size = 1.25), indicating a significantly lower score for perceived aggression in the homosexual photograph as compared to the heterosexual photograph.

For males there was a statistically significant difference between the homosexual scores (M=2.48, S.D. =125) and the heterosexual scores (M=3.86, S.D. =1.62), Z=-3.22, p<.001, (Effect size =-0.87), indicating a significantly lower score for perceived aggression in the homosexual photograph as compared to the heterosexual photograph (See Figure 5).

Figure 5 Bar chart depicting the ratings for males, females and combined ratings for the perceived aggressiveness of the Homosexual and Heterosexual composite images



No statistical analysis of facial measurements *per se* was possible as each individual photograph varied in size. Nevertheless, a simple comparison of measurements from the composite photographs was possible for an indication of putative femininity. Measurements were cross-referenced with research indicating the major sex differences in facial structure and were as Table 3.

Table 3 Relative measurements of facial features for the homosexual and heterosexual composite images and relationship to masculinity.

Facial measurement	Homosexual	Heterosexual	Most masculine
Jaw breadth at mouth	11.0	11.0	No difference
Jaw breadth at widest point	12.1	12.5	Heterosexual
Eye depth – vertical from centre	1.4	1.3	Heterosexual
Brow ridge to eyelid at central point	1.4	1.2	Heterosexual
Distance between innermost point of eyes	3.3	3.4	Heterosexual
Length of chin	3.9	3.7	Homosexual
Squareness of jawline (width x depth)	12.1 x 3.9	12.5 x 3.7	Heterosexual
Nose length	4.3	4.6	Heterosexual
Nose width	3.9	4.0	Heterosexual

7.4 Discussion

The aim of this study was to investigate potential differences in the ratings of attractiveness between composite images of homosexual and heterosexual males as a possible explanation for the genetic persistence of same sex sexual orientation. Having conducted Principal Components Analysis on the purpose written questionnaire it was decided to investigate two factors independently –

an ‘attractiveness’ factor (which indicated how generally appealing the image was) and an ‘aggression’ factor.

With regard to attractiveness, the averaged image of the homosexual man was, in accordance with predictions, deemed to be more attractive than his heterosexual conspecific. When analysed by gender this also held true for female only ratings. Male only ratings also indicated a preference for the image of the homosexual male over the heterosexual male, suggesting that males are receptive to the same visual cues as females.

With regard to aggression, the averaged image of the homosexual man was, in accordance with predictions, deemed to be less aggressive than his heterosexual conspecific. Again, when analysed by gender, this also held true for female only ratings. Interestingly, and consistent with the ratings for attractiveness, male only ratings were as female ratings indicating a perception of lower aggression in the homosexual than the heterosexual image.

The results therefore support all of the hypotheses. Both males and females differentiate between the composite images of heterosexual males and homosexual males. For both sexes the homosexual image was rated as both significantly more attractive and less aggressive.

7.4.1 Homosexuality and attractiveness.

This study lends support to a biological explanation for at least one subtype of same sex sexual orientation in males. It does not offer a definitive explanation. However, the putative explanation offered earlier is supported in the findings and therefore warrants further investigation.

The evidence supports the abundance of existing research proposing a genetic element to same sex sexual orientation. (Allen and Gorski, 1992; Bailey and Benishay, 1993; Bailey and Pillard, 1991; LeVay, 1991). It also supports the proposition that the gene for same sex sexual orientation may be carried on the X chromosome (as indicated, amongst other studies, by the evidence that

sexual orientation appears to be carried down the maternal side). This may be on the long arm of the X chromosome at position Xq28 (Turner, 1995).

This study supports these positions, whilst also sitting in concordance with the genetic modelling theories of homosexuality as posited by Gavrilets and Rive (2006). Their theoretical model considers possible evolutionary explanations for homosexuality and concludes that either overdominance (heterozygote advantage) or sexual antagonistic theory (in which the female is more greatly advantaged by the presence of the gene than the male is disadvantaged) could lead to a stable population when the homosexual gene is on the X chromosome (or, indeed, on an autosome).This study suggests that both genetic linkage and the tenets of sexual antagonistic theory are elements of the story. The proposition forwarded is that the gene(s) for attractiveness is linked to the gene(s) for homosexuality. Attractiveness (possibly femininity) is carried on a dominant gene, whereas the proclivity towards homosexuality is carried on a recessive gene. Therefore, those who inherit the gene will be more attractive (environmental issues notwithstanding) than those who don't carry the gene. Dependant upon sex they will also have homosexual proclivities (i.e. males will, through carrying only one X chromosome, whereas females will only if they happen to carry two X chromosomes). Sexual Antagonistic Theory is suggested to be a factor as a result of the increased reproductive value to the female of enhanced attractiveness over the decreased reproductive value to the male of enhanced attractiveness but reduced reproductive possibilities due to lack of desire for opposite sex relationships.

7.4.2 Homosexuality and feminisation of the phenotype.

Prior research into preferences for masculine / feminine faces has been ambiguous (Johnston et al, 2001; Penton-Voak et al, 1999; 2004; Perrett et al, 1998; Rhodes et al, 2000 –see Appendix b ii for a more comprehensive review). However, the wealth of evidence appears to lend support for a strategic preference in females for masculinised or feminised male faces, dependant upon status of current relationship, temporal nature of the potential relationship and menstrual cycle. For females looking for a short-term relationship or an extra-pair mating, preference tends to be in the direction of the masculinised

face, lending support for a ‘Good Genes’ hypothesis, and consistent with Strategic Pluralism Theory (Gangestad and Simpson, 2000; see Chapter 5). In other words, females are choosing males who are fit enough to be able to bear the costs of excess androgen production and resultant immunological stress. Females are choosing healthy males for short-term relationships. Similarly, at time of peak fertility (i.e. ovulation) female preferences become more masculinised, retuning to a more feminised male face preference as fertility again reduces (Penton-Voak et al, 1999).

Why do females not prefer ‘good genes’ all of the time? One reason could be that, according to Strategic Pluralism Theory, preference for indicators of greater immunocompetence or Good Genes in males should also be an indicator of reduced parental investment. Whilst for females of high mate value this may not be too harmful, due to their greater ability to attract mates and accrue their own resources, to the low mate value female the potential cost involved in attracting a high-quality male could be disastrous. Thus she may choose to trade the promise of Good Genes for the promise of increased investment (Gangestad and Simpson, 2000; Little, Burt, Penton-Voak and Perrett, 2001). Additionally (as discussed in Appendix b - ii), there is a psychological connection between perceptions of masculinity and perceptions of negative traits including lack of empathy, warmth, co-operation and concern, and increased aggression and dominance (Perrett et al, 1998; Rhodes et al, 2000). So, in order to maximise co-operation and concord within a relationship and parental investment in offspring, females prefer the more feminised male. (Little et al, 2002). There is, then, a strategic trade-off between gene quality and investment in partnerships and offspring (Little et al, 2007).

It is possible, however, that the preference for more masculine males may be more simply explained by the natural heterosexual female disposition to be attracted to males generally, and to look for this ‘maleness’ more specifically over ovulation. However, in view of the prior research and in view of the increased perception of aggressiveness of the heterosexual composite over the homosexual composite, it would seem likely that an attribution of putative

psychological traits is, indeed, the best explanation for the changing preferences over the menstrual cycle.

The findings of this research do not indicate that feminisation is at the root of the attractiveness of the homosexual composite over the heterosexual. There may have been (or there may be) other factors such as averageness or symmetry which better explain the preference for the homosexual over the heterosexual composite face. However, the putative explanation is for phylogenetic feminisation. This is offered on a number of grounds:

In informal discussion with raters and prior to the debriefings, an overwhelming proportion mentioned the increased femininity of the homosexual composite. As a qualitative review had not been intended this is only the author's observation and further qualitative research would be useful in order to substantiate this position.

Factor Analysis of the questionnaire revealed two factors – one on positive attributes (attractiveness) and one negative (aggression). Consistent with the research which suggests that raters link feminine faces with 'feminine' attributes of kindness, empathy and so on, and not with 'masculine' characteristics including aggression, raters seem to be endowing the homosexual composite with the same attributes as the more feminine male.

As a result of the two preceding points it was decided to try to quantify the composite images for masculine / feminine features. Unfortunately it was not possible to conduct a scientific faciometric analysis of the original photographs, as to compare chin length, eye width etc would have required each individual photograph to be matched for size. This was not necessary for PsychoMorph as the software can carry out this transformation and therefore wasn't part of the original methodological requirement. However, comparison of the composite images was possible (as these were matched for size) and the results would, in the main, lend support for the homosexual composite constituting a more feminised physiognomy. This could be seen in the squarer jawline of the heterosexual composite, the lower browline and smaller eyes, narrower

positioning of eyes and larger nose in both length and breadth. The only measurement which weakened this position was chin length which was longer in the homosexual composite and which normally signifies masculinity (See Table 3). Again a faciometric study of the differential between homosexual and heterosexual faces would be usefully addressed in future research.

The preceding proposition is not in total accord with the most recent paper considering this issue (Camperio-Ciani, Cermelli and Zanzotto, 2008). There is, however, considerable agreement. Through the use of a systematic mathematical analysis, Camperio-Ciani et al (2008) argue all empirical data that is known regarding homosexuality, including data on the relative fecundity of the female line of homosexual males, may be accounted for through a genetic model involving genes on two loci, one of which is on the X chromosome. Gene expression through these genes is sexually antagonistic. They consider the proposition that male homosexuality may be (a) a product of phenotypic feminisation, or (b) a product of 'androphilia' (or the increased attraction to males in both sexes). Their conclusion is that as androphilia is more naturally consistent with sexual antagonistic theory than with overdominance, it therefore provides a better explanation than the more feminised phenotype. However, this research *has* established that the homosexual male is deemed to be more attractive, and that that attractiveness may be seen as a result of feminisation. As this present study suggests that both genetic linkage and the tenets of sexual antagonistic theory are genetic factors influencing male homosexuality (or GFMH) the argument for androphilia is diminished. Accordingly, when one considers the modelling theories of Gavrilets and Rice (2006) and Camperio Ciani et al (2008) in conjunction with the evidence from this research establishing the enhanced attractiveness of the male homosexual, it appears that we may now tentatively conclude that genetic linkage and the tenets of sexual antagonistic theory offer a reasonable evolutionary explanation for the intra-sex differences in male sexual orientation.

7.4.3 The whole story?

If future research is to support these introductory findings there may be an evolutionary explanation for the evolutionary psychologists' conundrum – how has the gene for homosexuality remained stable in the population? It is proposed that the gene or genes for homosexuality advantage female carriers to such an extent that the disadvantage of reduced offspring in male homosexuals is sufficiently outweighed for the gene to remain stable in the population. However, this is not the whole story and is not offered as such. There is no question that environmental issues are also instrumental in the aetiology of same sex sexual orientation, especially with regard to the prenatal environment. For example, the fraternal birth order effect provides strong evidence for a biological but not necessarily genetic explanation for the potential for homosexuality (Blanchard and Bogaert, 1996; Bogaert, 2003, 2006; Gualtieri and Hicks, 1985). Nor does this explanation preclude other genetic explanations. Rather it is offered as a possible genetic explanation for one sub-type of homosexuality.

7.4.4 Methodological Constraints

As discussed under the methods section (7.3.2) a potential methodological flaw was introduced into the sample of homosexual males photographed for inclusion into the composite image. Due to the difficulty in attracting participants it was deemed necessary, in the end, to seek out participants rather than to rely on participants responding to requests for participation though homosexual websites, or through campus posters and university intranet advertising. As such, six participants of the thirteen were recruited directly from hairdressers, bringing with it the potential for selecting a particular sub type of homosexual (i.e. the 'femme' homosexual as opposed to the 'butch' homosexual). Should there be a biological demarcation of any kind between the femme and the butch, this would of course create a significant methodological problem. However, though there is admittedly a dearth of scientific literature on the subject, it would appear that there is no current voice arguing for a biological distinction. Rather, the consensus of opinion is that the butch / femme

distinction is essentially a sociological one in which roles adopted are not ‘natural’ but socially constructed (de Lauretis, 1993; Rubin, 1992). It is therefore hoped that no serious methodological issue has been created in this respect.

Along a similar vein, raters were not asked to divulge their own sexual orientation and it remains possible that this may have impacted upon the results. Nevertheless, it is believed that the number of potential homosexuals, whether male or female, as a percentage of the total participants, will have been small enough not to have had a significant impact on the results as the results all showed large effect sizes.

7.4.5 Future research and comment.

As previously suggested this study has highlighted the need for future research in a number of areas. Firstly, it would be of value to conduct further research into the individual faciometrics of both homosexual and heterosexual participants. By so doing it may be possible to assess with greater certainty the basis of the difference of perceived attractiveness between homosexual and heterosexual males.

Additionally, similar research would be of value with regard to female homosexuality. Are the faces of female homosexuals, as the hypothesis might suggest, indeed more feminine? Or are the female relatives of male homosexuals actually more interested in sexual relationships with males than other females?

Whilst this study was effective in highlighting the increased attractiveness of the gay averaged image over the straight averaged image, the issue of femininity has been offered only as a possible explanation. One possible method which may have helped to establish the veracity of this claim, aside from qualitative research as previously suggested, would have been to have conducted research into the menstrual cycle, consistent with the research by Penton-Voak et al (1999), in which females were found to judge male faces differently over their menstrual cycle, with a preference for masculinised features around

ovulation. If it were possible to show that females had an increased preference for the straight averaged image over the gay averaged image over time of peak fertility, this would lead to further corroborative evidence that feminisation were a factor in the attractiveness equation.

Whilst this investigation did, for the reasons above, ask participants for information regarding their menstrual status, as well as their use, or otherwise, of contraceptives, the participant sample did not include sufficient females in the fertile phase of their cycle to make analysis reliable, due to the time constraints imposed. A more comprehensive understanding of the general results may benefit from future research in this area.

Perhaps most importantly, and most constructive in terms of providing a genetic explanation of homosexuality (along with the many other biological and socio-cultural explanations), would be research into the possible linkage between homosexual and attractive/ feminised genes.

The aim of such research, both current and future, is to facilitate a more comprehensive understanding of an important aspect of human sexuality. For some, homosexuality is perceived to be a social problem. However, research shows that those who believe homosexuality to be ‘inborn’ display more tolerant attitudes towards the homosexual community than those who believe it to be a choice (Sheldon, 2007). It is therefore hoped that research of this nature will promote an even greater understanding and tolerance towards those of differing sexual orientation.

8. Male height and mating strategies.

> "Somewhere in this world of five billion people there lives the best-looking, richest, smartest, funniest, kindest person who would settle for you" (Pinker, 1997: 417)

8.1 Synopsis Study One - Height and Sociosexual Desire, Attitude and Behaviour, and Study Two - Male Height; Male Commitment.

Study One investigates the relevance of male height and its possible psychological and behavioural effects on aspects of sociosexuality. As male height is an important factor in female mate choice, particularly (but by no means exclusively) in relation to short-term and extra-pair matings, it would seem likely that height should influence males both psychologically and behaviourally. The study therefore investigates the impact of male height upon sociosexuality (sociosexuality being the degree to which emotional commitment and intimacy is desired before committing to a sexual relationship), by considering the impact of height upon the component parts of sociosexuality, i.e. sociosexual desire, attitudes and behaviours. It also considers the impact of height upon self-perceived physical attractiveness.

As with the previous study, Study Two also investigates the relevance of male height and its possible psychological and behavioural effects. This study addresses the possible relationship between male height and parental investment. This study, therefore, investigates the possibility of increases in potential child investment as a possible additional strategy to compensate for reduced mate value, consistent with the theoretical rationale proposed by both Gangestad and Simpson (2000) and Gross (1996).

8.2 Literature review

The previous chapter (and see Appendix b - ii) has argued that attractiveness judgements are cross cultural and relatively homogenous (Buss, 2003; Cunningham et al, 1995; Langlois et al, 2000; Symons, 1995). For example,

whilst not all people are attracted to the same skin colour, preference is universal for blemish free, unlined skin (Jones, Little, Burt and Perrett, 2004). While not all people are attracted to the same face, preference is universal for symmetry (Little et al, 2008). So, unjust though it may be, not all people can be attractive, and some people will be more attractive to more people than others. In other words, people have a differential mate value.

If, therefore, there is reasonably universal agreement on what it is to be physically attractive, with some people being highly attractive to most people and some people being attractive to very few, one can assume that most people would prefer to attract the most attractive mate. However, in reality many will have to accept a mate who has a comparable 'mate value' to themselves. The higher our mate value actually is, the more selective we can afford to be in our choices. Conversely, the lower mate value we have, the less selective we can be in our choices (Busten and Emlen, 2003). Human mating, therefore, is not simply a one way market in which one sex chooses and the other sex competes. In fact, whilst human females are choosier than human males, both have to compete in order to secure the best partner possible.

Human males, then, like other animals, must compete for access to the best (or, indeed, any) females. In order to be successful in this enterprise, they must be able to assess their own market value, and then adopt a strategy which will produce the best trade-off between expending energy on short-term matings and investing in maintaining long-term relationships and the resultant offspring. As stated earlier (chapter 5.1), surviving, reproducing and rearing offspring is costly in terms of time and energy, and any effort employed in one activity is at the cost of another. So, for example, if effort is invested in short-term matings, the cost incurred is investment in and the potential survival prospects of any offspring. It would therefore be a risky proposition to invest heavily in terms of short-term matings if one did not fulfil the short-term mating requirements of females. In such a scenario the potential for no reproductive success could be high. So, female mate choice will dictate strategy.

So, what do females want? For all relationships, but particularly so for short-term relationships and for extra-pair matings, females look for ‘Good Genes’. As discussed in chapter 5.3, Strategic Pluralism Theory argues that mating strategy should be contingent upon contextual cues. If males want to be successful in short-term relationships, they must be able to demonstrate ‘good genes’ (or heritable fitness and viability) through ‘honest markers’ such as bilateral symmetry (whereas this becomes less important, in relation to other factors, in long-term relationships). If males are able to demonstrate good genes and fulfill the requirements dictated by female choice, they can be more selective and may be more able to attract short-term and multiple partners. However, whilst they may be successful in short-term matings, the trade-off will be reduced effort in child rearing and parental investment. Conversely, males less able to demonstrate heritable fitness should invest more heavily in long-term partnerships and increased parental investment.

8.2.1 What constitutes ‘Good Genes’?

The importance of fluctuating asymmetry has already been discussed (chapter 5.3), as have the general facial characteristics which are more or less attractive dependant upon environmental and temporal cues (Appendix b - ii). There are, however, other indicators of ‘good genes’ which are important in female mate choice. One of the most important of these indicators is size (Buss, 1999). Throughout childhood and puberty, growth is partially dependant upon genes. It is also, of course, dependant upon nutritional availability. However, growth is also inversely related to pathogen exposure, as such exposure affects the amount of energy available for growth. Stronger immunological competence, therefore, enables the individual to invest more energy in growth, and therefore size becomes an indicator of good genes, immunocompetence and health.

8.2.2 The importance of height.

Similarly, male height is an indicator of good genes and health (Kuh and Ben-Shlomo, 1997; Silventoinen, Lahelma and Rahkonen, 1999) and also of reproductive success (Mueller and Mazur, 2001; Nettle, 2002). As such

females' preferences for height embody these cues. Research studies appear to be unanimous in their confirmation of male height as a desirable attribute, with important advantages accruing from the extra inches. For example, Buss and Schmitt (1993) found that tall, strong, athletic males were desired most as marriage partners, and were also more desirable for both long and short-term relationships. This was also found in a study of American females who consistently preferred average or taller males (around 5'11" or 180cm) over short males for marriage, and tall males over average or short males for dates (Ellis, 1992). Whilst males also prefer females who are shorter than themselves, a meta-analytic study has also shown that it is more important to females that their partner is as tall or taller than them, than it is for males that their partner is the same height or shorter than them (Pierce, 1996).

Preference for height has also been highlighted in studies of the personal advertisements columns in newspapers and magazines, and from studies of preference highlighted in speed dating (speed dating being a practice in which commercial companies arrange for single people to meet at bars, clubs or restaurants, are given a limited length of time to interact with a number of possible partners, and then are asked to feedback to the company those people who they would like to meet again). With regard to personal ads, this forum allows people to state, more or less explicitly, what attributes they are offering, and what they are looking for in return. For females, although the most emphasized requirement is for resources and commitment (Greenlees and McGrew, 1994; Weiderman, 1993), of those females who did state a preference for height, 80% wanted males to be 6' or taller (Cameron, Oskamp and Sparks, 1977). Tall males were also more likely than short males to receive responses (Pawlowski and Koziel, 2002). With regard to speed dating, a large study involving 10,526 participants indicated that the most important attributes for females when assessing a potential mate are that they be physically attractive, tall, young, of medium build and of a similar race (Kurzban and Weeden, 2005). Interestingly whilst males appeared to compensate for having a less attractive face (by saying "yes" to a relatively higher proportion of potential dates, thus indicating their lower self-perceived mate value) they did not compensate for being older or shorter. Does this indicate that they were not receptive to the

negative perception of their lack of height, or to the impact on their mate 'rating'? Or was it that they had to accept their lack of height as a factor outwith their control, and so, therefore, would prospective mates?

Despite these latter findings it seems clear that increased height offers a reproductive advantage to males. According to both the tenets of a conditional mating strategy and Strategic Pluralism Theory, female preference for taller males should require that males adjust their behavioural tactics according to their ability to satisfy this requirement. Tall males are more likely to be regarded as suitable candidates for short-term and extra-pair relationships, as they are offering 'good genes'. For shorter males, therefore, it will be necessary to adapt their tactics accordingly, even if this is achieved at a subconscious level. This may mean that shorter males will need to be offering greater commitment, to either the female herself, or to her offspring. Failure to do so would potentially reduce his chances in the mating market. This scenario is considered in the following study.

However, a less 'obvious' solution may also be available, not explicitly supported by Strategic Pluralism Theory. Rather than, or as well as, enacting a trade-off between good genes and good parenting, as predicted by Strategic Pluralism Theory, it is possible that a height disadvantage could be counteracted by an increase in both sociosexual desire and a more relaxed, less 'restricted' sociosexual attitude. Thus the environmental cue (female preference for taller males) driving the 'chosen' tactic (a greater sociosexual desire and more relaxed sociosexual attitude) may result in enhanced fitness gains over the pursuit of alternative tactics. If this were true one might anticipate that the shorter male would be more likely to create, and to respond to, sexual opportunities. One might anticipate, for example, differing attitudes towards the acceptability of a partner for a short-term relationship, with shorter males being less averse to lowering their standards (i.e. accepting a female of lower 'mate value' than himself for a short-term relationship) than taller males.

Some support for this proposition might be gleaned from research into the 'Closing Time Phenomenon' (Gladue and Delaney, 1990). In this study, an

apparent solution to the problem of reducing sexual accessibility is offered through the gradual increase in judgments of attractiveness over the course of an evening. Ratings of attractiveness were taken at three points throughout the evening. For individuals who were not in a relationship, each time point rating was higher than the one before. So, by the end of the evening, mean ratings were 6.5, whereas at the start of the evening mean ratings were 5.5. This perceptual shift was not noted, however, amongst those who were in a relationship already. It would appear, then, that context-specific adjustments are made with a lowering of standards as problems with sexual accessibility increase.

One might also anticipate that positive attitudes towards casual sex might be correspondingly higher in shorter males in order to maximise any sexual opportunities available. With regard to attitudes towards casual sex, there is, of course, a fund of literature on gender differences in attitudes towards such. For example, males have been shown to display greater willingness to engage in casual sex (Surbey and Conohan, 2000), to rate targets who showed cues to a more unrestricted sociosexual orientation more favourably than targets showing a more restricted sociosexual orientation when considering a short-term relationship (Schmitt, Couden and Baker, 2001), to seek a sexual relationship with their partner earlier in the relationship than females (Buss and Schmitt, 1993) and to engage in more sexual fantasies involving numerous females than vice versa (Barclay, 1973). Male desire for casual sex is also a driving force for the prevalence of prostitution, an overwhelmingly one way phenomenon, in which males almost inevitably solicit and females provide (Kinsey, Pomeroy, Martin and Gebhard, 1953). However, despite the abundance of literature investigating sociosexuality and inter-sex differences, there appears to be a corresponding absence of literature with regard to sociosexual attitudes and intra-sex differences. Study One aims to investigate, therefore, the importance of female mate choice favouring the taller man and the putative male response to these demands in terms of differential desires and attitudes towards short-term relationships.

Study Two aims to investigate the relationship between male height and parental investment. As we have seen, evolutionary theory predicts that sexual strategy is dependent upon both sex and context (Gangestad and Simpson, 2000; Gross, 1996). Indeed, earlier research into between sex differences has been largely superseded, within the last decade, by an explosion of research into context dependent strategies (See Chapter 5). This research has included research into female ovulation (Gangestad, Garver-Apgar, Simpson, and Cousins, 2007; Gangestad, Simpson, Cousins, Garver-Apgar, and Christensen, 2004; Haselton and Gangestad, 2006; Penton-Voak et al, 1999; Pillsworth, and Haselton, 2006; Pillsworth, Haselton, and Buss, 2004), individual differences (Cunningham and Russell, 2005; Greiling and Buss, 2000; Ostovich, 2004), sex ratios (Pedersen, 1991) and change over the lifespan (Frayser, 1985).

This study therefore takes the previous investigation one step further by exploring another potential trade off that shorter males might make. As discussed earlier it may be that shorter males adopt a further strategy in response to their less favourable mate value that being willingness to offer greater commitment, to either the female herself or to her offspring, in order to improve their status and mate value. Again, although there has been much research into the mating preferences of males and their general preference for youth and fecundity, there has been a relative dearth of literature investigating individual differences in apparent commitment to partners and/ or children dependant upon mate value. One possible exception investigates the link between mate value and jealousy in which it was hypothesised that a shorter male will be keener to ‘guard’ their partner than their taller conspecific (Park and Buunk, 2008). Consistent with the evolutionary hypothesis, it was found that shorter males are more sexually jealous of their partners than taller males (and that short and tall females are more emotionally jealous of their partners than average height females, average height being preferred by males than either of the extremes). So, shorter males are more ‘careful’ with their investment than taller males. Might they also be more willing to invest, in terms of commitment to parental investment?

Study Two investigates the hypothesis that shorter males, with reduced chances of successfully pursuing a short-term mating strategy as a result of lower mate value, may have evolved psychological mechanisms producing a raised level of interest in infants thus displaying honest signals of good parenting and raising their chances of sexual access and reproduction.

It is worth highlighting, here, the theoretical similarity between this and the argument put forward by Gangestad and Simpson (2000) in their response to Buss (1998, p24), when he stated “Males who lack mechanisms such as a desire for a variety of partners… would have been out reproduced by males who successfully solved [the problem of partner number] entailed by the pursuit of a short-term mating strategy”. Gangestad and Simpson point out that in actual fact “most males [who would not be successful in the pursuit of a purely short-term mating strategy] may have benefited reproductively by having little interest in pursuing multiple mates” (2000: 561, parenthetic insert mine). In the same way, most males who would not be successful in the pursuit of a purely short-term mating strategy may have benefited reproductively by having an increased interest in infants, thus raising their mate value in the eyes of their would be partner.

This is compatible with the notion that throughout our evolutionary history males have had to “trade off” time spent investing in a long-term partner and the resultant offspring, against time invested in pursuing mating opportunities (Trivers, 1972; Gangestad and Simpson, 2000). It is also compatible with the notion that females, as the primary ‘choosers’, look for signals of both ‘good genes’ and ‘good providers/ good parents’ (Buss and Schmitt, 1993). These preferences create intrasexual competition (see chapter 4.4). So, males should have evolved to compete with each other in displaying characteristics that are relevant to females. In other words, males who were able to display a greater level of commitment and interest in infants than their conspecifics will be at a reproductive advantage. Only those characteristics that are ‘honest’ signals of commitment should, through the weeding out of sexual selection, have been retained. It is therefore proposed that those males who are shorter will show a greater interest in infants than their taller conspecifics.

8.2.3 Experimental Hypotheses – Study One

It was predicted that there would be a significant correlation between male height and sociosexual desire, with shorter males displaying greater sociosexual desire than taller males.

It was predicted that there would be a significant correlation between male height and sociosexual attitude, with shorter males scoring more highly on the sociosexual attitude scale than taller males.

It was predicted that there would be no significant correlation between male height and sociosexual behaviour due to the restrictions on manifest behaviour placed by the potential partner.

It was predicted that there would be a significant correlation between male height and self-perceived physical attractiveness, with taller males rating themselves higher on perceived attractiveness than shorter males.

8.2.4 Experimental Hypotheses – Study Two.

It was predicted that there would be a significant correlation between male height and the ratings in the Visual Preference Test, with shorter males displaying greater interest in children than taller males. (Use of this measure has been shown to indicate a significant relationship between female ratings of paternal quality in male and his scores in this measure (Roney, Hanson, Durante and Maestripieri, 2006)

It was predicted that there would be a significant correlation between male height and a Forced Choice Scenario, with shorter males displaying greater interest in children than taller males.

8.3 Height and Sociosexual Desire, Attitude and Behaviour

Methodology

8.3.1 Design

This study employed a quantitative questionnaire design involving two questionnaires, as well as a Visual Preference Test and Forced Choice Questionnaire, both of which are discussed further in the following chapter on Height and Commitment. Height was taken as the predictor variable. After completing the Visual Preference Test and the Forced Choice Questionnaire, participants were then asked to complete the Revised Socio-Orientation Inventory (see appendix h - ii; Penke and Asendorpf; 2008) assessing sexual behaviour, attitude and desire. Finally, participants were asked to complete the Physical Attractiveness Scale – Revised, extracted from the Personal Attributes Survey (PAS – R; see appendix j) assessing self-perceived physical attractiveness. The scores from these questionnaires provided the criterion variable.

8.3.2 Materials

Firstly, the Revised Sociosexual Orientation Inventory, devised by Penke and Asendorpf, (2008; see appendix h - ii) was used to assess sexual behaviour (for example, “With how many partners have you had sexual intercourse on *one and only one* occasion?), attitude (for example, “I can imagine myself being comfortable and enjoying sex with different partners”) and desire (for example, “In everyday life, how often do you have spontaneous fantasies about having sex with someone you have only just met?”). So, the R-SOI measures degree of sexual restrictedness, or the degree to which a person requires an emotional commitment and intimacy before committing to a sexual relationship. (A discussion on the validity of sex-research based upon self-report measures may be found under appendix h) Analysis of the reliability of this scale showed good internal consistency, with a Cronbach alpha coefficient of.83. In the current study the Cronbach alpha coefficient was .855.

To score, items ranged from a possible 1 to 9 on a Likert Scale. Questions 1-3 related to sociosexual behaviour, with higher scores indicating a less restricted behaviour. Questions 4 – 6 related to sociosexual attitudes, with higher scores indicating a more relaxed attitude towards sexual relationships without the need for emotional commitment. Item 6 (I do *not* want to have sex with someone until I am sure that we will have a long-term serious relationship) was reverse scored. Questions 7 – 9 related to sociosexual desire, with higher scores indicating a greater desire for and interest in sexual relationships.

Participants were then asked to complete a self-perceived physical attractiveness questionnaire adapted from Physical Attractiveness Scale - Revised (see appendix j) which was employed to assess self- perceived physical attractiveness. Analysis of the reliability of the scale showed good internal consistency, with a Cronbach alpha coefficient, in the original study, of .83. In the current study the Cronbach alpha coefficient was .74. A Likert scale was employed with items scored from 1 to 5, a higher score indicating greater self-perceived attractiveness. Items 4, 5 and 9 were reverse scored.

Materials were presented in the order as discussed under 8.3.4 in order to negate the potential impact of the R-SOI early on later materials.

8.3.3 Participants

Eighty-six male participants were recruited, of whom most were university students with a number being recruited through snowball sampling. Age ranged from 18 to 69 years with a mean age of 27.85 and a Standard Deviation of 12.19. Normality of the distribution of the ages through Kolmogorov-Smirnov analysis indicated that there was a violation of the assumption of normality for age which was confirmed through an analysis of the histogram. However, this was felt to be acceptable as the trimmed means were close to the original means (26.58 and 27.85 respectively) indicating that this had not had a strong influence. A boxplot of the distribution of the ages indicated one extreme outlier.

However it was decided to include this result in the final analysis as analysis with and without was virtually identical.

With regard to height (see 8.3.4 for procedure), range recorded was from 163cm (5'4") to 193cm (6'4") with a mean height of 178.96cm (5'10.5") and a Standard Deviation of 6.54, as compared to the English mean male height of 175.2cm (5'9") (see Health Survey for England, 2006). Normality of the distribution of height through Kolmogorov-Smirnov analysis indicated that there was no violation of the assumption of normality. A boxplot of the distribution of heights likewise indicated no outliers.

8.3.4 Procedures

Potential male participants were approached and asked whether they would be interested in participating in the study on a voluntary basis. As some questions were of a personal nature (see appendix h - ii) it was explained that these were an essential part of the study but that responses would be kept both anonymous and confidential. The procedure for doing so was explained and they were also provided with envelopes in which to place their completed questionnaires. Demographic and height information was separated from the main questionnaire and collected separately in order to demonstrate overtly respect for anonymity (whilst an ID number allowed matching of information for analysis). Participants were also reassured that they could discontinue their involvement in the study at any point, and that they could omit any questions if they felt the need to do so.

To begin, participants read an information sheet, completed a participation agreement form and supplied age and ethnicity. Participants were then asked to remove their shoes and their height was taken. The Visual Preference Test and Forced Choice Questionnaires were then completed, as discussed more fully in the following chapter. Participants were then asked to complete both the R-SOI and the questionnaire assessing self-perceived physical attractiveness. They were not told the nature of the experiment until the questionnaires had been completed at which point an informal debriefing discussed the broad nature of

the investigation and answered any questions the participants had. Participants retained an information sheet with contact details for future contact should they wish it.

8.3.5 Results

As already discussed, the reliability of the Revised SOI was checked against the original study, with good internal reliability being recorded in both cases. However, as the scale was broken down internal reliability was checked for each of the three new scales. (See Appendix i for a more comprehensive discussion regarding the unidimensionality, or otherwise, of the scale). All proved to be reliable as recorded in Table 4.

Table 4 Cronbach Alpha coefficient on all sociosexuality factors

Scale	Cronbach Alpha Coefficient (original study)	Cronbach Alpha Coefficient (this study)
Revised SOI	.83	.86
Sociosexual Desire	.86	.84
Sociosexual Attitude	.87	.86
Sociosexual Behaviour	.85	.79

Firstly, partial correlation was used to explore the relationship between male height and sociosexual desire, while controlling for age. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity in this and all following investigations. Although the direction of the correlation was as expected, no significant relationship was found between male height and sociosexual desire (r= ˉ.06, N= 80, p= .304). An inspection of the zero order correlation (r= ˉ.042) suggested that controlling for age had very little effect on the strength of the relationship between the two variables.

Secondly, partial correlation was used to explore the relationship between male height and sociosexual attitude while controlling for age. There was an almost significant, one tailed, negative, partial correlation between male height and attitudes towards casual sex (r= ˉ.172, N= 80, p= .066), with greater height being associated with a less relaxed attitude. An inspection of the zero order correlation (r= ˉ.128) suggested that controlling for age had some effect on the strength of the relationship between the two variables. Interestingly, again, there was a significant, negative, partial correlation between male height and response to “I can imagine myself being comfortable and enjoying “casual” sex with different partners”. (r= ˉ.197, N= 80, p= .042), with greater height being associated with a less relaxed attitude.

Thirdly, partial correlation was used to explore the relationship between male height and sociosexual behaviour, while controlling for age. There was a significant, negative, partial correlation between male height and sociosexual behaviour (r= ˉ.23, N= 80, p= .021), with greater height being associated with more restricted behaviour (i.e. lower scores on the sociosexual behaviour scale). An inspection of the zero order correlation (r= ˉ.23) suggested that controlling for age had no effect on the strength of the relationship between the two variables. Interestingly, when analysed separately, it was also noted that there was a highly significant, negative, partial correlation between male height and the number of sexual partners on only one occasion (r= ˉ.29, N= 80, p= .005], with greater height being associated with fewer number of one time partners. An inspection of the zero order correlation (r= ˉ.31) suggested that controlling for age and ethnicity had very little effect on the strength of the relationship between the two variables.

Lastly, partial correlation was used to explore the relationship between male height and self-perceived physical attractiveness, while controlling for age. No significant relationship was found between male height and the self image (r= ˉ .028, N= 81, p= .403). An inspection of the zero order correlation (*r*= ˉ.051) suggested that controlling for age reduced the effect on the strength of the relationship between the two variables. Please see Table 5 and Figure 6.

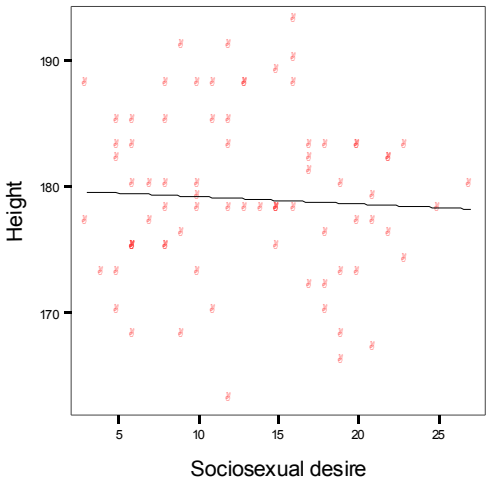
Table 5 Partial correlation results for all sociosexual scales against male height

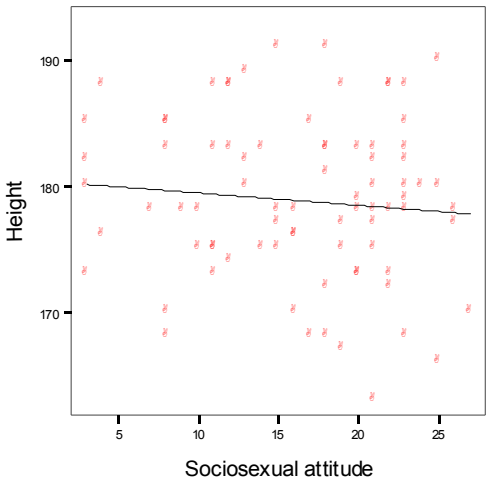
Scale	Correlation Coefficient	N	Significance
Sociosexual Desire	-.06	80	.304
Sociosexual Attitude	-.172	80	.066
Attitude towards Casual Sex (Q.5)	-.197	80	.042*
Sociosexual Behaviour	-.23	80	.021*
Sexual partners on only one occasion	-.294	80	.005**
Self-perceived Physical Attractiveness	-.028	81	.403

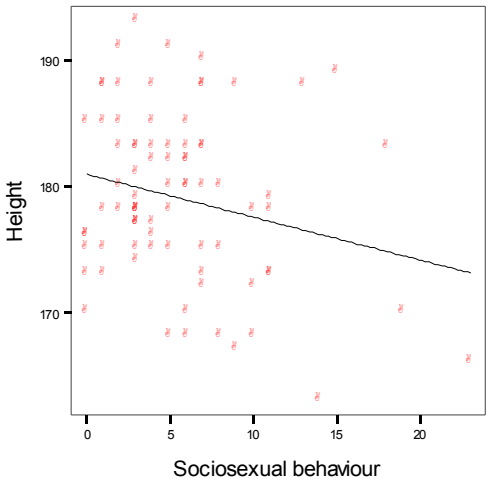
*Significant at the .05 level

**Significant at the .01 level

Figure 6 Scatterplots showing relationship between aspects of sociosexuality and male height







8.4 Discussion

The aim of this study was to investigate male height and its potential impact on sociosexual strategy and tactics. Partial correlations (controlling for age and ethnicity) were carried out on aspects of sexual strategy including sociosexual desire, attitude and behaviour as well as on ratings for self-perceived physical attractiveness. It was hypothesised that there would be a significant correlation between male height and sociosexual desire, and sociosexual attitude with shorter males scoring more highly in both scales than taller males. It was also hypothesised that there would be no significant relationship with sociosexual behaviour due to the constraining effect of female preference. Lastly, it was hypothesised that there would be a significant correlation between male height and self-perceived physical attractiveness, with taller males rating themselves higher on perceived attractiveness than shorter males.

With regard to sociosexual desire, no significant relationship was found between male height and desire, although the direction of the relationship was as expected. This was contrary to prediction. It would appear that despite shorter males being at a reproductive disadvantage, there is only a non-significant trend between sexual desire and height, with males of all heights showing similar levels of desire. Does this mean that males are not receptive to the negative effect that height (or lack of) could have on their mate 'rating'? This would, after all, be consistent with the findings of Kurzban and Weeden (2005) which found that males compensated for neither age, nor height. With regard to age this was, arguably, not overly surprising as this particular finding was inconsistent with the bulk of the research which suggests that females do, in fact, prefer older males (Buss, 1989; Kenrick and Keefe, 1992; Low, 1991). However, it is rather more surprising with regard to height as there appears to be consistency with regard to female preference for taller males. It is a possibility that as these were variables outwith their control this may have accounted for the apparent lack of recognition of their effect upon relative mate value (Kurzban and Weeden, 2005).

An alternative, and probably more satisfactory, explanation could be that a level of desire which could not be matched in ability to attract short-term matings could potentially be reproductively disadvantageous. After all, a high desire for sexual relationships in the absence of commitment, could, for the male with a lower mate value, result in no successful partnerships. For these males, as proposed by Gangestad and Simpson (2000), the reproductively most successful solution might well have been to maintain desire at an 'average' level (albeit not at a conscious level), in order that the long-term, monogamous relationship remains a viable proposition. By so doing the chances of successfully passing on ones genes are increased, particularly if this approach is matched or supplemented by the pursuit of extra-pair relationships when opportunity arises.

If shorter males do not compensate for their height through increased desire, does this mean that they are unreceptive to the negative effect that restricted height could have on their mate 'rating', or, indeed, their physical attractiveness to females? Will shorter males rate themselves more critically than taller males in terms of physical attractiveness? Is there evidence here to suggest that shorter males would feel the need to compensate for their height? It would appear not. According to the results of the Physical Attractiveness Scale - Revised, shorter males do not feel less physically attractive than taller males (r = -.02, p = .403). This is perhaps surprising due to the considerable evidence to suggest that females do find shorter males less attractive (Ellis, 1992; Hensley, 1994; Mueller and Mazur, 2001; Pawlowski and Koziel, 2002; Pierce, 1996; Shepperd and Strathman, 1989). Nevertheless, it is consistent with the findings of Kurzban and Weeden (2005) in terms of male compensation as previously discussed. It is, of course, possible that questions on self-perceived attractiveness were not answered honestly, as this is an area of some sensitivity. However, reasonable precautions were taken to try to convince participants of their anonymity in answering these questions, and it appears that the potentially more sensitive questions regarding sociosexuality were answered truthfully, so it seems reasonable to assume that these questions were answered honestly. It would appear that lesser height does not impact, in any conscious way, on self-perceived physical attractiveness.

So do shorter males compensate for their height, and if so, how? Tentatively, it appears that the answer may be ‘yes’, and that height may be playing a more subtle role in mating tactics. Furthermore, it may be that there are two factors at play. Firstly, the relationship, as we have seen, between sociosexual attitude and height is a negative one, with a small, though not significant, effect size (r = -.172, p = .066), which tends to indicate that shorter males may have a slightly more relaxed attitude to sexual relationships than taller males. This would be consistent with theory as those who are at a greater disadvantage in the mating market should be more willing to compromise their behaviours and attitudes in order to be as reproductively successful as their more advantaged conspecifics. Of particular interest, however, is the discovery that shorter males do have a significantly more relaxed attitude to casual sex with different partners (“I can imagine myself being comfortable and enjoying "casual" sex with different partners”) than taller males (r= -.197, p = .042). It seems reasonable to argue that to hold a positive attitude towards casual sex with a number of partners “allows” shorter males to seek out more such sexual situations than does a more restricted sociosexual attitude, thus ‘allowing’ them to maximise opportunities when they arise.

However, a more relaxed attitude to sexual relationships appears to be only part of the story. Surprisingly, with regard to sociosexual behaviour, a significant relationship was found between height and behaviour (r = -.23, p = .021), showing that *shorter* males exhibited more unrestricted behaviour than taller males. This was particularly apparent when looking at one sub-component of sociosexual behaviour, that being, how many different partners the participants had had sexual intercourse with on one and only one occasion. This was highly significant (p=.005) with shorter males having significantly more such relationships. This would be consistent with both a relaxed attitude to casual sex and sexual relationships generally, as well as the theory which again argues for a lowering of standards when the need arises. In comparison to the Closing Time Phenomenon (Gladue and Delaney, 1990), male standards fall (or, at least, perceptions of female attractiveness rise) as opportunity dwindles. Over a longer term, but in the same manner, if one sees generally reduced opportunity it makes theoretical sense to allow standards to drop (or, again, to

adjust perceptions of attractiveness) in order to ensure a successful result (i.e. a sexual liaison). This would appear to be supported by the evidence that though there is a significant difference in number of times that males have had sexual intercourse with a partner on one occasion only, there is no significant difference between taller and shorter males and the number of partners that they have had sex with over the past twelve months (r = -.133, N = 81, p = .241). This suggests that taller males are entering into a greater number of longer term relationships than shorter males (the suggestion being that shorter males have had to compromise their standard in order for a sexual liaison in a way that taller males haven't).

There is, however, an interesting issue here, highlighting the complexity of the two way relationship between choice and constraints placed by both genders on possible short-term partnerships. The evidence suggests that shorter males are behaviourally less restricted than taller males, and yet taller males are preferred by females as a short-term mate. Does this mean that taller males are not exploiting their advantage? And if this is the case, does a more restricted attitude to casual sex satisfactorily explain this situation? Although there is no definitive explanation at this stage, this seems unlikely. Rather a more likely explanation remains with the proposition that the shorter male pursues short-term relationships which he then quickly rejects through failing to meet his standards. Speculation might suggest that the taller male, on the other hand, might reject these less satisfactory relationships from the outset, finding instead partners with whom they feel more suited and thus less willing to reject as quickly. It is also possible that taller males attract 'good quality' females, but that these females, due to their higher mate value, demand more monogamous behaviour from their partner than lower quality females. Thus the relationship between height and sexual behaviour may be further obscured by female preference.

8.4.1 Methodological Constraints

The materials section discusses the use of the PAS – R questionnaire in order to measure self-perceived physical attractiveness. Whilst this questionnaire

embraces various aspects of physical attractiveness, there is no specific question or reference to height. It is possible that shorter males, therefore, ignored this aspect of their physique when considering how to rate their responses as, as has been mentioned, height is not an aspect of physique that can be easily altered. Future research might consider the addition of a height related question/s in order to address this concern.

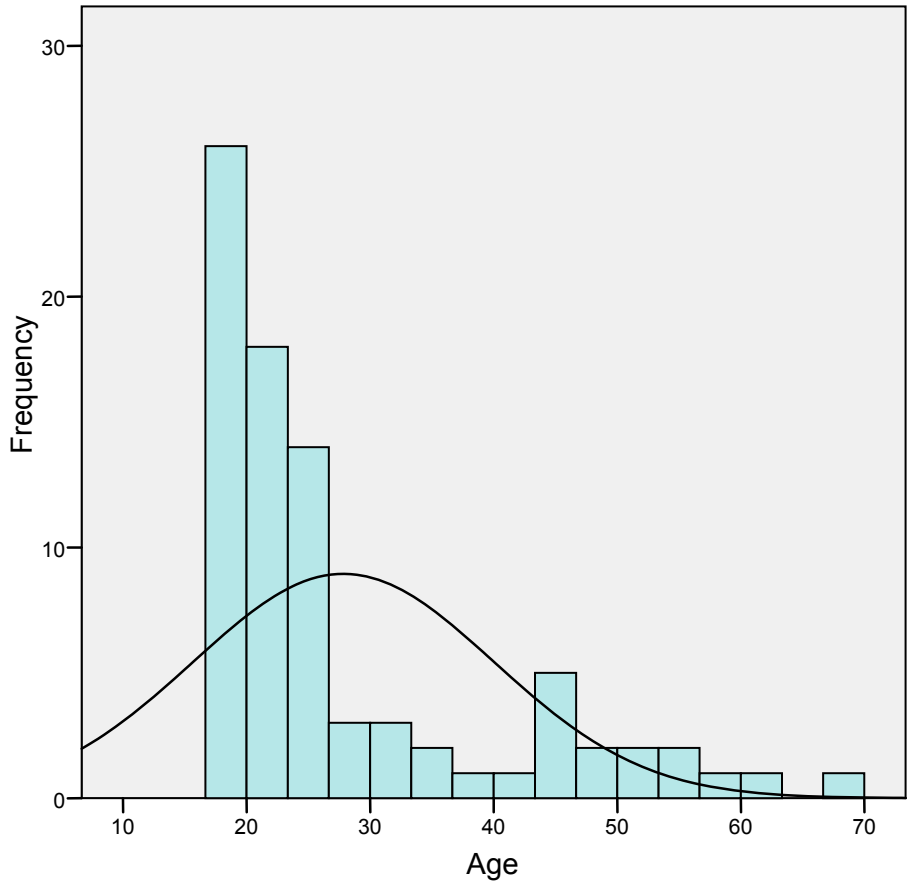
Additionally further research would be recommended to ascertain whether one or both of the afore-mentioned responses to reduced mating opportunities (i.e. a temporary drop in standards or adjustment in perceptions of attractiveness) is or are the driving forces behind such mating decisions.

It is also relevant to highlight, again, the concern over using a preponderance of university students in a study of this nature. Aside from the usual and valid concerns regarding generalisability to a wider population, this is arguably especially relevant when considering aspects of sexuality. As Paul, MacManus and Hayes (2000) point out, there is a generally more sexually permissive culture within a university environment than there is 'outside', in which a more restricted approach to sexuality, attitudes and behaviour is the norm. Caution should be exercised, therefore, in making such generalisations. Furthermore, there may be different interpretations of the term 'commitment' and what constitutes commitment which may well modify over the lifespan. Thus the use of a predominantly young population, as elucidated in Figure 7 and highlighting a positive skew of 1.56, presents, again, problems with generalisability to a broader population.

A plausible interpretation of the analysis of the data on male height and sociosexual desire, attitude and behaviour is, then, as follows. Males of all heights have a similar level of sexual desire. However, taller males are more attractive to females generally, and particularly in terms of short-term and extra-pair matings. For that reason shorter males must compromise in some way in order to have some level of success in the mating market. It appears that whilst shorter males do not apparently feel that they are disadvantaged, compromise is effected through a more relaxed attitude towards sexual relationships

generally and casual sex with different partners in particular. It also appears that this results in a greater number of short-term relationships, as is evidenced by the significantly greater number of sexual relationships on only one occasion, and this may, putatively, be attributed to a drop in standards or an adjustment in perceived attractiveness of the ‘target’ female.

Figure 7 Histogram depicting the age spread and skew of male participants



8.5. Male Height and Male Commitment

Methodology

8.5.1 Design

A quantitative correlational study was designed in which participants were asked to complete both a Visual Preference Questionnaire and a Forced Choice Scenario, both assessing likely investment in children, providing the criterion variables. The predictor variable was male height. Partial correlation was used for analysis, controlling for age and ethnicity.

8.5.2 Materials

Firstly, participants were asked to complete a Visual Preference Test as devised by Roney, Hanson, Durante and Maestripieri (2006) to assess interest in children (see appendix k). A4 sized pictures (both photographic and stylized) were presented in pairs, one of an adult and one of an infant. Ten pairs were presented though the order of presentation was changed in order to control for the left hand bias. Preference for the adult picture scored one whilst preference for the infant picture scored two. Higher scores therefore indicated a higher interest in children. Analysis of the reliability of the scale showed a reasonable internal consistency, with a Cronbach alpha coefficient of.68.

It is, however, possible, that there is no ‘honest’ difference in interest in infants between males of differing height. The study therefore investigated both ‘honest’ and ‘self-reported’ interest in infants, the hypothesis being that if there is no honest difference, there may still be a higher *reported* interest in infants by shorter males over taller males due to the need to display adequate mate value. A Forced Choice Scenario was therefore also used (see appendix l). Ratings were from 1 (least likely to invest in children) to 4 (most likely to invest in children). Choice 1 scored ‘3’, choice 2 scored ‘1’, choice 3 scored ‘4’ and choice 4 scored ‘2’. A high score, again, indicated a higher likelihood of investing in children.

8.5.3 Participants

As participants for this study were as in the previous study, please see section (8).3.3 for more information. It should be noted that the Forced Choice Scenario was introduced slightly later than the Visual Preference Test and therefore there were fewer participants completing this section (N=65)

8.5.4 Procedure

For the basic procedure, please see section (8).3.4. With regard to the Visual Preference Test, participants were informed in the briefing that they were to indicate their preference for either picture, but it was verbally stressed that this did not mean sexual preference. This was explained as the participant information sheet indicated that the thesis was looking into aspects of human sexual strategy (see appendix h - iii), and there was therefore an important need to alleviate any concern that this may have been a study into some aspect of paedophilia. (This is discussed later). Participants were not, however, told the nature of the experiment until the questionnaires had been completed. Participants were then shown pairs of images (either photographic or stylised) which included one picture of an adult and one of an infant. They were asked to indicate an immediate preference for one of them. Ten such pairs were presented.

Participants were then asked to complete a purpose written and pre-piolted Forced Choice Scenario, by simply reading the scenario presented and choosing their most likely course of action from four possible options.

The rest of the procedure was as has been discussed in section (8).3.4.

8.5.5 Results

Spearman's rho correlation was used to explore the relationship between male height and scores in the Visual Preference Test (VPT) as preliminary analyses to ensure no violation of the assumptions of normality, linearity and homoscedasticity indicated a violation of the assumption of normality. No

significant relationship was found between male height and the VPT (r= ¯.115, N= 82, p= .152).

Spearman's rho correlation was also used to explore the relationship between male height and scores in the Forced Choice Scenario. Again, no significant relationship was found between male height and the Forced Choice Scenario (r= .013, N= 64, p= .460).

Table 6 Inferential results into the relationships between height and potential parental investment

Scale	Correlation Coefficient	N	Significance
Visual Preference Test	-.115	82	.152
Forced Choice Scenario	.013	65	.460

8.6 Discussion

The aim of this study was to investigate male height and its potential impact on parental investment. Partial correlations (controlling for age and ethnicity) were carried out on two measures of parental investment, the Visual Preference Test and a Forced Choice Scenario. It was hypothesised that there would be a significant negative correlation between male height and parental investment, with shorter males scoring more highly in both scales than taller males.

With regard to both the Visual Preference Test and the Forced Choice Scenario, no significant relationships were found, either before controlling for age and ethnicity or after. It was therefore necessary to reject both experimental hypotheses, that there would be a significant correlation between male height and the ratings in the Visual Preference Test, with shorter males displaying greater interest in children than taller males, and that there would be a significant correlation between male height and the forced choice scenario, with shorter males displaying greater interest in children than taller males. In both cases, therefore, the null hypotheses were accepted. It should be noted,

however, that whilst there was clearly no relationship between height and the Forced Choice Scenario, there did appear to be a small effect size though non-significant directional trend in terms of the VPT (r = -.155, p = .152). If anything can be taken from this (and clearly with a non-significant result of this kind this should not be over-stated), it appears that there may be a small but honest difference in interest and potential investment in children, but this is not one that appears to be recognised at a conscious level (as indicated by the Force Choice Scenario).

This was contrary to expectations. It had been hypothesised that shorter males, with their reduced chances of successfully pursuing a short-term mating strategy as a result of their lower mate value, would have evolved psychological mechanisms producing a significantly greater level of interest in infants, or, potentially, an evolved willingness to indicate an interest in children. In this way shorter males would improve their mate value and raise their chances of sexual access and reproduction. In other words, if shorter males were able to display a greater level of commitment and interest in infants than their taller conspecifics, they would be at a reproductive advantage which could potentially outweigh their physical disadvantage.

The reality, however, suggests that no such relationship exists. Shorter males do not compensate for their height by indicating greater potential parental investment. This would be consistent with the prior study which showed that male height and self-perceived physical attractiveness were not correlated in any way. Despite the considerable evidence discussed in the previous chapter to suggest that height is an important factor in female mate choice, shorter males did not feel less physically attractive than taller males (r = -.02, p = .403). It is also consistent with the speed dating research discussed in Chapter 9 in which Kurzban and Weeden (2005) found that males did not appear to compensate for being either older or shorter.

It would appear, then, that there is no trade off made by shorter males either in terms of increased sexual desire, or in terms of a greater commitment to parental investment. Indeed, it would appear that shorter males feel no

disadvantage physically in comparison to taller males. However, shorter males *do* appear to compensate for their height when it comes to sexual attitude and behaviour as discussed in the earlier chapter. This would appear, at present, to be the only trade off made, therefore, when it comes to male height and sexual strategy (though see future research, 11.4.2, for further comment).

8.6.1 Methodological Constraints

As discussed under the procedure (11.3.4) a potential methodological flaw was introduced when using the Visual Preference Test as a tool for assessing potential parental investment in the broader context of this study, despite the fact that this measure did prove highly effective in the original research (Roney et al, 2006). From an ethical point of view it was felt that the general information sheet should be accurate in recording the fact that human sexual strategy was the core to the investigation. As a result, however, the pilot study did highlight the concern that giving this information led some people to misconstrue the nature of this particular study, with some apprehension that the study may have been connected in some way to paedophilia. Understandably this led to unease in making a preference in favour of the infant image. In order to respond to this potential misunderstanding it was felt that it would be sufficient to state clearly that ‘preference’ did not mean ‘sexual preference’. This did appear to be understood and accepted, but it is possible that there remained some question over the true nature of the study. If this were the case the potential methodological issue may have resulted in a Type II error. As a further response to this potential problem, the Forced Choice Scenario was added in order to triangulate the results. As the results from both were broadly the same it is felt that this potential methodological flaw did not, in the end, have a serious impact. It cannot, however, be ruled out.

8.6.2 Future research.

This study has investigated the possibility of a relationship between male height and parental investment. However, it may be that whilst the shorter male does not appear to compensate for his height in terms of parental investment, he

might compensate in terms of investment (or caring) in his primary partner. Future research would be useful, therefore, to investigate this possibility. Specifically, it would be of interest to ascertain whether shorter males are prepared to invest more as a percentage of their total assets in their partner. It would also be of interest to investigate the possibility that the shorter male professes to love / value his partner more than taller males.

9. 2D: 4D Digit Ratio and Sociosexuality

9.1 Synopsis

The last studies investigated the links between an aspect of physiology (height) and sociosexuality, amongst a number of other variables. This study aims to investigate the relationship between another physiological variable, that being the 2D: 4D digit ratio, and sociosexuality. Strategic Pluralism Theory suggests that males displaying features which would indicate genetic benefits to offspring (or correlates of them) should be preferred by females as short-term mates. It is therefore hypothesized that males displaying a lower 2D: 4D digit ratio (as a marker of greater exposure to prenatal androgens) will exhibit higher levels of sexual desire, a more relaxed attitude to sexual relationships and less restricted behaviour than males displaying a higher 2D: 4D digit ratio. It is also hypothesized that as there should be a trade off between investment in time pursuing sexual relationships and investment in time attributed to parenting, males displaying a lower 2D:4D digit ratio will be less likely to display cues to potential child investment than males displaying a higher 2D: 4D digit ratio.

9.2 Literature Review

Recent research has shown the 2D:4D digit ratio to be both sexually dimorphic and a putative marker of exposure to intrauterine sex steroids. In males the second digit, or index finger, tends to be shorter than the fourth digit, or ring finger (Lippa, 2003; Manning, Scutt, Wilson and Lewis-Jones, 1998; Manning, 2002), with lower ratios (i.e. a comparatively shorter index finger to ring finger) being associated with greater exposure to prenatal androgens or reduced exposure to prenatal oestrogens or both (Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer and Manning, 2004). Consequently, as a marker of masculinisation, it is believed that the 2D: 4D digit ratio is an honest signal of male fitness in the evolutionary sense of the word (i.e. an honest signal of the average contribution a male is likely to make to the next generation). For females, on the other hand, the second finger tends to be approximately the same length as the fourth digit, although it may be slightly longer or shorter (Williams, Pepitone, Christensen,

Cooke, Huberman, Breedlove, Breedlove and Jordan; 2000). Furthermore, it appears that, at least for males, the right hand shows greater sexual dimorphism than the left, indicating that the right hand is more sensitive to fetal androgens than the left (Williams et al, 2000). The relative contributions of genes and environment have also been assessed through the study of monozygotic (MZ) and dizygotic (DZ) twins and have found that there is significantly greater similarity between MZ than DZ twins, indicating that digit ratio is very significantly attributable to genetic and pre-natal factors (Gobrogge, Breedlove and Klump, 2008).

According to research conducted by Breedlove, Cooke and Jordan (1999) all non-gonadal somatic sex differences seem to be attributable to prenatal androgens and the resultant masculinization of males. As a result 2D: 4D Digit ratio, as a marker of the extent of exposure to these sex steroids, has been used in an explosion of research in many areas of psychology, physiology and health, including personality traits e.g. aggressiveness (Hampson, Ellis and Tenk, 2008; Millet and Dewitte, 2007) and sensation seeking (Hampson et al, 2008) emotional stability, social boldness and privateness (Lindova, Hruskova, Pivonkova, Kubena and Flegr, 2008), sexual orientation (Lippa, 2003; Martin, Puts and Breedlove, 2008, Williams et al, 2000) sports studies e.g. attainment levels in sport in males (Manning and Taylor, 2001) and females (Honekopp, Manning and Muller, 2006; Paul, Kato, Hunkin, Vivekanandan and Spector, 2006), aspects of cognition including mental rotation tasks (Manning and Taylor, 2001; Peters, Manning and Reimers, 2007, Poulin, O'Connell and Freedman, 2004, but see Coolican, 2003), visual recall abilities (Poulin et al, 2004); and musical ability (Sluming and Manning, 2000) and psychological disorders, e.g. depression (Bailey and Hurd, 2005b; Vermeersch, T'sjoen, Kaufman and Vincke, 2008), autism (Manning, Baron-Cohen, Wheelwright and Saunders, 2001), schizophrenia (Arato, Frecska, Beck, An and Kiss, 2004; Walder, Andersson, McMillan, Breedlove and Walker, 2006), hyperactivity in girls (Williams, Greenhalgh and Manning, 2003) trait anxiety and borderline personality disorder (Milagros, 2006) and disease predisposition (Manning, 2000a).

As a marker of prenatal androgens, digit ratio has also been helpful in illuminating aspects of mate value. For example, lower digit ratios have been connected with better health (Manning, 2002), and higher sperm numbers (Manning et al, 1998). An association between digit ratio and physical attractiveness has also been shown, with lower digit ratio being associated with increased attractiveness to females, as well as increased levels of courtship-like behaviour (Roney and Maestripieri, 2004). Additionally, lower digit ratio in males has been found to be associated with a greater number of sexual partners (Honekopp, Voracek and Manning, 2006) and greater reproductive success (Manning, 2000b). It is therefore hypothesized that this study will find digit ratio to be associated with sexual desire, attitude and behaviour (and, as with Honekopp et al, 2006, number of sexual partners).

It is also anticipated that, consistent with Gangestad and Simpson's Theory of Trade Offs and Strategic Pluralism (2000) those males who invest more in pursuit of sexual relationships and increased number of offspring should invest less in parental investment, and therefore males displaying a higher digit ratio should score higher in terms of cues to parental investment than males with a lower digit ratio.

9.2.1 Experimental Hypotheses.

It was predicted that there would be a significant correlation between male 2D: 4D digit ratio and sociosexual desire, with males showing a lower 2D: 4D digit ratio rating more highly on sociosexual desire than males showing a larger 2D: 4D ratio.

It was predicted that there would be a significant correlation between male 2D: 4D digit ratio and sociosexual attitude, with males showing a lower 2D: 4D digit ratio rating more highly on sociosexual attitude (i.e. being more relaxed about sexual relationships) than males showing a larger 2D: 4D ratio.

It was predicted that there would be a significant correlation between male 2D: 4D digit ratio and sociosexual behaviour, with males showing a lower 2D: 4D

digit ratio rating more highly on sociosexual behaviour (i.e. showing a less restricted approach) than males showing a larger 2D: 4D ratio.

It was predicted that males displaying a higher 2D: 4D digit ratio will be more likely to score highly on the Visual Preference Test, (or to display cues to potential child investment) than males of a lower 2D: 4D digit ratio.

9.3 Methodology

9.3.1 Design

This study employed a quantitative correlational design involving the 2D: 4D digit ratio and both the Revised Socio-Orientation Inventory (see appendix h - ii; Penke and Asendorpf; 2008) assessing sexual behaviour, attitude and desire as used previously, and a Visual Preference Test (see appendix k; Roney, Hanson, Durante and Maestripieri; 2006) to assess interest in children. 2D: 4D digit ratio was taken as the predictor variable. The scores from the R - SOI questionnaire, which were analysed in three parts, desire, attitude and behaviour, provided the criterion variables, along with the scores from the Visual Preference Test.

9.3.2 Materials

As used in the previous study, the R-SOI was used to assess sexual behaviour, attitude and desire (see appendix h - ii). A Likert scale was used with items scored from 1 to 9 with a higher score indicating a less restricted socio-sexuality (i.e. higher desire, more relaxed attitude to sexual relationships and less restricted behaviour). Question 6 was reverse scored (i.e. I do *not* want to have sex with someone until I am sure that we will have a long-term serious relationship). As previously reported analysis of the reliability of the scale showed good internal consistency, with a Cronbach alpha coefficient of.83. In this study the Cronbach alpha coefficient was .86.

Also as used in the previous study the Visual Preference Test was employed to assess interest in children and hence putative future parental investment (Roney, Hanson, Durante and Maestripieri, 2006; see appendix k). Pairs of both photographic and stylised pictures were presented to the participants, each pair consisting of one adult image and one infant image. Ten such pairs were presented, the order of presentation being changed as a way of controlling for the left hand bias. Higher scores indicated a higher interest in children, with preference for the adult picture scoring one and preference for the infant picture scoring two. Analysis of the reliability of the scale showed a reasonable internal consistency, with a Cronbach alpha coefficient of.68.

2D: 4D digit ratio was simply measured with the aid of a pair of compasses and a metal rule.

9.3.3 Participants

Eighty-two male participants were recruited, the majority of whom were university students. A minority of participants were colleagues and acquaintances. Analysis subsequently rejected three entries as incomplete. One participant entry was removed as he had prior knowledge of the hypotheses. Ages ranged from 18 to 61 years, $\underline{M}$ = 27.35, S.D. = 11.36. As previously, normality of the distribution of the ages through Kolmogorov-Smirnov analysis indicated that there was a violation of the assumption of normality for age which was confirmed through an analysis of the histogram. However, analysis of the trimmed means, i.e. with the top and the bottom 5% removed (that being 27.35 untrimmed and 26.21 trimmed), and of the histogram, indicated no extreme outliers and that the more extreme results had had little impact on the final analysis. It was therefore decided not to remove any entries.

Although the participants were aware of the nature of the general area of study (i.e. human sexual strategy), none were aware of the exact nature of the study until the debriefing.

9.3.4 Procedure

Participants were recruited on a voluntary basis mainly from a student population in Buckinghamshire. Due to the personal nature of the questions the procedure for ensuring anonymity and confidentiality was explained in some depth prior to the start of the study. This procedure entailed the separation of the signed consent form, which included demographic information and an ID number, from the main body of the study as in the previous studies. The former was collected upon its completion at which point the main study began. On completion of the Visual Preference Test and the questionnaire the forms were placed, by the participant, in a separate sealed envelope and collected. Participants were also reassured that they could discontinue their involvement in the study at any point, and that they could omit any questions if they felt the need to do so.

To begin participants read an information sheet, completed a consent form and confirmed their age and ethnicity. Participants then had their 2D: 4D digit ratio taken. Measurements of the second and fourth digits of the right hand were taken as the right hand has been shown to yield stronger results than the left (Manning, 2002; Williams et al, 2000). Measurement was taken from the ventral proximal crease to the tip of the finger as per accepted protocol (Bailey and Hurd, 2005a; Millet and Dewitte, 2007; Neave, Laing, Fink and Manning, 2003; Van den Bergh and Dewitte, 2006). Where there were a band of creases the most proximal crease to the tip was measured. Measurement was taken with the aid of a pair of compasses and measured against a metal ruler.

Once the 2D: 4D digit measurements were taken participants were asked to complete the Visual Preference Test. Participants were asked to indicate their preference for one of the two images in each pair. They were also told explicitly that this did not mean sexual preference, but simply that image which drew their immediate attention, for the reasons as discussed in chapter 11.3.3 and 11.3.4. Participants were then shown pairs of images, also as discussed earlier and were asked to indicate an immediate preference for one of them. Ten such pairs were presented.

Participants were then asked to complete the R – SOI questionnaire, and finally the Physical Attractiveness Scale - Revised (not analysed in this study). On completion participants were told the broad nature of the experiment, including why their 2D;4D Digit ratio had been taken, and any questions the participants had were answered. Participants retained an information sheet with contact details for future contact if desired.

9.3.5 Results

9.3.5.1 Descriptive Results

Inferential results and table may be found in the following section (9.3.5.2).

As predicted that there was a highly significant correlation between male 2D: 4D digit ratio and sociosexual desire, with males showing a lower 2D: 4D digit ratio rating more highly on sociosexual desire than males showing a larger 2D: 4D ratio. In other words, the more masculinised male indicated a greater sexual desire than the less masculinised male.

Similarly as predicted there was a significant correlation between male 2D: 4D digit ratio and sociosexual attitude, with males showing a lower 2D: 4D digit ratio rating more highly on sociosexual attitude than males showing a larger 2D: 4D ratio. In other words the more masculinised male was also more likely to exhibit a more relaxed attitude to sexual relationships than the less masculinised male. On investigating items in the scale it was also found that those with a low 2D: 4D digit ratio were significantly less likely to feel the need for a long-term serious relationship in order to have sex with someone. Additionally, though not significant, there appeared to be a directional trend indicating those with a low 2D: 4D digit ratio were more likely to feel comfortable with the thought of casual sex than those with a higher 2D: 4D digit ratio.

Contrary to predictions, however, there was no significant correlation between male 2D: 4D digit ratio and sociosexual behaviour. Males showing a lower 2D:

4D digit ratio were therefore not significantly more likely to rate highly on sociosexual behaviour than males showing a larger 2D: 4D ratio (i.e. more masculinised males were not significantly more likely to practice a less restricted approach). See Figure 8 for Scatterplots demonstrating the relationships between aspects of sociosexuality and digit ratio.

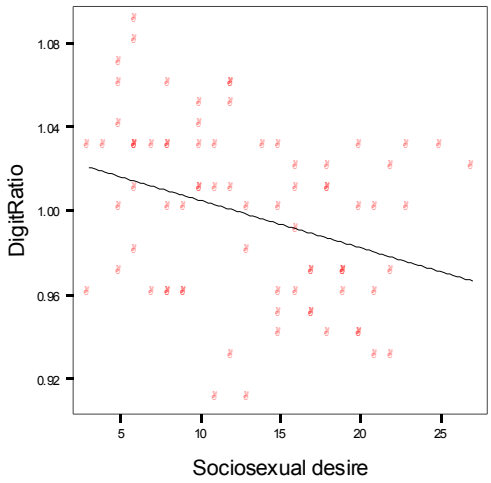
Also contrary to predictions, there was no significant correlation between male 2D: 4D digit ratio and interest in children. Males showing a higher 2D: 4D digit ratio were not significantly more likely to rate highly on the Visual Preference Test than males showing a larger 2D: 4D ratio (i.e. less masculinised males were not significantly more likely to display cues to potential parental investment).

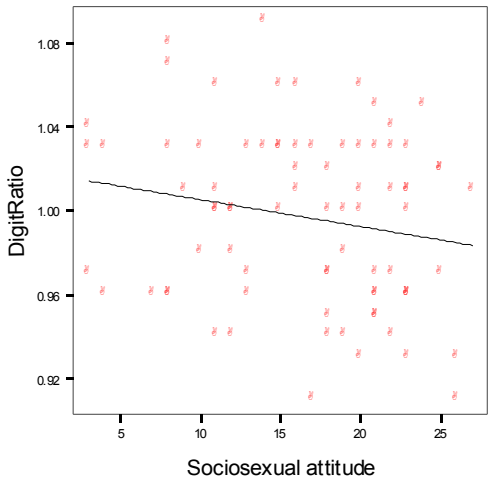
9.3.5.2 Inferential Results

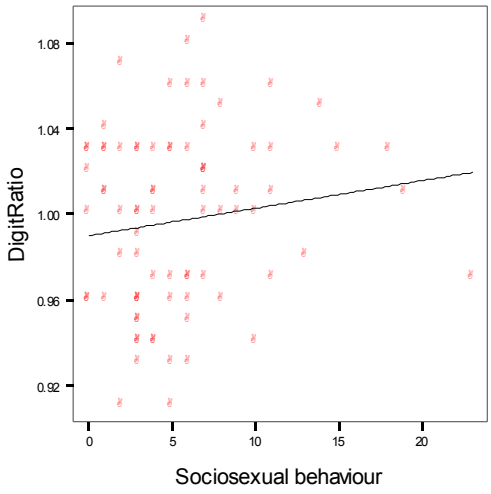
Preliminary investigations, through inspection of the histograms and scatterplots, were carried out to ensure no violation of the assumptions of normality, linearity and homoscedasticity in this and all following investigations. With regard to digit ratio, Shapiro Wilk analysis (chosen as the most appropriate test of normality for small to medium sized samples; Shapiro and Wilk, 1965) indicated a significance of $p = .047$. However, as this was so close to reaching non significance and the sample size was reasonable, it was decided that a parametric analysis would be acceptable.

All correlations controlled for age. Table 7 provides zero order correlations as well as all inferential statistics. Participant numbers vary as many participants completed parts of the questionnaires only, disqualifying them from aspects of the investigation.

Figure 8 Scatterplots showing relationship between Digit Ratio and aspects of sociosexuality with regression lines.







Firstly, partial correlation was used to explore the relationship between male 2D: 4D digit ratio and sociosexual desire. A highly significant, negative relationship was found between male 2D: 4D digit ratio and sociosexual desire (r= ¯.32, N= 77, p= .003). An inspection of the zero order correlation (r= ¯.32) suggested that controlling for age had no effect on the strength of the relationship between the two variables.

Secondly, partial correlation was used to explore the relationship between male 2D: 4D digit ratio and sociosexual attitude. A significant, negative relationship was found between male 2D: 4D digit ratio and sociosexual attitude (r= ¯.20, N= 79, p= .040). An inspection of the zero order correlation (r= ¯.18) suggested that controlling for age had very little effect on the strength of the relationship between the two variables.

When the items of the attitudinal scale were broken down it was found that attitude to the permanence of a relationship was negatively correlated with 2D: 4D digit ratio, i.e. those with a low 2D: 4D digit ratio were significantly less likely to feel the need for a long-term serious relationship in order to have sex with someone (r= ¯.25, N= 80, p= .015). There was also a non-significant but directional correlation between 2D: 4D digit ratio and how comfortable participants were with casual sex (r= ¯.16, N= 79, p= .082)

Thirdly, partial correlation was used to explore the relationship between male 2D: 4D digit ratio and sociosexual behaviour. No significant relationship was found (r= .14, N= 79, p= .217). An inspection of the zero order correlation (r= .14) suggested that controlling for age again had no effect on the strength of the relationship between the two variables.

Lastly, partial correlation was used to explore the relationship between male 2D: 4D digit ratio and cues to parental investment. No significant relationship was found between male 2D: 4D digit ratio and scores on the VPT (r= .082, N= 80, p= .237) though the trend was in the expected direction. An inspection of the zero order correlation (r=.077) suggested that controlling for age had minimal effect on the strength of the relationship between the two variables.

Table 7 Partial Correlation results when measured against 2D: 4D digit ratio

Scale	Correlation Coefficient	Zero-Order Correlation Coefficient	Significance (1st order)	df	N
Desire	-.32	-.32	.003**	73	77
Attitude	-.20	-.18	.040*	75	79
No need for a L.T. rel$^{n.}$ pre sex	-.25	-.24	.015*	76	80
Behaviour	.14	.14	.217	75	79
Cues to parental investment	.082	.077	.237	76	80

* Significant at the .05 level
** Significant at the .01 level

9.4 Discussion

The aim of this study was to investigate 2D: 4D digit ratio and its relationship with aspects of male sexuality, including sexual desire, attitudes and behaviour. It also aimed to investigate the proposition that there would be a relationship between 2D: 4D and indicators of potential parental investment.

9.4.1 Digit ratio and Sociosexuality

Analysis of the results showed that in accordance with predictions there was a significant relationship between 2D: 4D digit ratio and sociosexual desire, with males displaying a lower, or more masculinised 2D: 4D digit ratio scoring higher on the sociosexual desire scale. This was also true of sociosexual attitude, with males displaying a lower 2D: 4D digit ratio again scoring higher on the sociosexual attitude scale (indicating a more relaxed attitude to sexual relationships). When this was broken down it was found that males displaying a lower 2D: 4D digit ratio were significantly more likely to state that they did not need to be sure that they would be in a long-term relationship with someone before they would have a sexual relationship. Low 2D: 4D digit ratio was also

found to show a non-significant trend towards being more comfortable with casual sex. Both factors were consistent with expectation.

However, contrary to expectations, sociosexual behaviour did not conform to the hypothesis as suggested by prior research, i.e. that in which lower digit ratio in males was found to be associated with a greater number of sexual partners (Honekopp et al, 2006) and a greater reproductive success (Manning, 2000b). Rather, this research found no significant relationship between 2D: 4D digit ratio and sociosexual behaviour.

The finding that males displaying a more masculinised digit ratio score more highly in terms of sexual desire is easily understood. According to Trivers' (1972) theory of parental investment, males *should* have evolved a powerful desire for casual sex. A single act of sex for a man, after all, obligates him to no further investment but may have resulted in a pregnancy and an opportunity to perpetuate his genes. So the reproductive benefits of *successfully* pursuing short-term mating opportunities would have been substantial. According to Strategic Pluralism Theory (Gangestad and Simpson, 2000), male mating tactics should 'track' female mate preferences. If females are looking for indicators of Good Genes when contemplating short-term or extra-pair matings, males with a low digit ratio should be more successful than those with a higher ratio. It is therefore consistent that he should also have evolved a stronger desire in order to facilitate this proclivity.

With regard to attitude, again, the results are as hypothesised. The more masculine male exhibits a more relaxed attitude to casual sex as his desires will influence his attitude. It would, on the other hand, be more difficult to understand how evolution could have shaped a powerful desire without a corresponding attitude to allow the execution of that desire should the opportunity arise. What is particularly interesting is that more masculinised males are significantly ($p=.015$) less likely to need to be sure that they would be in a long-term relationship with someone before they would have a sexual relationship. In other words, more masculinised males do not make as

strong a connection between commitment and sex as other, more feminised males. We shall return to this point.

With regard to behaviour, however, the results are less easily understood. More masculinised males were not found to display less restricted behaviour, despite the desire and the attitude to do so. Furthermore, this finding is not consistent with prior research on numbers of sexual partners (Honekopp et al, 2006) and reproductive success (Manning, 2000b.) discussed earlier. How, then, can this be explained?

One possible explanation revolves around the complexity of human sexual strategy. As Symons (1979) pointed out, desire and manifest behaviour are not one and the same. Whilst the male may have a strong desire for casual sex, if the female does not see sufficient incentive for her to consent to such a relationship, the male will not be successful. We return to the finding that males displaying a low digit ratio, the more masculinised males, have indicated that they are significantly less likely to need to be sure that they would be in a long-term relationship with someone before they would have a sexual relationship. It is conceivable, perhaps, that the female is able to sense or 'read' this lack of commitment to a future relationship and hence create a barrier to the fruition of the males' desires. Indeed, this lack of commitment may, in fact, make the male sufficiently 'unattractive', despite his masculinity, to negate his 'masculine advantage' over the fertile phase of the menstrual cycle. Assuming that the increased androgenic exposure associated with low 2D: 4D is also associated with a masculinisation of features, this makes a plausible interpretation. It may be that the very factors which drive a greater desire for and attitude towards casual sex are those which, ironically, create a restriction on his sociosexual behaviour.

However, another putative explanation may be that the more masculinised male is, in fact, more successful reproductively, though not statistically, in short-term matings, as he may be more successful over the fertile period of the females' menstrual cycle, but less successful for the remaining period. If, for example, a female has six short-term liaisons per menstrual cycle, and the majority of these

occur over her fertile period, she may have three such relationships over the fertile period with the more masculine male and three such relationships over the remaining (longer) non-fertile phase with the more feminine male. Such a scenario would result in an equal number of short-term relationships recorded, but as the more masculinised male was more active over the fertile phase, this would result in greater reproductive fitness for the masculinised male, despite a similar number of reported short-term relationships. Such an explanation would also account for the enhanced reproductive success of the more masculinised males as discussed previously (Manning, 200b).

9.4.2 Digit ratio and putative parental investment

Similarly, analysis of the data showed there to be no significant relationship between 2D: 4D digit ratio and cues to potential parental investment. In other words, the predicted relationship between the more feminised male and cues to increased parental investment was not found. It appears, then, that the trade-off proposed by Strategic Pluralism Theory between masculinisation and the promise of 'good genes', and feminisation and the promise of future care, is not grounded, at least in this research, in reality. It is suggested there may be a number of possible explanations.

Firstly, as has been seen, more feminised males are not, at least here, less successful than more masculinised males in terms of short-term relationships (See 9.3.5.2). This could be because the female sees the potential for a longer relationship with the more feminised male and is therefore more willing to embark on a short-term relationship with him in the hope that it may develop into a committed relationship. It may be because she is able to pick up cues to the absence of a connection between a future relationship and casual sex that the more masculinised male reports. It may be that she is making psychological assumptions about his probable kindness, empathy, generosity, level of aggression and so forth, consistent with Perrett et al's research (1998), which makes her prefer the more feminine male under all conditions. It is most probable that there are a number of contributory explanations. Whatever those explanations are, unless due to methodological issues, the impression that the

more feminised male is apparently more successful in terms of short-term relationships than had been expected would negate the need for increased parental investment.

9.4.3 Future research and methodological considerations.

In order to ascertain whether more masculinised males are more successful in short-term relationships over the fertile phase of a female's menstrual cycle, but, as importantly, whether more feminised males are more successful over the non-fertile phase of the cycle, further research regarding the timings and masculinity of short-term partners would be recommended. If females do, indeed, engage in more short-term relationships with the more feminised male over the longer, non-fertile period (albeit less frequently, but resulting overall in an equal number of short-term liaisons over one cycle as with the more masculinised male), the latter hypothesis would gain weight.

Additionally, concern remains, as discussed in the previous to chapters, regarding the possible link that participants may have made between the VPT and investigations into human sexuality. Qualitative research to investigate this possibility may allow a more definitive conclusion and greater confidence that a Type II error has not been made through this potentially confounding methodological issue.

10. Do Good Genes mean Poor Parenting? An investigation into the relationship between cues to potential parental investment, sociosexuality and self-perceived physical attractiveness.

10.1. Synopsis

According to Parental Investment Theory (Trivers, 1972), there should be a differential investment in parenting between males and females, with that sex which has little to gain from increased mating effort investing more in parenting. So females should invest more in parenting and less in investment in mating opportunities than males, and males should invest less in parenting and more in investment in mating opportunities than females. However, there should also be phenotypic diversity within the sexes, with those males who are less likely to be successful in pursuing a short-term strategy benefiting reproductively by reducing mating effort and increasing parental effort (Gangestad and Simpson, 2000; Gross, 1996). Thus, this triangulated study considers the relationship between self-perceived physical attractiveness and a possible trade off with parental investment, the hypothesis being that males who score more highly in terms of self-perceived physical attractiveness should be less willing to invest in parenting effort than males who perceive themselves to be less attractive. This study further looks at the putative trade off between cues to potential parental investment and their relationship with the facets of sociosexuality. Finally, it considers the relationship between self-perceived physical attractiveness and its impact on sociosexuality, the hypothesis being that males scoring higher in self-perceived physical attractiveness will also score more highly in measures of sociosexuality (the more attractive a male is, the higher their mate value and the less they need to commit to long-term relationships).

10.2 Literature Review

10.2.1 Parental Investment and Sociosexuality

According to Trivers' Parental Investment Theory (1972) trade offs are demonstrated by the differential allocation of time and effort by males in their

pursuit of mating opportunities versus parental investment. As he states, parental investment should be understood as, “any investment by the parent in an individual offspring that increases the offspring’s chance of surviving at the cost of the parent’s ability to invest in other offspring” (p. 139). This statement also carries with it the implicit understanding that “the parent’s ability to invest in other offspring” will also include any future offspring that that parent may have. Increased parental investment should, therefore, correlate with reduced mating effort.

For females there should generally be no fitness gains to be had from an increased number of sexual partners. It therefore makes strategic sense for the female to invest more of her time and energy in parental investment than in mating effort. However, for males there are potential fitness gains in increased mating effort. More effort may, after all, mean access to a greater number of sexual partners, with the resultant implication for increased fitness. Hence males should have evolved to expend more effort, as a whole, in the pursuit of mating opportunities than females.

However, as has been discussed in previous chapters, many males will not be successful in pursuing short-term mating strategies as their success will be restricted by female short-term preferences. It would therefore have been an evolutionarily risky strategy for many males to have pursued short-term mating strategies, as these males may not have adequately fulfilled the females’ preferences for such mates. (These preferences have already been discussed in some detail in previous chapters). So, male allocation of effort to short-term mating tactics should be contingent upon their ability to satisfy female preference in this respect. Thus males able to satisfy the short-term requirements of females would benefit from employing a short-term strategy. For the rest, however, a more successful strategy should entail increased parental investment through a long-term monogamous relationship, whilst differentially pursuing extra mate opportunities dependant upon the environmental context. A male predisposition towards investment in a monogamous, long-term relationship should, therefore, be inversely correlated with their genetic fitness or ‘good genes’.

Within sex variation, therefore, should be expected when mixed mating strategies occur (i.e. when a strategy employs a variety of behaviours, or tactics, dependant upon the context). Furthermore, as a corollary to such phenotypic diversity in mating behaviours with regard to mating or parental effort, it would be theoretically consistent to assume that there may also be phenotypic diversity in sexual desire. This should be true as although it is accepted that males should have evolved a greater desire for sexual relationships with a greater number of partners *than females* (Trivers, 1972) it would not have been reproductively useful for *many* males to have an excessive interest in mating with many partners. So, contrary to the argument proposed by Buss (1998) that those males who lacked the psychological mechanism (i.e. desire) to seek out multiple short-term relationships would have been out reproduced by those who had evolved that mechanism, rather it is argued that for some males it would have been reproductively advantageous to have a lower level of sexual desire *than other males*. It would be these males who would be better placed to invest more heavily in parental effort than in failed mating effort offering a poor outcome. As Gangestad and Simpson argue, “Both the desire for multiple mates and the lack of this desire should have been beneficial under certain circumstances” (2000: 561).

Phenotypic diversity should also be expected in terms of attitude and behaviour in sexual relationships, with those males investing more in mating opportunities investing less in potential parenting. Conversely, one would expect to see those males who are investing more in parenting displaying a less casual attitude towards sexual relationships as well as more restricted behaviour, with a proclivity to single, long-term relationships over short-term matings.

10.2.2 Sociosexuality and self-perceived physical attractiveness

It is unlikely that such strategies are articulated at a conscious level. Whilst most males will be aware of their individual proclivities, it is doubtful that the actual strategies that these proclivities represent will even be accessible to conscious thought. However, it is possible that such strategies are influenced by

characteristics that *are* open to conscious consideration. It is possible, for example, that one of these characteristics may be self-perceived physical attractiveness. If, after all, self-perceived physical attractiveness usefully reflects actual physical attractiveness as rated by the opposite sex, then it is possible that an individuals self-perceived attractiveness could influence their level of desire, for the same reasons as set out earlier i.e. a higher level of desire in those who would not normally attract short-term mates could be reproductively disadvantageous due to the increased likelihood of infidelity and potential loss of a primary partner (in the same way that for some males it would have been reproductively advantageous to have a lower level of sexual desire than other males as they would be better placed to invest more heavily in parental effort than in failed mating effort offering a poor outcome). Furthermore, one might predict that increased sexual activity as a result of successfully meeting partner preference for a more attractive male (at least for short-term partnerships) might feedback to elevate baseline levels of desire.

Additionally, one would predict that both attitude and behaviour with regard to casual relationships and short-term mating would be similarly affected, with a more relaxed attitude and less restricted behaviour being displayed by those whose desire for, and potential success in, short-term mating is strongest.

There is some, albeit limited, empirical evidence in support of this position. For example, Rhodes, Simmons and Peters (2005) report a positive correlation between short-term mating success and both facial attractiveness and body attractiveness. They also found that more attractive males reported earlier sexual activity than their peers, a finding supported by Mazur, Halpern and Udry (1994). In their study of the sexual behaviours of 10^{th} and 11^{th} grade boys (i.e. boys of 15 to 16 years of age), they found that sexual behaviour was explained less by pubertal development than by their level of dominance and physical attractiveness. There has also been some research into body symmetry (a factor associated with attractiveness) and sexual behaviour in which low levels of body symmetry have been found to be correlated with a reduced number of lifetime partners (Thornhill and Gangestad, 1994) and later reported age at first sex (Gangestad and Thornhill, 1997). Additionally, males who were more

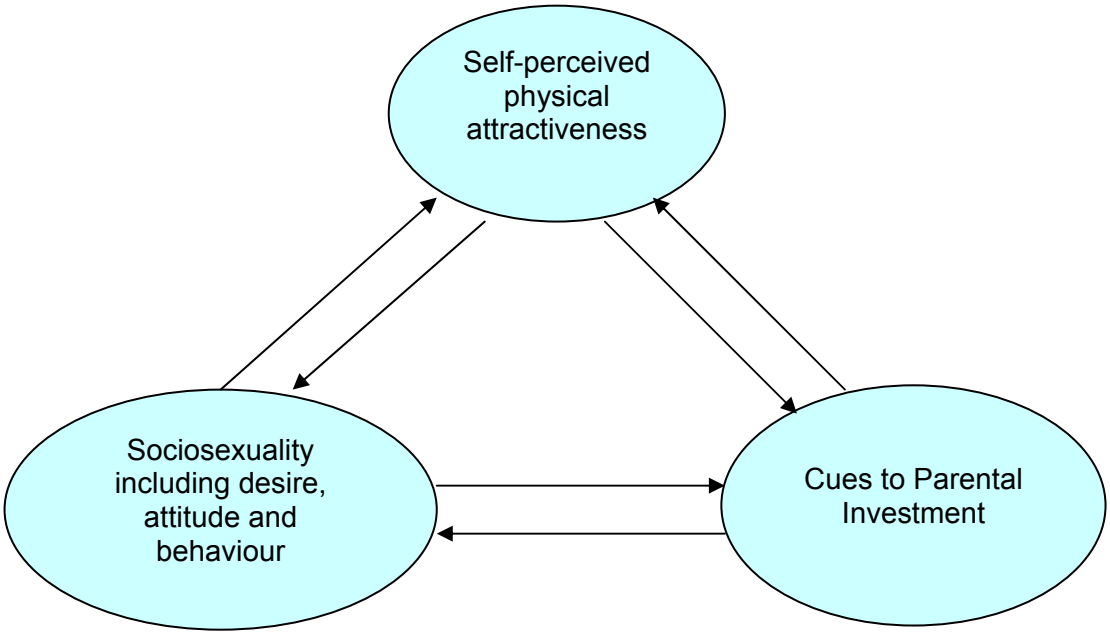
symmetrical and males who have a more unrestricted sociosexual orientation have also been shown to use the same behavioural tactics (i.e. the use of more direct competition with same-sex competitors, as opposed to the accentuation of their personal qualities; Simpson, Gangestad, Christensen and Leck, 1999) indicating a likely correlation between symmetry and sociosexual orientation. As far as is known, there is no empirical evidence which contradicts this position, though as stated there is a relative dearth of literature in this area.

10.2.3 Self-perceived physical attractiveness and parental investment

It is also conceivable that self-perceived physical attractiveness should influence the level of investment made in terms of mating versus parenting. Whilst, again, the rationale for this trade off may or may not be available at a conscious level, (though at this level it becomes more likely that there should be at least some level of conscious awareness), it is theoretically logical that those who perceive themselves to be less physically attractive will recognize that they will be less able to attract a range of short-term partners than their more attractive conspecific. They would therefore be better advised, from a strategic perspective, to invest more in a long-term and stable relationship, and in the resultant offspring that that relationship might then produce.

It is predicted, therefore, that there should be a complex relationship between these variables as summarized in Figure 9 and expressed in the formal hypotheses under 10.2.4.

Figure 9 Flow Diagram to illustrate the relationships between factors affecting investment in mating and parenting.



10.2.4 Experimental Hypotheses

10.2.4.1 Hypotheses regarding Parental Investment and Sociosexuality

It was predicted that there would be a significant correlation between scores in the Visual Preference Test and sociosexuality, with males scoring lower on the Visual Preference Test scoring more highly in measures of sociosexuality (i.e. the less interest displayed in children, the greater the sociosexual desire, the more relaxed the attitude towards sexual relationships and the less restricted the sexual behaviour).

10.2.4.2 Hypotheses regarding self-perceived physical attractiveness and Sociosexuality

It was predicted that there would be a significant correlation between self-perceived physical attractiveness and sociosexuality, with males scoring higher in self-perceived physical attractiveness also scoring more highly in measures of sociosexuality (i.e. the higher the self-perceived physical attractiveness, the greater the sociosexual desire, the more relaxed the attitude towards sexual relationships and the less restricted the sexual behaviour).

10.2.4.2 Hypotheses regarding self-perceived physical attractiveness and cues to parental investment

It was predicted that there would be a significant correlation between scores in the Visual Preference Test and self-perceived physical attractiveness, with males scoring lower in the Visual Preference Test scoring more highly in terms of self-perceived physical attractiveness.

10.3 Methodology

10.3.1 Design

This study employed a triangulated, quantitative, correlational design. Interrelationships between three factors were considered. Firstly, in order to assess interest in children and potential future parental investment a Visual Preference Test was utilized (see appendix k). Secondly, participants were asked to complete the R-SOI (see appendix h - ii) assessing sexual desire, attitude and behaviour. Lastly, participants completed a questionnaire adapted from PAS – R (see appendix j) assessing self-perceived physical attractiveness. Consequently the relationship between potential parental investment and sociosexuality was investigated, as was the relationship between sociosexuality and self-perceived physical attractiveness, and lastly the relationship between potential parental investment and self-perceived physical attractiveness.

10.3.2 Materials

As used in previous studies the Visual Preference Test (VPT) was employed to assess interest in children and potential future parental investment (Roney, Hanson, Durante and Maestripieri; 2006; see appendix k). A full description of this test is provided under section 8.3.2.

Similarly, a full description of the R-SOI (see appendix h - ii) can be found under section 8.3.2., as can full details on the Physical Attractiveness Scale - Revised, as extracted from the International Personality Item Pool (see appendix j).

10.3.3 Participants

As participants for this study were as in the previous study, please see chapter 8, section 3.3 for more information.

10.3.4 Procedures

Please see chapter 8.3.4.

10.3.5 Results

Preliminary investigations were carried out, through inspection of the histograms and scatterplots, as well as through Shapiro Wlik's test of normality in order to check for any violations of normality, linearity and homoscedasticity in this and all following investigations in this chapter. Shapiro Wilk analysis highlighted a violation of the assumption of normality for VPT ($p = .029$) and self-perceived physical attractiveness ($p = .022$). As a result the non-parametric correlational analysis, Spearman's Rho, was used. Participant numbers again vary as many participants completed parts of the questionnaires only, disqualifying them from aspects of the investigation.

10.3.5.1 Parental Investment and Sociosexuality

Spearman's rho correlation was used firstly to explore the relationship between the Visual Preference Test and sociosexuality generally. A significant, negative relationship was found between the Visual Preference Test and sociosexuality, (r= ¯.228, N= 76, p= .024). Males scoring higher in terms of sociosexuality (i.e. those exhibiting a greater sociosexual desire, more relaxed attitude towards sexual relationships and less restricted sexual behaviour) did, indeed, display a lower interest in children.

Secondly, Spearman's rho correlation was used to explore the relationship between the Visual Preference Test and sociosexual desire. A highly significant, negative relationship was found between the Visual Preference Test and sociosexual desire, (r= ¯.266, N= 78, p= .009). So males scoring higher in terms of sociosexual desire displayed a lower interest in children.

Thirdly, Spearman's rho correlation was used to explore the relationship between the Visual Preference Test and sociosexual attitudes. A non-significant but negative trend was found between the Visual Preference Test and sociosexual attitude, (r= ¯.157, N= 80, p= .083). So, males scoring higher in terms of sociosexual attitude showed a non-significant leaning towards a lower interest in children.

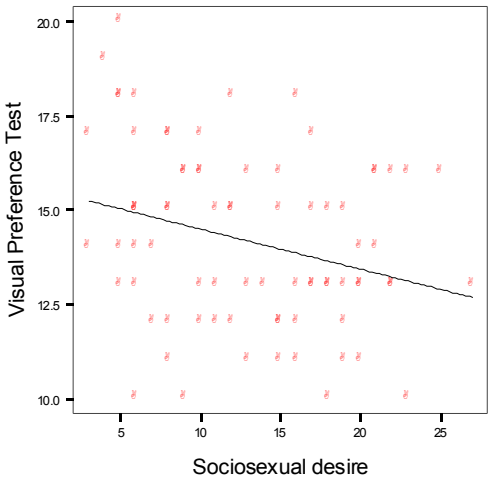
Fourthly, Spearman's rho correlation was used to explore the relationship between the Visual Preference Test and sociosexual behaviour. No significant relationship was found between the Visual Preference Test and sociosexual behaviour, (r= ¯.019, N= 80, p= .432). See Table 8 and Figure 10 for a summary.

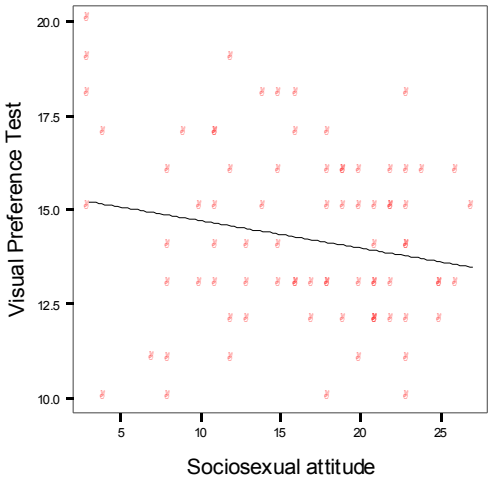
Table 8 Pearson Correlation results for Sociosexuality and Visual Preference Test

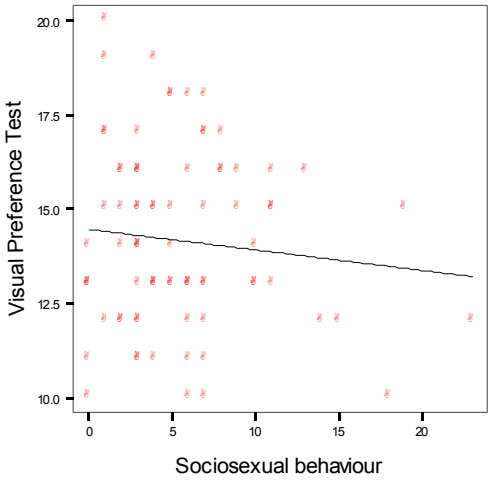
Scale	Correlation Coefficient	N	Significance
Sociosexuality	-.228	76	.024*
Sociosexual Desire	-.266	78	.009**
Sociosexual Attitude	-.157	80	.083
Sociosexual Behaviour	-.019	80	.432

* Significant at the .05 level
** Significant at the .01 level

Figure 10 Scatterplots showing relationship between VPT and aspects of sociosexuality with regression lines







10.3.5.2 Self-perceived physical attractiveness and Sociosexuality

Firstly, Spearman's rho correlation was used to explore the relationship between self-perceived physical attractiveness and sociosexuality generally. This indicated a highly significant, positive relationship between the two variables, (r= .39, N= 77, p= .001), indicating that the more physically attractive participants perceived themselves to be, the greater their sociosexuality (i.e. the higher their desire, the more relaxed their attitude towards sexual relationships and the less restricted the behaviour).

Secondly, Spearman's rho correlation was used to explore the relationship between self-perceived physical attractiveness and sociosexual desire. This indicated a significant relationship between the two variables, (r= .222, N= 79, p= .025), indicating that the more physically attractive participants perceived themselves to be, the greater the sociosexual desire.

Thirdly, Spearman's rho correlation was used to explore the relationship between self-perceived physical attractiveness and sociosexual attitudes. This indicated a highly significant relationship between the two variables, (r= .341, N= 81, p= .001), indicating that the more physically attractive participants perceived themselves to be, the greater their sociosexual attitude score (i.e. the more relaxed they were about sexual relationships).

Lastly, Pearson correlation was used to explore the relationship between self-perceived physical attractiveness and sociosexual behaviour. This, again, indicated a highly significant relationship between the two variables, (r= .295, N= 81, p= .004), indicating that the more physically attractive participants perceived themselves to be, the greater their sociosexual behaviour score (i.e. the more polygamous their approach to sexual relationships). See Table 9 and Figure 11.

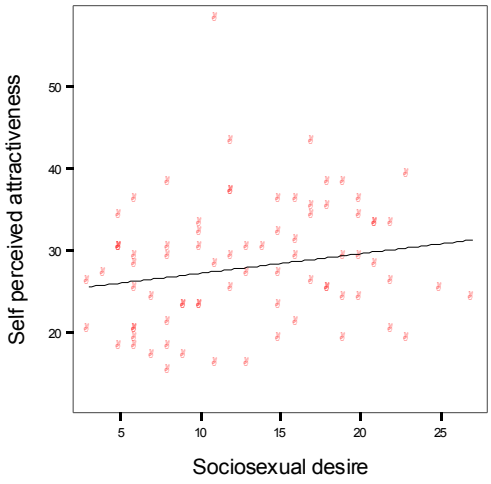
Table 9 Pearson Correlation results for Sociosexuality and self-perceived physical attractiveness

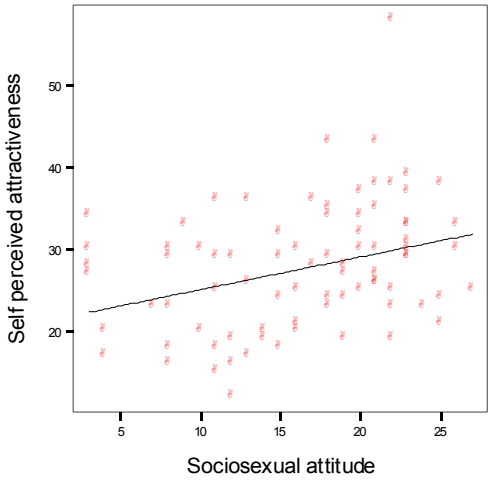
Scale	Correlation Coefficient	N	Significance
Sociosexuality	.390	77	.001**
Sociosexual Desire	.222	79	.025*
Sociosexual Attitude	.341	81	.001**
Sociosexual Behaviour	.295	81	.004**

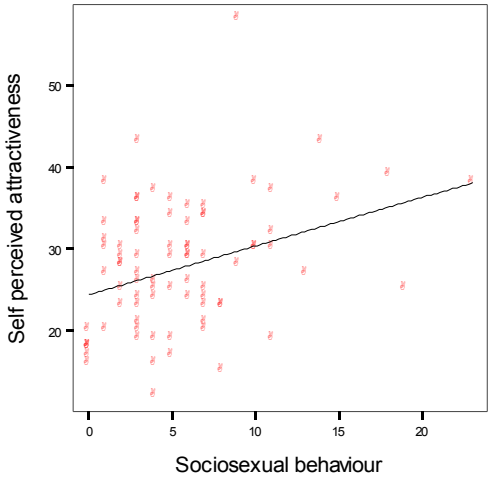
* Significant at the .05 level
** Significant at the .01 level

Figure 11

Scatterplots with regression lines showing relationship between aspects of sociosexuality and SPPA.







10.3.5.3 Parental investment and self-perceived physical attractiveness

Spearman's rho correlation was used to explore the relationship between the cues to potential parental investment and self-perceived physical attractiveness. A non-significant but directional trend was found between the Visual Preference Test and self-perceived physical attractiveness (r= ¯.098, N= 81, p= .192). In other words, though not significant, the trend suggested that the more physically attractive participants perceived themselves to be, the less interest they displayed in infants.

10.4 Discussion

This study aimed to investigate the complex interrelationships and trade offs between cues to parental investment, sociosexuality and self-perceived physical attractiveness. The research was triangulated with the relationships between potential parental investment and sociosexuality, sociosexuality and self-perceived physical attractiveness, and potential parental investment and self-perceived physical attractiveness being investigated.

10.4.1 Parental Investment and Sociosexuality

As hypothesized, there did appear to be a trade off between potential parental investment and sociosexuality, consistent with theoretical expectations and Trivers' Parental Investment Theory (1972), with a significant negative correlation of -.228 (p=.024). In other words, those males exhibiting a greater sociosexual desire, more relaxed attitude towards sexual relationships and less restricted sexual behaviour did, indeed, display a reduced interest in children, and, arguably, a cue to reduced future parental investment. The evidence does, then, support the Trivers' theory that there should be a trade off between investment in time in pursuit of mating opportunity and investment in time in parenting.

Of particular interest, however, was the significance of the component parts of the SOI – R. With regard to sociosexual desire, the trade off with potential parental investment was particularly strong (r = -.266, p=.009). So at a very personal level, and one which, arguably, will be least easily constrained by social or cultural factors, there appears to be a very direct and clear trade off between cues to parental investment and level of sexual desire. (This is not to suggest that sexual desire is totally innate, unmodified by culture and social attitudes and expectation, but that of the three elements of sociosexuality, desire is, perhaps, the least subject to these modifying influences).

However, at the next 'level' of sociosexuality, i.e. attitude towards sexual relationships, this inverse relationship with potential parental investment is weakened (r = -.157, p=.083). It is suggested that this might be best explained by social and cultural factors which modify and constrain 'basic instinct' in order to present a more acceptable social self. In other words, it appears that morality, and societal expectations and norms, begin to constrain the cognitive by-product of desire, that being attitude, and its relationship with parental investment, into something more culturally acceptable. It is argued, then, that societal expectations and attitudes are influencing the attitudes of those perhaps less innately inclined towards parental investment.

This is also, perhaps, a reasonable explanation for the non-significant relationship between sexual behaviour and parental investment, which, though following the directional trend, has lost significance (r = -.019, p = .432). There is, after all, a powerful cultural interest in the protection of and investment in our children. To openly reject this cultural attitude is therefore a socially unattractive stance to adopt, and may, in itself, be of reproductive disadvantage through the negative impact on potential partners (partner choice having, after all, a powerful moderating influence on behaviour in a way in which it cannot with regard to desire).

10.4.2 Sociosexuality and self-perceived physical attractiveness

As hypothesized, there was a highly significant, positive relationship between self-perceived physical attractiveness and the component parts of the SOI – R, with scores for sociosexuality increasing alongside scores for self-perceived physical attractiveness ($r = .390$, $p=.001$). However, as before the significance of the component parts of the SOI – R provided perhaps the most interesting elements of the research.

With regard to desire, there is a significant relationship between self-perceived physical attractiveness and desire ($r = .222$, $p=.025$), with, as expected, higher scores for self-perceived physical attractiveness being associated with increased desire. Consistent with theory, if self-perceptions accurately reflect others' perceptions, then higher self-perceived physical attractiveness should correlate positively with the anticipation of short-term mating success, driving elevated desire. Conversely, those scoring lower for self-perceived physical attractiveness should anticipate reduced short-term mating success. As previously stated, in such instances a higher level of sociosexual desire could be reproductively disadvantageous through the increased likelihood of infidelity and possible loss of the primary partner. It is also possible, however, that desire is associated with self-perceived physical attractiveness in a more direct way. It is possible that it is, in fact, female choice and the *actuality* of increased short-term mating success, which provides a further reason for increased sociosexual desire.

An even stronger relationship than that with sexual desire can be seen between both self-perceived physical attractiveness and sexual attitude, and self-perceived physical attractiveness and sexual behaviour. It is argued that both elevated sociosexual desire (for the reasons just given), in addition to the ability to satisfy partner preference, combine to encourage both a more relaxed sociosexual behaviour and more relaxed sociosexual attitudes. It would appear, then, that a complex feedback system is enacted in which sociosexual desire, attitude and behaviour are all influenced both by external factors (e.g. female preference) and by their influence upon each other.

It is worth noting that whilst discussion has been made of the relationship between attractiveness and sociosexuality, this has not included discussion of the supposed link between attractiveness, good genes and masculinity (though this has been considered in appendix b - ii). The reason for this omission is that it is, in fact, less than certain that self-perceived attractiveness equates to 'good genes'. Certainly there is theoretical argument to suggest that there should be such a relationship. The evolutionary argument, as previously discussed, proposes that facial attractiveness is a marker of good genes, and that masculinity, as a marker of phenotypic quality through elevated immunocompetence, should hence be attractive (Grammer and Thornhill, 1994; Thornhill and Gangestad, 1993). Empirical support for such a proposition is offered by Scheib et al (1999). Their investigation into cues to phenotypic condition (or 'good genes') did, indeed, find an association between facial attractiveness and masculinity (as measured by cheekbone prominence and the relative length of the lower face). This was also consistent with the research by Johnston et al (2001), as previously discussed. Nevertheless, there is a relative dearth of empirical support for a positive correlation between increased masculinity and increased attractiveness.

Indeed, previous research has cast doubt over this potential over-simplification, highlighting the influence of socio-cultural factors over perceptions of attractiveness. It seems that these factors may, in fact, supersede bio-physiological influences specifically over the non-fertile phase of a female's menstrual cycle as previously discussed. For example, research by Perrett et al (1998) suggests that in fact more feminised males may be regarded as more attractive to prospective partners, except over the mid-follicular to ovulatory fertile phase of their menstrual cycle, as a product, most probably, of the 'feminine' characteristics attributed to the apparently more feminine male. Similarly, investigations into the impact of averaging faces also indicated, amongst other findings, that composite images increased ratings of attractiveness but decreased ratings of masculinity (Little and Hancock, 2002). Environmental harshness and duration of relationship too has also been shown to moderate level of masculinity preference, and presumably attractiveness of a

masculine face (Little, Cohen, Jones and Belsky, 2007). Additionally, Cunningham et al (1990: 61) highlight the 'multiple motives' behind attractiveness ratings, indicating that "appearances [which] elicit [females'] nurturant feelings, [which] appear to possess sexual maturity and dominance characteristics, [and which] seem sociable, approachable, and of high social status" are rated as more attractive than those which are rated lower in these areas.

The latter findings are consistent with the previous chapters of this thesis. For example, higher attractiveness ratings were achieved by the homosexual over the heterosexual composite images, as well as an indication that this was connected with increased femininity of the composite homosexual face. Furthermore, those displaying a lower 2D: 4D Digit Ratio (or higher masculinity) showed depressed sociosexual behaviour, consistent with female preference for a less masculinised male. This interpretation was strengthened by the finding that whilst the more masculinised male showed depressed sociosexual behaviour, he conversely (and as expected) showed elevated sociosexual desire and a more relaxed sociosexual attitude. If one were to assume that self-perceived attractiveness were one and the same as a measure of masculinity, then one would expect to find similar results for the male rating high in self-perceived attractiveness, i.e. one would expect to find that the more attractive male scored higher in sociosexual desire and attitude, but would exhibit depressed scores in sociosexual behaviour. This was not the case, the more attractive male in fact exhibiting higher scores for sociosexuality across all facets, including sociosexual behaviour ($r=.295$, $p=.004$). Furthermore, one might also expect to find a negative correlation between self-perceived attractiveness and Digit Ratio (i.e. the more attractive you are, the more masculine you are), and again this was not found ($r= -.012$, $p= .458$). Thus, it would appear that it may be erroneous to equate self-perceived physical attractiveness with either masculinity or 'good genes'.

10.4.3 Parental investment and self-perceived physical attractiveness

In order to triangulate the research, the relationship between cues to parental investment and self-perceived physical attractiveness was investigated. Contrary to the hypothesis and to Strategic Pluralism Theory, no significant relationship was found (r= ¯.098, p= .192), though the directional trend was as anticipated, with lower scores in parental investment being marginally associated with higher scores for self-perceived physical attractiveness.

Although difficult to explain, it is possible that the possible trade off between effort spent in parenting and effort invested in the pursuit of mating opportunities as a response to self-perceived physical attractiveness might, as was suggested under 8.6.2 regarding height and commitment, be expressed less directly. It may be that whilst those who do not believe themselves to benefit from the 'good genes' that would reliably attract short-term partners (i.e. those scoring low on the self-perceived physical attractiveness scale) do not appear to compensate in terms of increased cues to parental effort, they may, in fact, compensate indirectly through increased diligence and care of the mother. Thus whilst the relationship between self-perceived attractiveness and parental investment exists, it may be expressed through the mother as opposed to the offspring.

10.4.4 Methodological constraint and future research.

In view of the research findings and the emphasis placed on the moderating influence of female preference, it would be helpful to ascertain whether self-perceived physical attractiveness did, indeed, correlate positively with others' perceptions of physical attractiveness. It is assumed that there should be such a correlation. However, in the absence of such a correlation, the conclusions drawn above would clearly be subject to debate. Whilst some research exists which suggests that self-ratings are relatively accurate (a good ecological indicator of accuracy being an investigation into waitresses' self-ratings of attractiveness and sexiness correlating with size of tips; Lynn, 2008), findings

have been contradictory. For example, further studies have found that there is a significantly positive correlation between self and other ratings of physical attractiveness in females but not males (Rand and Hall, 1983), and there is also research that suggests the opposite, that female ratings of their own attractiveness are not correlated with male raters, that they overestimate their attractiveness and that more attractive females are apt to overestimate more than less attractive females (Brewer, Archer and Manning, 2007). For this reason, further research with the addition of self and other ratings of attractiveness would be advantageous. Nevertheless, whether the correlation exists between self and other-perceived attractiveness or not, this study chose to consider self-perceptions, as it would be, after all, self-perceptions which would, arguably, create the primary psychological impact on attitudes and resultant behaviour.

Furthermore, the possibility that males who do not rate themselves highly for physical attractiveness might compensate in terms of parental investment through their investment in their primary partner, as opposed to more directly through their offspring, is also worthy of investigation. Empirical investigation into male diversity in self reported love and investment in their primary partner (either actual or emotional) would therefore be of value, with the hypothesis that those who believed themselves to be of lower physical attractiveness would profess to love and invest more in their partners than those males who scored higher in self-perceived physical attractiveness.

Lastly, it may also be possible that the potential methodological flaw regarding the use of the VPT in the study of human sexual strategy may have had some impact (see chapter 8.6.1), with males being reluctant to rate photographs of infants positively through conscious or sub-conscious fear of a paedophilic association. However, the associated ethical implications involved in withholding the broad nature of the study made this difficulty unavoidable.

11. When trade-offs are expected and when they are not: Gender differences in the relationship between self-perceived physical attractiveness and sociosexuality.

11.1 Synopsis

This study investigates gender differences in the relationship between self-perceived physical attractiveness and sociosexual behaviour. Specifically it investigates the proposition that there should be a positive relationship for males between self-perceived physical attractiveness and aspects of sociosexuality, including sociosexual desire, sociosexual attitude and sociosexual behaviour. In other words, as males rate themselves more highly in self-perceived physical attractiveness, so they should also score more highly in terms of sociosexuality. However, based on Trivers' theory of sexual selection and parental investment (1972) it is proposed that the same relationship need not exist for females. Thus, male and female relationships with self-perceived physical attractiveness and sociosexuality are investigated, along with putative gender differences in these relationships.

11.2 Literature review

The previous chapter considered the relationship between, amongst other factors, self-perceived physical attractiveness and sociosexuality amongst males. It found that there was a highly significant relationship between ratings for the two factors ($r = .390$, $p=.001$), with scores for self-perceived physical attractiveness increasing alongside scores for sociosexuality. When broken into the SOI's component parts it was also found that whilst desire was significant ($r = .222$, $p=.025$), attitude and sociosexual behaviour were more so ($r = .341$, $p=.001$ and $r = .295$, $p=.004$ respectively). It was concluded that the relationship between self-perceived physical attractiveness in males and sociosexual desire, attitude and behaviour was a complex one. All elements appear to influence each other, and are further influenced, crucially, by societal norms, expectations and, perhaps most importantly, female preference for physically attractive men in a short-term relationship.

In this chapter the question of gender differences is considered, with regard to self-perceived physical attractiveness and aspects of sociosexuality, focussing on Trivers' theory of sexual selection and parental investment (1972) as a theoretical foundation. Trivers' theory did, of course, pave the way for a proliferation of empirical research investigating the major sex differences in human mating strategies, all based on the premise that the female, through gestation, child bearing, lactation and all of the ensuing care and protection of the infant, carries the most valuable reproductive resources. Thus, as economic theory would predict, the female will not be willing to allocate these resources indiscriminately. As a result, the females of the species tend to be more restrictive in their sociosexuality than the males, and more discriminating in their choice of partner. (It is worth commenting, however, that it is the sex that invests more and which controls the reproductive resources, not the female of the species per se, which is the more discriminating. This is *usually* the female – and is the female in all species of mammals – but does not have to be so. There are examples, for instance, of sex-role reversed species such as the Mormon cricket and the pipefish seahorse in which the male invests more in terms of parenting and is also the more discriminating in terms of mate choice (Trivers, 1985). Nevertheless, with regard to humans the females are deemed to be the choosier of the two sexes by dint of their limited reproductive capacity.

How might this impact in terms of gender differences when considering sociosexuality and self-perceived physical attractiveness? In males, and in accordance with the hypotheses set out in the previous chapter, there was a positive relationship between sociosexuality and self-perceived physical attractiveness. In terms of desire, this was attributed to two possible factors. Firstly, and most obviously, if self-perceived physical attractiveness is positively correlated with actual physical attractiveness, this should provide a reliable indicator of possible success in pursuing a short-term mating strategy. Thus it would be beneficial for an appropriate drive to have evolved in order to facilitate this mating advantage. It is also possible, however, that desire has developed as a result of increased sexual success, with, in fact, increased attractiveness enhancing success in short-term mating due to female preference, in turn

relaxing attitudes towards sexual behaviour and so enhancing desire. Thus it is possible that either a baseline level of desire exists in males which is modified by the environmental context (attractiveness, societal norms, partner choice and so on), or there is, in fact, genetically determined phenotypic diversity in sociosexual desire, with those males who have more to gain from pursuing a monogamous, long-term relationship actually benefiting from a lower level of desire than other males.

In terms of the relationship for males between both self-perceived physical attractiveness and sexual attitude, and self-perceived physical attractiveness and sexual behaviour the relationship is stronger than the relationship between self-perceived physical attractiveness and sociosexual desire. The putative explanation offered is that female preference for physical attractiveness when looking for a short-term relationship drives increased sexual behaviour, and with it a more relaxed attitude towards uncommitted sexual relationships. This is exacerbated by societal norms and expectations, in which physical attractiveness is associated with a less restricted approach to sexual relationships.

However, as Trivers' points out, the female of the species must be more discriminating when she chooses a sexual partner. For her, as the primary 'chooser', her level of physical attractiveness, both self-perceived or actual, should have little impact on her levels of desire, or, arguably, her attitudes towards sexual relationships or resultant behaviour. There would be no evolutionary advantage, after all, for the female to have an increased desire, associated to physical attractiveness or otherwise, due to her inability to bear an unlimited number of offspring. In other words, her limited reproductive capacity should negate the need for an increased level of sociosexuality, whether that be in terms of sociosexual desire, attitude or behaviour. (This, of course, differs from the male of the species whose increased desire could, potentially, afford him the opportunity to father large numbers of offspring).

To return to the 'arguably' in the previous paragraph, there is, however, the impact of male preference to consider, for whilst females are the primary

choosers in human mating behaviour, males also choose, and their preferences will in turn impact upon female behaviour and attitudes. Thus the more attractive females will be approached more frequently and with more determination for sexual relationships than the less attractive female (as physical attractiveness is uppermost in male mating preference due to its link with fecundity). It could be reasonably anticipated that this differential should have at least some impact upon the females' resultant behaviour and attitudes, and less so, perhaps, her desire.

This area of enquiry has received a fair degree of empirical investigation, though with conflicting results. For example, an investigation conducted by Clark (2004) into the differing sources of monogamous/ polyandrous proclivity in females as indexed by the SOI considered a number of possible sources including physical attractiveness. Three studies were conducted in which it was found that whilst self-perceived attractiveness predicted SOI in the first and third studies, it did not do so in the second study. Furthermore, facial attractiveness in females was correlated with the number of long-term but not short-term sexual partners in a study by Rhodes et al (2005), although in the same study no correlations were found between body attractiveness and any sexual behaviour variable in females (though correlations were found for males between body attractiveness and the number of short-term but not long-term partners). Low levels of body symmetry have, however, been reported to be associated, as with males, with low reported lifetime number of sexual partners in females (Thornhill and Gangestad, 1994).

Additionally, Weiderman (1998) found that females with a higher body mass index (BMI) and who were rated by experimenters as less facially attractive were less likely to be in a dating relationship or to have had sexual intercourse. However, again the story was unclear as it was also found that once the respondents had had sexual intercourse they did not have significantly fewer lifetime partners than females with a lower BMI. Interestingly this study considered the possible reasons for the relationships they did find between body size, attractiveness and sexual experience. Possible causes investigated included differing sociosexual attitudes, inhibition through self-consciousness

and reduced opportunity. It found no relationship between BMI and attitudes towards sexual relationships as measured by the Sexual Opinion Survey (Fisher, Byrne, White and Kelly, 1988), nor did it find that a higher BMI was related to either sexual esteem scores or their evaluation of themselves as a sexual partner. They conclude, albeit hesitantly, that the primary explanation for those negative relationships they did find between BMI and sexual relationships was relative lack of opportunity as a result of reduced interest from potential partners.

The relationship between female sexuality and self-perceived attractiveness, therefore, remains inconclusive. As such it is possible that the relationship between physical attractiveness and sociosexuality could be another area in which gender differences might be observed. Whilst the relationship for males between physical attractiveness and sociosexuality should be a clear and positive one, the relationship for females is unclear. This study, therefore, investigates the relationship between female self-perceived physical attractiveness and sociosexuality, before making a between sex comparison. The formal hypotheses are therefore set out below:

11.2.1 Experimental Hypotheses

11.2.1.1 Males, self-perceived physical attractiveness and sociosexuality

It was predicted that there would be a significant correlation between male self-perceived physical attractiveness and sociosexuality, with males rating highly on self-perceived physical attractiveness also rating more highly on sociosexuality (i.e. requiring less emotional commitment and intimacy before committing to a sexual relationship) than males rating lower on self-perceived physical attractiveness.

11.2.1.2 Females, self-perceived physical attractiveness and sociosexuality

It was predicted that there would be no significant correlation between female self-perceived physical attractiveness and sociosexuality.

It was predicted that there would be no significant correlation between female self-perceived physical attractiveness and sociosexual desire.

It was predicted that there would be no significant correlation between female self-perceived physical attractiveness and sociosexual attitude

It was predicted that there would be no significant correlation between female self-perceived physical attractiveness and sociosexual behaviour.

11.2.1.3 Gender differences in self-perceived physical attractiveness and sociosexuality

It was predicted that there would be a significant difference between the relationship between male self-perceived physical attractiveness and sociosexuality and female self-perceived physical attractiveness and sociosexuality.

It was predicted that there would be a significant difference between the relationship between male self-perceived physical attractiveness and sociosexual desire and female self-perceived physical attractiveness and sociosexual desire.

It was predicted that there would be a significant difference between the relationship between male self-perceived physical attractiveness and sociosexual attitude and female self-perceived physical attractiveness and sociosexual attitude.

It was predicted that there would be a significant difference between the relationship between male self-perceived physical attractiveness and sociosexual behaviour and female self-perceived physical attractiveness and sociosexual behaviour.

11.3 Methodology

11.3.1 Design

This study employed a quantitative mixed groups design in two parts. In the first part two groups, males and females, completed a correlational study on self-perceived attractiveness and sociosexuality. In the second part the correlations were compared to see if self-perceived physical attractiveness explains significantly more of the variance in sociosexuality in either males over females or females over males. The correlational study involved two questionnaires – the Physical Attractiveness Scale assessing self- perceived physical attractiveness and the R-SOI assessing sexual behaviour, attitude and desire. The scores from the former provided the predictor variable and the latter the criterion variable.

11.3.2 Materials

Firstly, the Revised Socio-Orientation Inventory was used to assess sexual behaviour, attitude and desire (see appendix h - ii). A Cronbach Alpha analysis of the scale showed good internal consistency, with a coefficient of.83. In this study the internal consistency was also demonstrated to be good, with a Cronbach alpha coefficient of .855 for males and .839 for females. Scoring was as indicated in chapter 8, subsection 3.2.

Participants were subsequently asked to complete a questionnaire adapted from Physical Attractiveness Scale - Revised (see appendix j) chosen in order to assess self-perceived physical attractiveness. Analysis of the reliability of the original scale showed good internal consistency, with a Cronbach alpha coefficient of .83. In the current study the Cronbach alpha coefficient was .738

for males and .855 for females. Again, scoring was as indicated in chapter 10, subsection 3.2.

11.3.3 Participants

141 females and 83 males participated in the study. The majority of participants were psychology undergraduates, though a small number were recruited through personal contacts. See Table 10 for descriptive statistics regarding the ages of the participants.

Table 10 Descriptive statistics for age for female and male participants

Males			Females		
Mean age	Range	Standard Deviation	Mean age	Range	Standard Deviation
27.85	18-69	12.19	30.42	18-61	11.39

Kolmogorov-Smirnov analysis of the male data indicated that there was a violation of the assumption of normality for age. This was confirmed through an inspection of the histogram. However, as the trimmed mean of 26.57 was close to the original mean, indicating that this had not had a strong influence, this violation was felt to be acceptable. A boxplot of the distribution of the ages indicated one extreme outlier. It was decided not to remove this outlier, however, as analysis with and without proved to be virtually indistinguishable.

Kolmogorov-Smirnov analysis of the female data also indicated that there was a violation of the assumption of normality for age and this was confirmed, again, through an inspection of the histogram. Again the trimmed mean (29.56) was sufficiently close to the original mean to be satisfied that the violation of the assumption of normality was acceptable. A boxplot of the distribution of the ages indicated that there were no extreme outliers.

11.3.4 Procedure

As in previous studies (see 8.3.4, 9.3.4 and 10.3.4), male and female participants were asked whether they would be willing to participate, on a voluntary basis, in a study on human sexuality. Those who were willing were then given an information sheet and consent form, and were advised both verbally and through the consent form that they were free to withdraw at any point should they wish. Procedures to ensure anonymity and confidentiality were explained in some detail due to the sensitive and private nature of the SOI questionnaire.

Once these procedures were completed participants were asked to complete both questionnaires in their own time.

Having completed the questionnaires, participants were thanked for their participation and any questions were answered.

11.3.5 Results

11.3.5.1 Descriptive Results

Inferential results and table may be found in the following section (11.3.5.2). It should be noted that due to partial completion of some of the questionnaires, total number of analysed responses varies.

Males, self-perceived physical attractiveness and sociosexuality

As already reported, there was a highly significant correlation between self-perceived physical attractiveness in males and sociosexuality, with males scoring higher in self-perceived physical attractiveness also scoring more highly in sociosexuality. In other words, males who believed themselves to be more physically attractive were more likely to require less in terms of emotional

commitment and intimacy before having a sexual relationship than those who believed themselves to be less attractive (See Figures 11 and 12).

Females, self-perceived physical attractiveness and sociosexuality

Also as predicted there was no significant correlation between self-perceived physical attractiveness in females and sociosexuality, with females scoring higher in self-perceived physical attractiveness scoring no more highly in sociosexuality than females scoring lower in self-perceived physical attractiveness. In other words females who believed themselves to be more physically attractive were no more or less likely to require a certain level of emotional commitment and intimacy before having a sexual relationship than those who believed themselves to be less attractive.

This also held true for the relationships between self-perceived physical attractiveness in females and sociosexual desire, attitude and behaviour. None were significant, indicating that females who perceived themselves to be more physically attractive were no more nor less likely to score highly in sociosexual desire, attitude or behaviour than those who perceived themselves to be less physically attractive (See Figure 12).

Gender differences in self-perceived physical attractiveness and sociosexuality

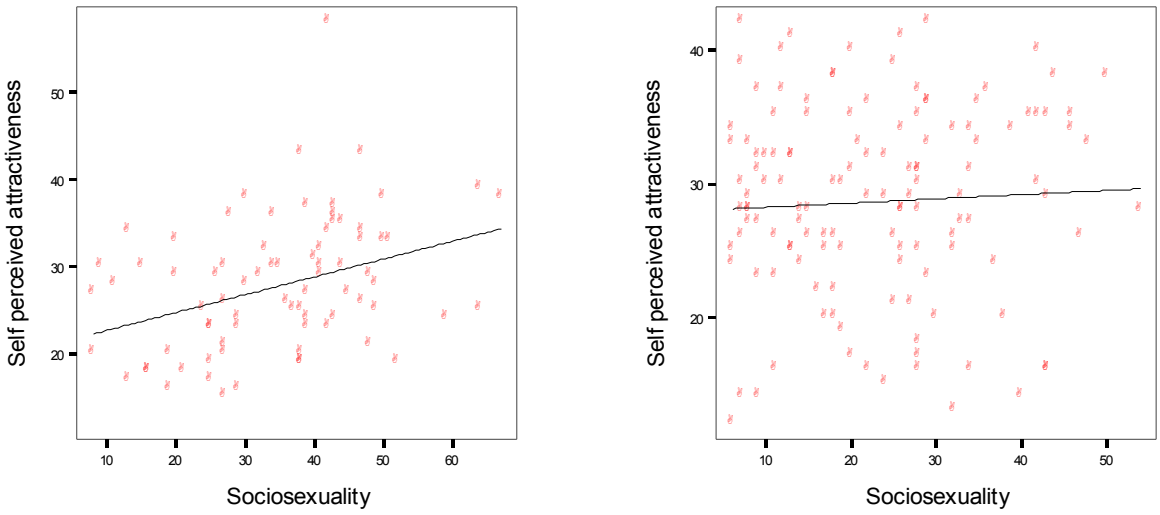
When analysing the gender differences in self-perceived physical attractiveness and sociosexuality it was found that there was a significant difference between males and females, with self-perceived physical attractiveness explaining significantly more of the variance in sociosexuality than in females.

This was not the case, however, with regard to gender differences in the relationship between self-perceived physical attractiveness and sociosexual desire. No significant difference was found, indicating that self-perceived

physical attractiveness explained no more of the variance in sociosexual desire in males than in females. This was also true of sociosexual behaviour.

However, with regard to gender differences in self-perceived physical attractiveness and sociosexual attitude it was found that there was a significant difference between males and females, with self-perceived physical attractiveness explaining significantly more of the variance in sociosexual attitude in males than in females.

Figure 12 Scatterplots showing relationship between sociosexuality and male (LHS) and female (RHS) self perceived physical attractiveness



11.3.5.2 Inferential Results

Males, self-perceived physical attractiveness and sociosexuality

The relationship between male sociosexuality and self-perceived physical attractiveness was investigated using Pearson's product-moment correlation coefficient. There was a highly significant, positive correlation between the two variables

(r = .39, N = 77, p = .001) with high self-perceived physical attractiveness associated with high scores in sociosexuality (see Table 11).

Table 11 Pearson Correlation results for male sociosexuality and self-perceived physical attractiveness

Scale	Correlation Coefficient	N	Significance (1 tailed)
Sociosexuality	.390	77	.001**
Sociosexual Desire	.222	79	.025*
Sociosexual Attitude	.341	81	.001**
Sociosexual Behaviour	.295	81	.004**

* Significant at the .05 level
** Significant at the .01 level

Females, self-perceived physical attractiveness and sociosexuality

The relationship between female sociosexuality and self-perceived physical attractiveness was also investigated using Pearson product-moment correlation coefficient. There was no significant, positive correlation between the two variables (r = .053, N = 129, p = .553) with high self-perceived physical attractiveness having no association with high scores in sociosexuality.

The relationship between female self-perceived physical attractiveness and the three elements of sociosexuality was also investigated using Pearson product-moment correlation coefficient. There was no significant correlation between any of the variables, with self-perceived physical attractiveness having no association with any element of sociosexuality (see Table 12).

Table 12 Pearson Correlation results for female sociosexuality and self- perceived physical attractiveness

Scale	Correlation Coefficient	N	Significance (2 tailed)
Sociosexuality	.073	129	.410
Sociosexual Desire	-.027	132	.762
Sociosexual Attitude	.044	130	.617
Sociosexual Behaviour	.151	131	.086

Gender differences in self-perceived physical attractiveness and sociosexuality

Observed z scores were calculated by hand to determine whether the correlations between sociosexuality and self-perceived physical attractiveness for males and females are significantly different. (Calculations may be found under appendix m). When analysing the gender differences in self-perceived physical attractiveness and sociosexuality a z_{obs} value of 2.2 was obtained. This is outside the specific bounds so it can be concluded that there is a statistically significant difference in the strength of the correlation between sociosexuality and self-perceived physical attractiveness, with self-perceived physical attractiveness explaining significantly more of the variance in scores in sociosexuality in males than in females.

Observed z scores were also calculated to determine whether the correlations between sociosexual desire, sociosexual behaviour and sociosexual attitude on the one hand and self-perceived physical attractiveness on the other for males and females are significantly different. (Calculations may be found, again, under appendix m).

When analysing the gender differences in self-perceived physical attractiveness and sociosexual desire a z_{obs} value of 1.19 was obtained. This was within the specific bounds so it can be concluded that there is no statistically significant difference in the strength of the correlation between sociosexual desire and self-perceived physical attractiveness, with self-perceived physical attractiveness explaining no more of the variance in scores in sociosexual desire in males than in females. This was also true of the relationship between self-perceived physical attractiveness and sociosexual behaviour which, with a z_{obs} value of 1.2, was also within the specified bounds. This again indicated, therefore, that self-perceived physical attractiveness did not explain more of the variance in sexual behaviour in males than in females.

However calculation of the observed z to determine whether the correlations between sociosexual attitude and self-perceived physical attractiveness for males and females are significantly different, produced a z_{obs} value of 2.22. This was outside the specific bounds so in this case it can be concluded that there is a statistically significant difference in the strength of the correlation between sociosexual attitude and self-perceived physical attractiveness, with self-perceived physical attractiveness explaining significantly more of the variance in scores in sociosexual attitude in males than in females.

Table 13 provides a summary of the gender differences as discussed.

Table 13 Gender differences in the relationship between self-perceived physical attractiveness and aspects of sociosexuality.

	r scores		N		z scores		z_{obs}
	♂	♀	♂	♀	♂	♀	
Sociosexuality	.390	.073	77	129	.412	.075	**2.3***
Sociosexual Desire	.222	-.027	79	132	.224	.025	**1.38**
Sociosexual Attitude	.341	.044	81	132	.354	.045	**2.16***
Sociosexual Behaviour	.295	.151	81	131	.304	.151	**.69**

*= significant

11.4 Discussion

As an extension of the previous chapter, this chapter aimed to investigate gender differences between sociosexuality and self-perceived physical attractiveness. As the relationship between male sociosexuality and self-perceived attractiveness was discussed in the last chapter (13.4.2), this will not be discussed again, except in relation to the additional findings. Suffice it to say that for more physically attractive males the reported increased levels of desire and the more relaxed attitude towards unrestricted relationships would be advantageous, affording him, as it might, potentially enhanced opportunities to father larger numbers of offspring. Conversely, a greater desire for a larger number of partners and reduced interest in commitment could, in fact, be detrimental to the mating prospects of a less attractive male.

With regard to female sociosexuality and self-perceived physical attractiveness there was, as hypothesised, no significant correlation between the two factors. This proved to be the case when the scale was reduced, as previously, into its three component parts with sociosexual desire, attitude and behaviour

independently showing no such correlation. These findings are consistent with the research by Rhodes et al (2005) discussed earlier, which found no correlations between body attractiveness and any sexual behaviour variable in females. However, this does conflict with the findings that low levels of body symmetry were associated with low reported lifetime number of sexual partners in females (Thornhill and Gangestad, 1994) and in part with the ambiguous findings reported by both Clark (2004) and Weiderman (1998).

The results are consistent, however, with Trivers' theory of sexual selection and parental investment (1972). As discussed in the literature review, it was argued that the female of the species, as the principal 'chooser' in mating strategies, would have little to gain from an increased level of desire due to her limited child bearing capacity. Thus, whilst increased attractiveness might improve her mate value and enable her to choose the more 'attractive' male (either physically or psychologically), increased desire would not afford her any like improvement in actual reproductive opportunity. Similarly, a more relaxed attitude towards uncommitted sexual relationships would not, generally, be reproductively beneficial for females, as careful discrimination regarding the father of her offspring would be vital in view of her limited capacity. (It should be acknowledged, however, that if the female were of lower mate value, there might be a reproductive benefit in the pursuit of a well placed extrapair copulation which could offer access to good genes whilst retaining the parenting investment of her long-term mate).

In terms of female sociosexual behaviour there is, again, no significant correlation with physical attractiveness. However, consideration of the comparison in the observed z scores into the difference between males and females (regarding the relationship between physical attractiveness and sociosexual behaviour) suggests that there is, perhaps, more to these findings than is immediately apparent. Whilst it is noted that there is a highly significant correlation between self-perceived physical attractiveness and sociosexual behaviour in males ($p = .004$), and there is no significant difference between self-perceived physical attractiveness and sociosexual behaviour in females ($p = .086$), it is noted that there is *no* significant difference between males and

females, the actuality being that females are more similar to males in terms of the relationship between sociosexual behaviour and physical attractiveness than might first be construed. However, interestingly the observed z scores *do* show a significant difference between males and females when it comes to considering sociosexual attitude and physical attractiveness i.e. there is a significant difference in the relationship between self-perceived physical attractiveness and sociosexual attitude for males and females, with males showing a highly significant relationship between the two factors (p= .001) and females showing a non-significant relationship between the same factors (p= .617).

So why is it that males and females are apparently diametrically opposed when it comes to the relationship between attitudes towards casual relationships and their physical attractiveness, and yet not as clearly dissimilar when it comes to actual sociosexual behaviour? In other words, why would attractive females be apparently no less restricted in terms of sociosexual attitude than their less attractive peers, and yet appear to be closer to males in terms of a leaning towards less restricted behaviour? The action, apparently, belies the cognitive manifestation of the female imperative to choose discriminatively.

One simple explanation is that the more attractive female will be asked more frequently than the less attractive female to participate in sexual activity, by dint of her higher mate value. As a result, attractive females may be more frequently exposed to the decision as to whether or not to engage in sexual activity than their less attractive peers. If, proportionally, they consent to sexual activity at the same rate as any other group of females, then they will be more likely to have agreed to sexual activity in absolute terms than other groups of females whilst not differing from them in terms of attitude to sexual behaviour. This is, in fact, consistent with the conclusions drawn by Weiderman (1998), that a positive relationship between increased physical attractiveness and less restricted sexual behaviour may be seen as a result of increased interest from potential partners.

A further explanation may, in fact, be a reversal of the more commonly held assumption that the directional relationship is from attractiveness to sociosexuality. In other words, it is commonly assumed that physical attractiveness has a causal effect upon sociosexuality. This is almost certainly the case, but it does not preclude the possibility that the relationship also works in the other direction, that being that less restricted behaviour in females creates, for them, the feeling of greater attractiveness. The more they engage in sexual activity, the more they are desired, the more attractive they must be.

It may also be useful to consider the notion of consensual but not desired sexual behaviour (O'Sullivan and Allgeier, 1998), consensual participation in unwanted sexual activity referring to "situations in which a person freely consents to sexual activity with a partner without a concomitant desire for the initiated sexual activity" (p. 235). According to O'Sullivan and Allgeier, this form of behaviour is not uncommon, with females being more likely than males to report having consented to unwanted sexual activity over the two weeks of the study during which all forms of sexual behaviour was self-recorded. It was shown that respondents typically explained such behaviour in three ways – to satisfy a partner's needs, to promote or to establish emotional intimacy and to prevent discord within a relationship. Thus whilst attractive females may experience no greater desire to participate in sexual activity than other less attractive females, nor, indeed, harbour a more relaxed attitude towards casual sex, it is likely that they will agree to sexual behaviour more frequently in absolute terms (as a consequence of being asked more) in order to establish such intimacy in a new relationship, with sex being used as "…an important symbolic means of establishing coupledom in a way that distinguishes the relationship from one of 'mere' friendship" (p. 240).

The argument that females are likely to engage in sexual activity with a casual partner in order to establish intimacy is well supported (Cohen and Shotland, 1996; Grello, Welsh and Harper, 2006 and Impett and Peplau, 2003). It is suggested that this may be as a result of traditional gender roles in which compliance to the male desire for sexual relations is seen to be appropriate (Impett and Peplau, 2003). Furthermore, females are more likely to romanticise

the start of a relationship, creating for them the perception of a more established, less casual relationship and one in which sexual relations are 'permissible' (Cohen and Shotland, 1996). With regard to female attractiveness, therefore, the female predisposition to romanticise a potential relationship is magnified by male preference, resulting, potentially, in less restricted sociosexual behaviour (though not attitude) than her less attractive peers.

Nevertheless, despite the greater similarity between the male and female correlations for self-perceived physical attractiveness and sexual behaviour, this finding should not be overstated. The fact that the female relationship between self-perceived physical attractiveness and sociosexual behaviour was not a significant one should not be overlooked.

11.4.1 Methodological constraints and future research

Whilst this study has highlighted both foreseen and unforeseen results, there are shortcomings in the methodology which could usefully be addressed by future research in order to obtain a more comprehensive understanding of the gender differences in sociosexuality and perceived attractiveness. For example, whilst the self-perceived attractiveness questionnaire showed good internal consistency, the Cronbach alpha coefficient being .738 for males and .855 for females, the scale did not distinguish between bodily and facial attractiveness. Later consideration, and a review of the work conducted by Rhodes et al (2005), highlighted belatedly the fact that the relationship between sociosexuality and self-perceived facial attractiveness, and the relationship between sociosexuality and self-perceived bodily attractiveness may not necessarily be one and the same.

Additionally caution should be exercised in accepting self-perceptions of attractiveness as the only way of researching the relationship between attractiveness and sociosexuality. Self-perception was chosen after careful consideration as it was felt that the participants own perceptions regarding his or her own appearance would have a greater bearing on subsequent feelings of sexual desire, attitude and behaviour than the perceptions of others. However,

the perceptions of others should not be ignored as these impact both directly (in terms of partner preference) and indirectly (in terms of impact upon self-perception) on aspects of sociosexuality. Thus triangulated research would be valuable, incorporating both self and other perceptions of attractiveness, in order to gain a more complete and comprehensive understanding of this complex interaction between perceptions of attractiveness and sociosexuality.

Lastly, with respect to the comparison of gender differences in the association between self-perceptions of attractiveness and sociosexuality, one needs to be aware of the difficulties which may arise when making comparisons between the sexes in issues regarding sexuality. As discussed in Chapter 7 there are problems regarding gender discrepancy in self-reports of the number of lifetime sexual partners, and this is a matter which has not been adequately resolved. Indeed in this data it was found that there is still a significant difference [$t(217) = 2.42$, $p = .023$] between the sexes in their response to the first question in the R-SOI (i.e. “With how many different partners have you had sex within the past 12 months?”), despite the decision to ask about past year as opposed to lifetime partners (supposedly a source of greater discrepancy; Brown and Sinclair, 1999). Nevertheless, this question may have created a bias in just one part of the sociosexual behaviour element, and in fact in terms of sociosexual behaviour it was found that there was no significant difference between males and females in its relationship with self-perceived physical attractiveness. It is therefore concluded that not too much weight should be given to the fact that there has been seen to be some degree of misreporting in terms of this facet of sociosexual behaviour.

Prologue to Female Studies

The empirical studies so far conducted have researched aspects of intra-sex differences in males and have considered the differential responses to aspects of mate value – height and the relationship with sociosexuality, height and the relationship with parenting, masculinity (as measured by 2D:4D digit ratio) and the relationship with sociosexuality, and lastly the relationship between self-perceived physical attractiveness and both parenting and sociosexuality. All such characteristics are characteristics relative to mate value, and hence to intra-sex competition for access to the choosier sex, as theorised by Trivers (1972).

The empirical studies now move to a consideration of female intra-sex differences. However, the nature of the studies now takes on a different perspective as a reflection of the differential position of females in the mating 'market'. The reason for this is as follows. For males, successful competition ensures access to not only the best females, but, importantly, to more of them (signalling reproductive fitness). Thus, characteristics relevant to mate value (height, masculinity, attractiveness etc) should bear a relationship with sociosexuality. For females, on the other hand, there is little benefit to be gained from a less restricted sociosexuality, as a result of the natural limit on child bearing capacity through the limits imposed by pregnancy, lactation and child rearing in addition to the lack of opportunity available to males through contiguous reproduction.

Additionally, males, as we have seen, must compete across many domains to persuade a prospective female of their value as a mate (i.e. as a mate who is both willing and able to invest in his partner and offspring, who is able to provide physical protection and who offers the health that will ensure that she and her offspring benefit from his continued investment and without the potential for risk to their own health). Females, on the other hand, must compete, essentially, on just two grounds for access to the best mates, and these are in youth and in beauty (both as reliable indicators of health and fecundity). As there is little to be gained by responding to older age or a less beautiful appearance through an

adjustment in levels of sociosexuality (as for males), a more appropriate response would be in the differential manipulation of these two characteristics. For this reason, the following studies consider intra-sex differences in the manipulation of both beauty and perceived age. Specifically, they consider intra-sex difference in the use of cosmetics both as a putative method by which to manipulate perceived age and beauty (and hence perceived health and fecundity), as well as a possible method of signalling other aspects of a females personality and sociosexuality.

12. Cosmetic Usage, Psychophysiology and Individual Differences

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12.1 Synopsis: Study One Cosmetic Usage and Psychophysiology, and Study Two, "Who wears Cosmetics?" Individual Differences and their relationship with cosmetic usage.

In view of the central focus of male mate preferences (that being for beauty and youth) as just discussed, the following female studies investigate intra-sex differences in the controllable modification of appearance via the differential use of cosmetics. This represents an area which, though playing an important role in the daily lives of many females, has received relatively little empirical attention, save for a growing interest in the effect of cosmetic usage on the attributions of others (e.g. with regard to health, social status etc). These studies, on the other hand, investigate cosmetic usage from another angle, that being the various motivations behind its use.

From an evolutionary perspective, and the Multiple Fitness Model in particular, it is suggested that individuals will undertake deceptive behaviours in order to manipulate the perception of one's appearance in others. It is also suggested that, consistent with a Conditional Mating Strategy, such deceptive behaviour may be carried out when that deception is most salient, or when that individual has most to gain from the manipulation. The use of cosmetics may be one such device that individuals use in the deception of others. As such this and the following study (Study Two) investigate the use of cosmetics and their relationship to psychological well-being.

Study One begins by considering, through recognition of some of the short-comings of self-report measures, a physiological correlate (baseline blood pressure) of a psychological trait (state anxiety). Study Two uses psychological measures to investigate a wider variety of interrelated personality traits in order to ascertain their possible relationships with cosmetic usage. By conducting research in this area it is intended that the results may inform forthcoming research into the relationship between cosmetic usage, attractiveness and sociosexuality (the focus of chapter 13).

12.2 Literature Review

The notion that attractiveness and beauty are cross-culturally perceived is now well established (Cunningham et al, 1995; Buss, 1989). Perhaps not surprisingly therefore, the last two decades have seen a surge of interest in the effects of cosmetic usage on self and others' perceptions of attractiveness. In addition, the attributions of others with regard to, for example, supposed health, social class, earning potential, professional competence, and marital status have been studied (Nash, Fieldman and Hussey, Lévêque and Pineau 2006; Richetin, Croizet and Huguet, 2004; Jones et al, 2004; Mulhern, Fieldman, Hussey, Lévêque and Pineau, 2003; Franzoi, 2001; Kyle and Mahler, 1996; Cox and Glick, 1986). However, whilst there is now a fairly comprehensive literature available regarding the effect of cosmetic usage upon self perceptions of attractiveness, as well as on the resultant attributions of others, there is still a dearth of research into the motivations and personalities of the people who use cosmetics.

From an evolutionary perspective, the power of cosmetics to influence the afore-mentioned perceptions and attributions should come as no surprise. Indeed, the Multiple Fitness Model proposed by Cunningham, Barbee and Pilhower (2002) posits that individuals may use deceptive behaviour in order to manipulate perceptions of facial attractiveness, so cheating honest signals of health and fecundity. The utilisation of cosmetics in this way would be consistent with the evolutionary rationale for cosmetic usage proposed by Law-Smith, Perrett, Jones, Cornwell, Moore, Feinberg, Boothroyd, Durrani, Stirrat, White, Pitman and Hillier (2006). In this paper, on detectable cues to female fecundity, it was concluded that cosmetics may be used, particularly by females of reduced fecundity, in order to deceive perceivers by disabling male ability to form attributions based on natural hormonal cues. So cosmetics appear to be used as a physical 'mask', but might they also be used as a psychological 'mask'?

Using a Conditional Mating Startegies approach, it could be argued that appearance manipulation will be deemed most necessary (albeit probably at a

subconscious level) when the *effect* of that manipulation, whatever it may be, is deemed to be most necessary. On the other hand, if the result of the manipulation is less important, the likelihood of employing such 'deception' should reduce accordingly. If this were true, one might suppose that the manipulation of appearance via the use of cosmetics should be more relevant to those individuals who are less confident within their social setting. Or, put another way, it is possible that cosmetic usage becomes most salient when the individual has an increased need to present a favourably manipulated image to the world, or when the need to 'mask' the real self is at its most critical. This could, of course, be contextual, in as much as the individual finds herself at a particular time in a situation in which she feels less comfortable (at a job interview for example). It could also apply more generally, however - for example, when one individual has simply greater social anxiety or lower self esteem than the average and therefore feels the need to manipulate appearance to present the desired effect. These studies explore the latter scenario.

It is hypothesised that those individuals who have greater negative affectivity, including, for example, higher social anxiety, should be the individuals who feel most in need of controlling and manipulating their appearance in order to present an enhanced and positive image to the world. Certainly this is reflected in associated research into the psychological underpinnings of eating disorders, the psychological effects of dental appearance and so on (Akan and Grilo, 1995; Strong and Huon, 1998; Huon and Walton, 2000; Al-Omiri, Clifford, Lamey, Cooper 2002; Chen, Chen and Yun, 2000). An investigation into the relationship between personality traits and cosmetic usage is the focus of the subject matter in Study Two. However, it is also hypothesised that cosmetic usage may be correlated with psychophysiological indicators of emotional state. One such universally acknowledged indicator is blood pressure which, in accordance with the fight-or-flight response, is both responsive and positively correlated with fluctuating anxiety as a temporal measure (James, Yee, Harshfield, Blank and Pickering, 1986; Raglin and Morgan, 1987). Measures of both diastolic and systolic blood pressures are also recognised, however, to be reliable physiological indices of longer-term anxiety (Räikkönen, Matthews,

Flory, Owens and Gump,1999; Wells, Golding and Burnham, 1989), with Diastolic Blood Pressure being particularly associated with state anxiety (O'Connor et al, 1993; Shapiro et al, 1996). As such it is suggested that measures of such may offer a novel method for ascertaining potential relationships between cosmetic usage and emotional state, and this forms the rationale for Study One.

Additionally, Study Two investigates not the attributions of personality invoked by the female through her use of cosmetics, but how different personality traits will affect cosmetic usage in the first place. Despite the virtually unambiguous scientific evidence that cosmetics offer real and salient benefits, there is, nevertheless, great disparity in cosmetic usage. What constitutes the psychological determinants of, or motivations behind, cosmetic usage, whether at a conscious or subconscious level? One such possible motivation, as discussed in the previous paragraphs, may be the desire to cheat honest signals of psychological well-being, and to undertake deceptive behaviour in order to promote one's 'fitness' as recognised by the Multiple Fitness Model (Cunningham et al, 2002). For example, if it is possible to cheat signals of psychological well-being through the use of cosmetics in order to persuade a possible partner of greater 'fitness' as a partner and parent to one's offspring than is the reality, then this may be pursued.

If this is so, the desire to utilise cosmetics may be seen as both a legitimate form of sexual strategy, and one that will be subject to individual differences. In other words, it is suggested that individual differences in personality traits should be a fundamental consideration when attempting to understand who will use cosmetics and when. This research therefore constitutes an exploratory investigation into personality traits and their association with cosmetic usage. Traits investigated were as follows:

Firstly, anxiety is included in accordance with the rationale from the previous study and in order to triangulate findings with that physiological investigation. Additionally, self- consciousness and conformity are investigated as it is proposed that these, too, may be positively correlated with cosmetic usage. For

these personality traits the broad conjecture is, again, that cosmetics might be applied as a tool to ‘mask’ underlying emotions, presenting a positive if manipulated image to the outside world. Empirical support for this hypothesis comes from research into eating disorders, which shows a positive relationship between conformity, self-consciousness and body dissatisfaction (Strong and Huon, 1998; Huon and Walton, 2000). Self-presentation is similarly predicted to show a positive correlation with cosmetic usage, following the intuitive assumption that the greater a person’s awareness of and interest in their physical presentation, the higher the likelihood that they would be interested in manipulating it. Research into the psychological correlates of self-objectification, or the propensity to see oneself as an object to be inspected and assessed (Davis, Dionne and Shuster, 2001), argues that self-objectification is correlated with greater interest in and motivation to enhance one’s image. As such the intuitive conclusion to be drawn is that cosmetic usage should increase the more one self-objectifies.

Self-esteem is also investigated, as theoretically tools facilitating the manipulation of features will be most used when perceived to be most functional. It is hypothesised that low self-esteem will provide such a functional rationale for the increased usage of cosmetics, through the hypothesised link between self-esteem and appearance satisfaction. This would seem to be supported by literature on self-esteem and eating disorders, which suggest that a fairly consistent pattern exists between self-esteem and body dissatisfaction (Akan and Grilo, 1995), though caution should be applied when assuming cross-cultural relevance (Davis and Katzman, 1998). For example, a Croatian study found a positive correlation between frequency and variability of cosmetic usage and self-esteem, which the authors assume to be due to a link between self-esteem and greater proficiency in self- presentation (Brdar, Tkalcic and Bezinovic, 1996). Nevertheless, the balance of research would suggest that a negative correlation should exist between cosmetic usage and self-esteem, and this is therefore predicted.

Conversely, social confidence, emotional stability, and physical attractiveness are predicted to be negatively correlated with cosmetic usage, again following

the assumption that manipulation of features will be especially necessary when at its most functional, i.e. when a 'mask' for the outside world is at its most necessary. It is recognised, however, that a negative correlation might not exist regarding physical attractiveness. It is suggested that a recognition of one's own attractiveness might lead to increased self-awareness and a heightened interested in maximising one's assets (Davis et al, 2001). The relationship between attractiveness and cosmetic usage is, in fact, discussed in greater depth in chapter 13.

Aspects of intelligence are also considered, including intellectual depth and complexity (incorporating notions of culture and philosophy), intellect (in the more traditional sense of the word) and social, personal and emotional intelligence. Taking an evolutionary perspective, it is hypothesised that there may be a negative relationship between aspects of intelligence and cosmetic usage, as it is plausible that an individual may try to capitalise on their inherent strengths. If this were deemed to be in the intellectual arena, it is presumed that the need for facial enhancement may be reduced. Conversely, if intellectual ability were not deemed to be a particular asset it is hypothesised that cosmetic usage may increase in order to improve attractiveness and hence mate value.

Lastly, extroversion and introversion are considered though two-directional hypotheses are proposed in these cases. The rationale for this departure is that there are strong arguments for proposing either direction. For example, one might suppose that extroverts would be more interested in manipulation of facial image as they would be keener to be noticed and to attract social attention. Indeed, Ashton, Lee and Paunonen (2002, p. 245) argue that "the tendency to behave in ways that attract social attention" are the real core of the extroversion factor, as opposed to preference for social interaction. However, one could also argue that introverts might feel a greater need to 'mask' their inner self, and therefore they, too, could be argued to be the potentially greater users. Some research might support this position. For example, relationships have been found between dissatisfaction with dental appearance and introversion as previously discussed (Al-Omiri et al, 2002; Chen et al, 2000). Additionally, research into internet usage showed that introverts locate their "real me" on the

Internet, whilst extroverts locate their “real me” through traditional social interaction – suggesting a possibly higher need to “mask” in the introvert than the extrovert (Amichai-Hamburger, Wainapel and Fox 2002). The formal hypotheses are therefore as follows:

12.2.1 Experimental Hypotheses – Study One

It is predicted that there will be a positive correlation between cosmetic usage and baseline systolic and diastolic blood pressures, as physiological indices of state anxiety.

12.2.2 Experimental Hypotheses – Study Two

It is predicted that there will be a positive correlation between scores for cosmetic usage and scores for anxiety, self-consciousness, conformity and self-presentation.

It is predicted that there will be a negative correlation between scores for cosmetic usage and scores for social confidence, emotional stability, self-esteem, physical attractiveness, intellectual complexity and breadth, intellect and social, personal and emotional intellect.

It is also predicted that there will be a significant relationship between cosmetic usage and extroversion/ introversion.

12.3 Cosmetic Usage and Psychophysiology

Methodology

12.3.1 Design

A quasi-experimental correlational design was employed to investigate the relationship between cosmetic usage (as indicated through completion of a purpose written cosmetic usage questionnaire) and two physiological indicators of anxiety, baseline systolic and diastolic blood pressures (BSBP and BDBP).

12.3.2 Materials and Apparatus

Systolic and diastolic blood pressures were measured using a semi-continuous blood pressure monitor (Vasotrac AMP205A), a monitor allowing non-invasive readings of a participants blood pressure.

In addition, participants completed a purpose written questionnaire on customary cosmetic usage. This questionnaire was compiled through discussion with a number of volunteers regarding their own cosmetic usage and issues salient to their decisions on when they would or would not be comfortable using cosmetics. These issues were then compiled and presented in questionnaire format, which was then piloted. This allowed the consolidation of questions to nine. Analysis of the reliability of this scale showed good internal consistency, with a Cronbach alpha coefficient of .862. The questions gave a minimum rating of 1 and a maximum of 5, giving the questionnaire as a whole a minimum rating of 9 (indicating lowest cosmetic usage) to 45 (indicating highest cosmetic usage). Of the nine questions, questions 1,2,7,8 and 9 were reverse scored. Results were collated and divided into three groups of cosmetic users for descriptive purposes: low (0 – 26), medium (27 - 35) and high (36 - 45) (please see appendix n).

Those participants who were able to commit the time were also asked to complete a range of personality questionnaires from the International

Personality Item Pool, a scientific collaboratory for the development of advanced measures of personality and other individual differences (see appendix o). Analysis and discussion of these forms the basis of Study Two.

12.3.3 Participants

49 female participants, predominantly volunteer university undergraduates, were recruited with an age range from 18 to 55 years (M = 28.66, S.D. = 11.35). 30 went on to complete the personality questionnaires, though 3 were then removed as they were incomplete. A range of ethnic backgrounds was represented.

12.3.4 Procedure

Participants were initially asked to sit quietly and read in a room for ten minutes before baseline systolic and diastolic blood pressures (BBP) were measured. Participants were then connected to a semi-continuous blood pressure monitor (Vasotrac AMP205A), and a total of six BBP readings were taken (readings taken every twelve to fourteen heart cycles). Mean systolic and diastolic blood pressures were subsequently calculated.

Participants were then asked to complete the purpose written 9-item Cosmetic Usage Questionnaire (See appendix n)

Lastly, those participants who were willing to commit the time (30) completed three questionnaires, each an amalgamation of questionnaires drawn from the International Personality Item Pool (2001). The first questionnaire was broadly associated with social anxiety, the second with self-esteem, and the third with intellect, as discussed above and included in appendix o.

They were informed that there were no right or wrong answers, and that they should answer as honestly as possible. If in doubt, participants were advised to give their initial response to a question. On completion of these questionnaires, participants were debriefed and given the opportunity to ask questions.

12.3.5 Results

12.3.5.1 Descriptive Results

After initial examination of the scattergraph and boxplots, two extreme outliers (i.e. those falling more than three box lengths outside the edge of the box plots as indicated by SPSS), participants 5 and 28, both medium cosmetics users, were removed from the analysis.

Initial investigation of the descriptive statistics showed no relationship between BSBP and cosmetic usage. However, a positive relationship was found between BDBP and cosmetic usage. This is more graphically represented when considered as groups. Specifically low users had a lower mean BDBP than medium users, who also had a lower mean BDBP than high users. Descriptive results are shown in Tables 14 and 15, and Figures 13 and 14.

12.3.5.2 Inferential Results

The relationship between the physiological correlate of anxiety (as measured by BDSP and BDBP) and cosmetic usage (as measured by the Cosmetic Usage Scale) was investigated using Spearman's rho correlation as preliminary analyses indicated that whilst normality was acceptable for cosmetic usage and BSBP, there was a violation of the assumption of normality for BDBP. With regard to BDBP there was a moderate positive correlation (1-tailed), with a small to moderate effect size, between the two variables [r = 0.26, N = 47, p = .038], with high baseline diastolic blood pressure associated with increased cosmetic usage. With regard to BSBP no correlation was found [r = 0.137, N = 47, p = .180].

Table 14 Descriptive Statistics: Cosmetic Group and Baseline Diastolic Blood Pressure.

Cosmetic Usage Group	N	Mean Diastolic	Standard Deviation	Range (Min, Max)
1 (Low Users)	17	**71.18**	6.94	25 (57, 82)
2 (Medium Users)	13	**74.31**	7.04	24 (59, 83)
3 (High Users)	17	**79.47**	11.96	39 (68,109)
Total	47	75.04	9.61	52 (57,109)

Table 15 Descriptive Statistics: Cosmetic Group and Baseline Systolic Blood Pressure.

Cosmetic Usage Group	N	Mean Systolic	Standard Deviation	Range (Min, Max)
1 (Low Users)	17	**124.65**	10.91	38 (108,146)
2 (Medium Users)	13	**122.00**	14.12	52 (99, 151)
3 (High Users)	17	**128.18**	14.95	56 (106,162)
Total	47	125.19	13.23	63 (99, 162)

Figure 13 Bar Chart depicting the relationship between Cosmetic Group and Baseline Diastolic Blood Pressure.

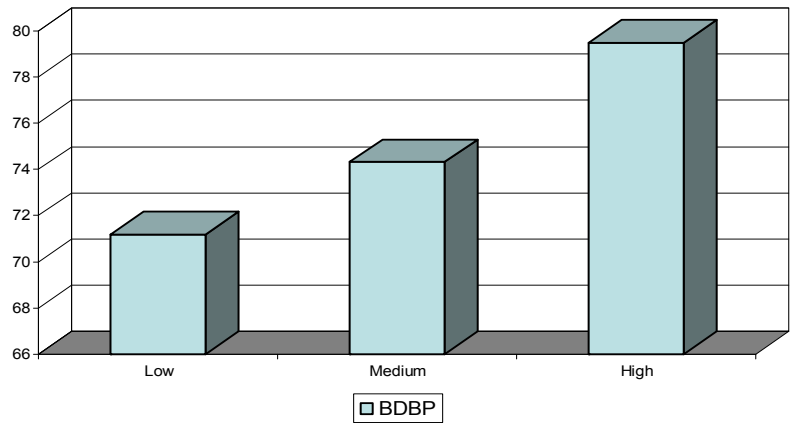
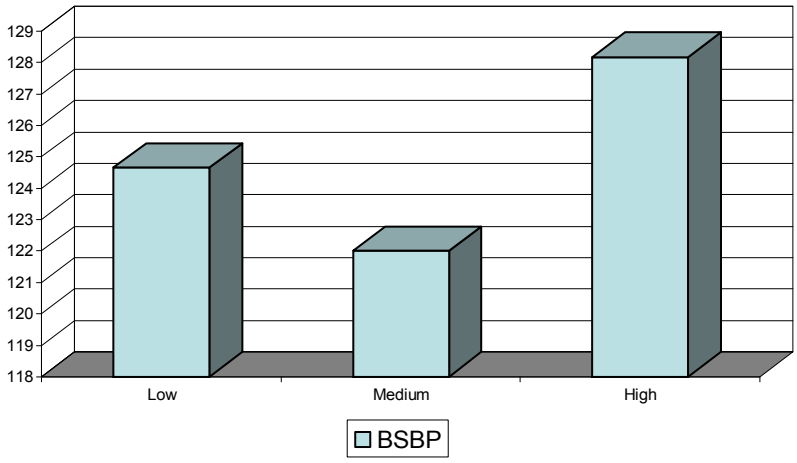


Figure 14 Bar Chart depicting the relationship between Cosmetic Group and Baseline Systolic Blood Pressure.



12.4 Discussion

Correlational analysis of the data indicated a significant relationship between one of the two physiological indicators of anxiety, diastolic blood pressure, and cosmetic usage, thus partially supporting the hypothesis that manipulation of facial features through the application of cosmetics becomes increasingly important as underlying anxiety increases.

The significance of the physiological relationship between baseline diastolic blood pressure and cosmetic usage ($p = .038$) is of particular interest, establishing, as it does, objective data without the potential for confounding variables present in other self-reported measures of emotion or affect (the conscious or subconscious desire to portray a more socially confident image being a salient example). Confidence may also be drawn from the knowledge that the differences in BDBP were not as the result of prior knowledge of the purpose of the experiment, as the participants had received no briefing regarding the nature of the study at this point.

The absence of a relationship between cosmetic usage and both diastolic *and* systolic blood pressures, taken together, is also interesting. Whilst both are important to long-term health, it is generally accepted that systolic blood pressure reflects the more immediate situation with regard to anxiety and stress, for example, whereas diastolic blood pressure is associated with a more stable reflection of the individual's health (O'Connor et al, 1993; Shapiro et al, 1996). Nevertheless, caution should be exercised when drawing conclusions based on differences between systolic and diastolic blood pressures (Deedwania, 2002). Indeed, current research shows that both diastolic and systolic blood pressures are affected by a complex interaction between intensity of single moods and of mood combinations (Shapiro, Jamner, Goldstein and Delfino, 2001), as well as the more traditional factors associated with blood pressure (e.g. age, gender, smoking, cholesterol levels etc).

Nevertheless, this empirical evidence provides further support for theories in evolutionary psychology. Specifically, the Multiple Fitness Model proposed by

Cunningham et al (2002) proposed that individuals would employ deceptive behaviour in order to manipulate those who perceive them. This was supported by the empirical research conducted by Law Smith et al (2006) regarding detectable cues to female fecundity, in which it was concluded, again, that cosmetics may be used as a 'mask', particularly by females of reduced fecundity, in order to deceive perceivers by disabling their ability to form attributions based on natural hormonal cues. Results of this research are therefore consistent with both evolutionary theory and existing empirical evidence.

It would appear that cosmetics are, therefore, employed as a strategy to reduce the impact of elevated anxiety, whether that be directly by actually reducing anxiety, or indirectly through the portrayal of greater social confidence and reduced anxiety. It is possible that cosmetics are therefore used as both a psychological and physical 'mask' by which the user can manipulate their outward persona. By so doing, it is possible that the wearer is able to deceive others into perceiving a variety of positive attributes which she may not, in fact, possess. Consistent with a Conditional Mating Strategy, such a tactic could serve an important function in both enhancing the wearer's potential mate value (through enhancing the portrayal of a stable and steady partner and parent) as well as enhancing the wearer's social status as a more confident and self-assured individual. Nonetheless, this research presents scope for further investigation, not least research into a wider variety of interrelated personality traits and their possible relationships with cosmetic usage, an area which is considered in more depth in the following study.

12.5 "Who wears Cosmetics?" Individual Differences and their relationship with cosmetic usage.

Methodology

12.5.1 Design

A quasi-experimental correlational design was employed to investigate the relationship between cosmetic usage and a number of personality traits as detailed in Table 16.

12.5.2 Materials

Participants completed the purpose written questionnaire on customary cosmetic usage as discussed in Study One (12.3.2 – see appendix n).

In addition, participants were asked to complete a range of questionnaires extracted from the International Personality Item Pool (2001), a scientific collaboratory for the development of advanced measures of personality and other individual differences. Scales utilised included: Anxiety, Emotional Stability and Introversion from Cattell's 16 Personality Factors Questionnaire (Alpha .80, .85 and .73 respectively); Extraversion, Self Consciousness and Intellect from the Revised NEO Personality Inventory (Alpha .86, .80 and .86 respectively); Self-Esteem and Physical Attractiveness from the Personal Attributes Survey (Alpha .84 and .87); Conformity, Intellectual Complexity, Intellectual Breadth and Social Confidence from the Jackson Personality Inventory (Alpha .71, .82, .79 and .87 respectively); Self Presentation, an abbreviated version of Attractiveness from Saucier's Big 7 Factors (Alpha not available) and finally, Social, Personal and Emotional Intelligence from Values in Action (Alpha .76).

Questionnaires were pooled into three sections, roughly constituting the areas of anxiety (1), self-esteem (2) and intellect (3). Each section's questions were

then arranged in alphabetical order ensuring participants' naiveté as to the nature of the questionnaire they were answering.

Having completed the questionnaires, responses were subsequently sorted into their original lists in order to obtain final scores for each original questionnaire. (Please see appendix o).

12.5.3 Participants

Please see Study One (12.3.3)

12.5.4 Procedure

Please see Study One (12.3.4)

12.5.5 Results

12.5.5.1 Multiple Regression 1

A Multilinear Regression was performed to investigate the relationship between cosmetic usage and the personality traits as listed in the Descriptive Statistics in Table 16. As SPSS indicated that pairwise deletion in this Multiple Regression may be inappropriate, and reducing cases listwise reduced the already small number of cases further, it was decided to replace missing values with the mean value. This allowed all computations to be based on the same number of cases without reducing the sample size (Tabachnick and Fidell; 2007). For this reason descriptive statistics vary from those reported in the previous chapter.

Positive trends were noted between cosmetic usage and anxiety, self-consciousness, introversion, conformity and self- presentation.

Negative trends were noted between cosmetic usage and extroversion, social confidence, emotional stability, self-esteem, physical attractiveness, intellectual

complexity, intellectual breadth, intellect and social/personal and emotional intellect.

Table 16 Descriptive Statistics for Cosmetic Usage and Personality Traits.

Trait	Mean	Standard Deviation	Coefficient Alphas
Cosmetic Usage	29.03	9.16	.82
Anxiety	31.78	6.93	.88
Extraversion	34.41	7.11	.76
Social Confidence	29.70	5.66	.76
Self Consciousness	27.11	6.05	.68
Emotional Stability	30.69	4.88	.76
Introversion	30.89	6.36	.75
Self Esteem	35.37	6.13	.75
Conformity	27.15	6.25	.61
[a] Self Presentation	16.11	2.26	-
Intellectual Complexity	36.21	4.31	.66
Physical Attractiveness	27.48	5.94	.86
Intellectual Breadth	40.72	4.63	.64
Intellect	32.79	5.42	.83
Social, Personal and Emotional Intelligence	22.96	2.94	.71

[a] "Self-presentation" is an abbreviated version of the "Attractiveness" questionnaire. A Cronbach's Alpha rating on the revised questionnaire was not advisable as items were fewer than ten, so inter-item correlations were checked. Inter-item correlations were .428, .234, .423, .428, .212 and .549, thus satisfying standard criteria as recommended by Briggs and Cheek (1986).

Of these trends, significant correlations with cosmetic usage were found with anxiety (p= .008), emotional stability (p=.037), self-esteem (p=.003), conformity (p= .007), physical attractiveness (p=.006) and self-presentation (p=.045).

With regard to the unpredicted variables introversion and extraversion (measured on different scales), a negative but not significant trend was seen between extroversion and cosmetic usage, and a positive, but again not significant trend was seen between introversion and cosmetic usage.

Evaluation of the Model.

A scattergraph of adjusted predicted value against standardised residual value was produced and checked, confirming that the assumptions of linearity and homogeneity of variance were met.

The model was evaluated by taking the Adjusted R Square, this being the preferred option due to the small sample size (N=30). This was chosen in preference to the R Square value, giving a better estimate of the true population value. Adjusted R Square was 0.437, indicating 43.7% of the variance in cosmetic usage can be explained by this model. ANOVA indicated that the model reached borderline statistical significance, [F (16,13)= 2.41 p=.058]

Evaluation of the Predictor Variables

The standardised coefficients indicated that self-esteem makes the strongest unique contribution to explaining cosmetic usage with a Beta value of -0.657, having controlled for all the other variables. Physical attractiveness made the next strongest contribution (β = -0.629), followed by intellectual complexity (β =-0.572), self-presentation (β =0.551), conformity (β =0.454) and introversion (β =0.427). Of these, self-presentation and self-esteem jointly made the most significant *unique* contribution to the prediction of cosmetic usage (β =0.023), followed by physical attractiveness (β =0.043).

12.5.5.2 Multiple Regression 2

Results from the correlation matrix were used to determine which of the personality variables to enter into a second multiple regression which might offer a stronger model indicating the factors important in cosmetic usage. This

allowed the reduction of this set of variables to a smaller subset of seven, representing only those variables which achieved significance ($p<0.05$) in the exploratory investigation. These variables were then reanalysed by multiple regression.

Cosmetic usage was found to correlate significantly with anxiety (p=.008), social confidence (p=.032), emotional stability (p=.037), self-esteem (p=.003), conformity (p= .007), physical attractiveness (p=.006) and self-presentation (p=.045). Of these, anxiety and conformity were both positively correlated with cosmetic usage, whilst social confidence, emotional stability, self-esteem and physical attractiveness were negatively correlated with cosmetic usage.

Evaluation of the New Model.

Residual outliers were first checked which showed no outliers with an absolute standardised residual value greater than 3. A scattergraph of adjusted predicted value against standardised residual value also confirmed that the assumptions of linearity and homogeneity of variance were met.

The new model was evaluated again by taking the Adjusted R Square, again due to the small sample size. Adjusted R Square value was 0.413, indicating 41.3% of the variance in cosmetic usage can be explained by this revised model. In this case ANOVA indicated that the model did reach statistical significance, [$F(7,22)=3.921$, $p=.006$]

Evaluation of the Predictor Variables

The standardised coefficients indicated that self-presentation makes the strongest unique contribution to explaining cosmetic usage with a Beta value of 0.569, having controlled for all the other variables. This was highly significant at $p = .003$. None of the other traits made a significant *unique* contribution to the prediction of cosmetic usage, though self-esteem and physical attractiveness achieved borderline significance as shown in appendix p.

In conclusion, our revised model indicates that social confidence, emotional stability, self-esteem and physical attractiveness are all significantly negatively correlated with cosmetic usage, and anxiety, conformity and self-presentation are significantly positively correlated. Of these, the only unique contribution to the prediction of cosmetic usage comes from self-presentation.

12.6 Discussion

As hypothesised, positive trends were found between cosmetic usage and anxiety, self-consciousness, introversion, conformity and self-presentation. Also as hypothesised, negative trends were found between cosmetic usage and extroversion, social confidence, emotional stability, self-esteem, physical attractiveness, intellectual complexity, intellectual breadth, intellect and social/personal and emotional intellect. With regard to the unpredicted variables, extraversion was negatively related and introversion positively related to cosmetic usage.

Of these, significant correlations were found between cosmetic usage and anxiety (p= .008), emotional stability (p=.037), self-esteem (p=.003), conformity (p= .007), physical attractiveness (p=.006) and self-presentation (p=.045). These results were all consistent with expectations in terms of their directional relationship, if not in terms of statistical significance. Furthermore, Adjusted R Square indicated that 41.3% of the variance in cosmetic usage is explicable through the revised model, achieving high statistical significance (p=.006). It is clear, therefore, that individual differences account for a significant element in the prediction of cosmetic usage.

Firstly, anxiety was highly correlated with cosmetic usage, showing psychological and physiological consistency in terms of the previous investigation into one of the psycho-physiological indicators of anxiety, diastolic blood pressure (DBP). In both cases a positive correlation was discovered between anxiety (as a direct psychological measure, or as an indirect physiological measure) and cosmetic usage. The use of triangulated results is important. As Begley (1996, p.122) states, ‘The conscious employment of

multiple data sources and methods to cross check and validate findings continuously, should permeate all studies and lead to the goal of confirmation'. In an area which is still largely under researched, this is, of course, especially important, and the decision to assess both physiological and psychological indicators of the same construct has afforded greater confidence in the results as a consequence of their consistency.

These findings support the hypothesis that cosmetic usage might be employed as a psycho-physical mask, in order to manipulate facial features in order to present an image of enhanced psychological affectivity. As an evolved adaptation, the need for such manipulation should be at its strongest when it is at its most functional: when the individual is feeling less certain, less sure of themselves, less confident in their social context. The positive relationship between self-consciousness and cosmetic usage is consistent with this position. Further, it was found that as conformity increases, so too does cosmetic usage. This was also consistent with expectations, as, by cosmetic application, the ability to control our outward image is facilitated. In this respect it is therefore possible to present to the world an image which is less individual, and more conformant to social preference and expectation. Additionally, the self-presentation questionnaire investigated aspects of grooming and manipulation of appearance. Self-presentation was therefore predicted to correlate positively with cosmetic usage, and this was proven to be the case.

Lastly with respect to introversion, results showed that this was positively correlated with cosmetic usage, and it is therefore surmised, again, that cosmetics are used for their 'masking' abilities. This was consistent with the (separate) results for extroversion, which were negatively correlated, the inference being that the extrovert is more comfortable with presenting their true image to the world than one which has been manipulated. This provides further evidence for the belief that cosmetics are not, in fact, used primarily as attention seekers, but more as attention manipulators, consistent with the views of Ashton et al (2002) with regard to the core element of extraversion.

From the opposing end of the spectrum, social confidence, emotional stability, self-esteem and physical attractiveness were all negatively related to cosmetic usage. In view of the findings above, and the prior assumptions made, this is entirely consistent, again, with the notion that manipulation occurs when most functional. Cosmetics are used to create an image when a psychological boost is required.

Finally, the directional hypothesis, if not statistical significance, regarding aspects of intellect and cosmetic usage was supported. Across all aspects of intellect, there was a negative relationship with cosmetic usage, though in none significant. Nevertheless, both intellect and social, personal and emotional intelligence came close to reaching significance ($p = .058$ and $.070$ respectively). It would, therefore, appear that people may indeed be trying to capitalise on their inherent strengths. So, as intelligence increases, in whatever guise, it is possible that the need to control our outward image is reduced. This is at this point, of course, a matter for conjecture, and these conclusions should not be over stated. Nevertheless, in view of the small sample size, further investigation into this unexplored area with a larger sample would be recommended in order to be able to draw more definitive conclusions.

It should also be noted that although not all personality traits were significant, all followed the directional trends hypothesised. Furthermore, it was clear that increased cosmetic usage appears to be related to traits reflecting greater negative affectivity. As such it is suggested that future research investigating the relationship between cosmetic usage and the five super-factors (Goldberg, 1993), and particularly neuroticism, would be of value.

Nevertheless, taken as a whole, the findings clearly lead one to the conclusion both that cosmetics are utilised primarily by females of greater negative affectivity, and also that they are used as a tool in order to manipulate an outward image. That outward image is one that represents a more positive self image – one of greater self confidence, self esteem, emotional stability and health. This is entirely consistent with the Multiple Fitness Model (Cunningham et al, 2002) as discussed earlier, in that cosmetics are clearly used, in part, as a

deceptive tactic in order to persuade others of the users higher than actual psychological well-being. Such manipulation should see important benefits, in terms of both positioning within a social hierarchy and in terms of mate value. The latter is discussed in more detail in the following two chapters.

12.6.1 Methodological constraints and recommendations for future research.

Due to the investigatory nature of this research, basic standardised questionnaires were employed. As no prior research in this area exists, further investigation using a range of methodologies would be recommended in order to strengthen the current data. More specifically, and as just recommended, investigation into possible correlations between cosmetic usage and the five super-factors may well be fruitful.

It should also be noted that the term ‘cosmetics’ was not defined for the participant. Though this does not appear to have been a problem (participants were given the opportunity to ask questions or raise issues during the debriefing), it is possible that different definitions may have been employed. It is therefore recommended that future research in this area is more explicit in this regard. (It should be noted that comments regarding questionnaire construction and usage are relevant to Chapters 12 and 13).

Additionally, this research was conducted, due to time constraints, with a small sample size, which may well have produced Type II errors. It is therefore recommended that similar research on a larger scale be conducted in order to reduce the possibility of such errors.

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13. Cosmetics, Physical Attractiveness and Sociosexuality

13.1 Synopsis Study One – "Cosmetics: deceptive markers of female health and fecundity? The relationship between cosmetic usage and physical attractiveness", and Study Two, "Cosmetics: honest markers of sociosexuality? The relationship between cosmetic usage and sociosexuality".

Study One aims to cast more light on the relationship between female beauty and cosmetic usage. As Law-Smith et al (2006) have shown, cosmetics are able to mask indicators of health and fecundity, those very factors which have evolved into what are now recognised cross culturally as features of attractiveness. As female beauty is a core factor in male mate choice, anything which affects female beauty must, by definition, impact upon male preferences. Theoretical argument regarding the connection between attractiveness and cosmetic usage is, however, equivocal, with inconsistency also in the little empirical research conducted. This study therefore aims to investigate this relationship in more depth, in the hope of explicating the apparent anomalies in the literature.

Study Two aims to cast more light on the relationship between sociosexuality and cosmetic usage. This relationship is, as with the relationship between cosmetic usage and physical attractiveness, an area that has received little empirical attention (though the relationship between attractiveness and sociosexuality has received more). There is general consensus regarding the ability to improve appearance through cosmetic usage (see previous discussions). Nevertheless, it would be unwise to make assumptions about the relationship between cosmetic usage and sociosexuality based upon the putative relationships between both cosmetic usage and attractiveness, and attractiveness and sociosexuality. There is, after all, too much disagreement in this area to be able to draw suppositions from such research, not least due to the largely correlational nature of the investigations. This research aims to

provide some filler, therefore, for this gap, by investigating the relationship between cosmetic usage and the three facets of sociosexuality directly.

13.2 Literature Review

The previous chapter investigated the psychological and physiological correlates of cosmetic usage. It was argued that cosmetics are utilised primarily by those exhibiting signs of greater negative affectivity, as a way of presenting a desired image to the world – that being one that represents a more positive self image, involving greater self confidence, self esteem, emotional stability and health.

This chapter focuses on the relationships between cosmetic usage and self-perceived attractiveness in the first instance, and sociosexuality in the second. As has been discussed, most females need to make a trade-off in expectation between good genes and parenting effort from males. However, it is possible that more attractive females need to compromise their preferences less. For males, physical attractiveness in their partner is rated as both important and desirable, across cultures and mating systems, applying to both short-term and long-term partners. (Buss and Schmitt, 1993) This has also been found in more recent research in which it was found that, given a limited 'budget', males assigned female attractiveness as a necessity as opposed to a luxury, with physical attractiveness, in fact, out-rating other qualities such as a sense of humour or exciting personality (Li, Bailey, Kenrick and Linsenmeier, 2002). Thus, through their greater mate value, attractive females may be able to secure both good genes and parenting or material investment from their primary partner. Furthermore, if attractive females were not able to secure both from one partner, they could feasibly obtain parental and material investment from a long-term partner whilst finding the genetic benefits from a short-term liaison.

Females of lesser attractiveness, however, may not have these options. Rather, they would have to accept a trade-off, surrendering 'good genes' for increased parental investment. Empirical evidence supports this theory, with research showing that females who rated themselves as less attractive actually preferring males with more feminised faces than more attractive females (Little et al,

2001). Similarly, females with a less attractive body, specifically with a higher Waist to Hip Ratio (WHR) have also been shown to prefer the less masculinised male face (Penton-Voak and Perrett, 2001). Evidence from the animal kingdom further supports this proposition. For example, zebra finches mate monogamously and both male and female invest equally in the rearing of their young. Zebra finches have been shown to have a preference for black banded legs as opposed to blue bands. After manipulating the male birds' attractiveness by attaching black bands to blue banded males, these males started to behave polygamously. Additionally, manipulated females (i.e. those with black bands attached) started to invest less in parenting and more in mating, whilst retaining a reproductive edge through the increased parenting effort of their partner (Burley, 1986). Similar findings have been reported regarding the mating strategies of sticklebacks (Kraak and Bakker, 1998).

However, for conditional mating strategies to be successful, males and females need to be able to assess accurately their relative mate value in the reproductive market place. They need to know what attributes are preferred by the opposite sex, and how they themselves fare in relation to their conspecifics with regard to meeting these preferences. Such evaluation, for a female, would be largely contingent upon the history of the reactions of males to her in relation to other females, as well as her ability to attract males who are desirable to other females. Self assessed physical attractiveness, then, would be used, albeit probably not consciously, to determine a particular female's mating strategy, based, as it were, on her ability to satisfy the preferences of potential males.

Self-perceived physical attractiveness, and specifically comparative attractiveness, therefore, determines the appropriate mating strategy. If she deems herself (correctly) to be more attractive than her conspecifics she can afford to be choosier. If, on the other hand, she rates herself as comparable to her conspecifics, she may decide to use additional tactics in order to enhance her attractiveness over and above her competitors. Such attractiveness enhancing techniques may be behavioural. She may, for example, behave in a more seductive manner, flirting and standing and moving more provocatively

than usual. She may, on the other hand, dress more provocatively. Singh (2004) suggests that the use of corsets (to enhance the WHR), padded bras and cosmetics would all serve to enhance attractiveness in this way. Research has shown that females at point of ovulation are more likely to reveal more flesh and make more effort to look more attractive then than at other times during their menstrual cycle (Grammer, Renninger and Fischer, 2004; Haselton, Mortezaie, Pillsworth, Bleske-Reche and Frederick, 2007). In other words, when the context (in this case, high fertility) warrants it, behaviour may change, as it may when the intrasexual competition is higher. Again this may occur outside of her conscious awareness.

Interestingly, Singh (2004) makes exactly this point, but goes on to suggest that the success of such tactics would be greater for more attractive females than for less attractive females, and therefore that less attractive females are more likely to use other strategies than attractiveness-enhancing techniques in order to attract a mate. This appears to run counter to his earlier claim that intrasexual competition should drive those who see their conspecifics as similarly attractive to gain an edge by attractiveness-enhancement activities. In the latter argument the implication is that females who are in fact less, or at least similarly, attractive should be more responsive to such appearance enhancing strategies.

Nevertheless, Singh (2004) did find in favour of his hypothesis, revealing, amongst other things that WHR was negatively correlated with self-rated attractiveness (r = -.39, $p < .01$) (i.e. the lower the waist to hip ratio the higher their self ratings of physical attractiveness), a finding consistent with prior research (e.g. Penton-Voak and Perrett, 2001). When separated into high and low WHR groups, the low WHR group were significantly more likely to '[use] facial make up to look nice' ($t = 2.14$, $p < .05$). Thus, Singh argues, those females who regard themselves as more attractive are more likely to use more cosmetics, supporting the hypothesis that such deceptive tactics would be of greater benefit to more attractive than less attractive females.

Further empirical evidence regarding cosmetic usage and attractiveness is both limited and equivocal. According to Davis et al, in their investigation into self-objectification (or the likelihood of seeing oneself as an object 'designed for

visual inspection and assessment"; 2001: 22), those who are more attractive are more likely to self-objectify. As self-objectification is linked to a "heightened focus on grooming and other image-enhancing behaviours" (p.22), the indirect conclusion to be drawn is that cosmetic usage should increase the more attractive one is. This would be consistent with Singh's findings just discussed. However it should also be noted, Davis et al also found in the same study that self-objectification increases with increased negative affectivity, a finding they attribute to the increased vulnerability those of low self esteem, poor body image etc to the sexualisation process. Thus, from the research discussed in the previous chapter, one could argue that a relationship between self-objectification and cosmetic usage could be as much attributable to negative affectivity as to attractiveness.

It should be noted that Singh's findings are not consistent with the findings reported in the previous chapter (12.5.5.2) in which cosmetic usage and self-rated physical attractiveness were found to be highly negatively correlated ($p = .006$). In that investigation it was found that cosmetic usage was correlated with a number of personality traits, in essence being positively correlated with traits of negative affectivity and negatively with positive personality traits. So, for example, whilst cosmetic usage increased with anxiety and conformity, it decreased with self-perceived physical attractiveness and self esteem. This supports the findings of Davis et al (2001) with regard to their reported link between self-objectification and negative affectivity, but counter to their link between self-objectification and greater attractiveness. The findings also run counter to Singh's results and conclusions, this conclusion being that in fact lower attractiveness females invest more heavily in cosmetic usage in order to enhance appearance than their more attractive conspecifics.

The negative correlation found previously between self-perceived physical attractiveness and cosmetic usage is, however, consistent with research by Milroy, Cronk, Campbell and Simpson (2002) who investigated the possibility that health and beauty can be faked by the use of cosmetics. They found (as did Law-Smith et al, 2006) that females who reported poor health had greater cosmetic usage, and they reported doing so in order to look more feminine and

healthier. (The investigation also incidentally showed that they were successful in this respect).

Empirical research into the relationship between cosmetic usage and attractiveness is therefore one which is both limited and contradictory, and is therefore deserving of further scrutiny, impacting as it may on partner preference and conditional mating strategy.

The degree to which cosmetic usage and sociosexuality is one which is both under researched and uncertain. One might argue that females might actively seek to manipulate and improve appearance through cosmetics in order to attract a partner, whether long or short-term. In other words, one might see cosmetics as a tool by which females provide honest markers of sociosexual desire and intent. However, one might also argue that if cosmetics are used primarily by those with greater negative affectivity (as previously found), then those who choose to use more cosmetics may well have lower mate value and will therefore be less successful in attracting mates.

The question is further complicated by what might be regarded as a 'successful' strategy. For males, multiple partnerships represent the best outcome if such can be achieved. For females, however, multiple relationships *may* represent a successful strategy (if she is pursuing short-term relationships for their genetic benefits). However, one could equally argue that fewer but more permanent relationships would be more reproductively advantageous to most females, with multiple sexual relationships in fact representing a failed strategy to attract the desired long-term partner. It has been suggested, for example, that a less restricted approach to sexuality in adolescent females is correlated with lower self esteem and emotional distress (e.g., depression, anxiety, stress, hostility; Ethier, Kershaw, Lewis, Milan and Niccolai; 2006), though whether greater sexual activity in females lowers self esteem or low self esteem encourages more promiscuous behaviour remains unclear. Similar results regarding self esteem and sociosexuality were also found in earlier research in which early sexual relationships were found to correlate positively with self esteem in boys but negatively with girls (Spencer, Zimet, Aalsma and Orr; 2002).However,

other studies have found positive relationships between self esteem and unrestricted sociosexuality (e.g. Walsh, 1991).

To the author's knowledge, there is no research which focuses primarily on this subject. However, a study on cosmetics as a signalling system investigated the concept that signalling systems will not persist if founded purely on deception as over time receivers of dishonest signals will learn to ignore them (Milroy, Cronk, Campbell, and Simpson, 2002). The researchers therefore considered the ability of females to fake signals of health and beauty through the use of cosmetics and found that females in poorer health were more inclined to use cosmetics in order to look healthier. They concluded that deceptive strategies were indeed used in the manipulation of apparent health. However, it was also argued that deceptive signals 'piggybacked' on honest signals. In this case, the researchers found that cosmetics were used as honest signals regarding the females' sociosexual orientation, with more cosmetics used by people with a less restricted orientation. A significant relationship between facial appearance, oestrogen levels and fecundity was also found by Law Smith et al (2006). Although the focus of this study was not the use of cosmetics, nevertheless they did find that the significant ratings attributable to hormonal markers in facial attributions were lost when females wore make up. The inference was therefore that females were able to mask detectable signs of fecundity through cosmetic usage, a factor which would presumably be of greater benefit to females of reduced as opposed to elevated fecundity.

The potential relationship, nevertheless, between sociosexuality and cosmetic usage is one that has been little informed, currently, by empirical investigation. This second study aims, therefore, to provide an explorative investigation into this under researched field.

13.2.1 Experimental Hypotheses – Study One

It was predicted that there would be a significant correlation between cosmetic usage and self-perceived physical attractiveness, though the direction of the correlation was not predicted.

13.2.2 Experimental Hypotheses – Study Two

It was predicted that there would be a significant correlation between cosmetic usage and sociosexuality (i.e. the degree to which emotional commitment and intimacy is desired before committing to a sexual relationship) though, again, the direction of the correlation was not predicted.

13.3 "Cosmetics: deceptive markers of female health and fecundity? The relationship between cosmetic usage and physical attractiveness"

Methodology

13.3.1 Design

This study employed a quasi-experimental correlational design in which participants completed questionnaires on cosmetic usage and self-perceived physical attractiveness. The purpose written questionnaire, designed to assess the degree to which cosmetic usage is of practical and psychological relevance to the user was employed (see appendix n) in conjunction with the previously used Physical Attractiveness Scale - Revised (see appendix j), designed to assess self-perceived physical attractiveness. Scores from the PAS-R provided the predictor variable and scores from the Cosmetic Usage Questionnaire provided the criterion variable.

13.3.2 Materials

Firstly, the purpose written Cosmetics Usage Questionnaire, as utilized in chapter 12, was employed (see appendix n). When analyzed for internal consistency the original study showed a Cronbach Alpha rating of .862. This study also showed good internal consistency with a Cronbach Alpha rating of .871. For scoring instructions see chapter 12, sub-section 3.2.

Secondly, Penke and Asendorpf's R-SOI was again used to assess sociosexual desire, sociosexual attitude and sociosexual behaviour (see appendix h - ii). As sociosexuality is the focus of the following study, however, it is not discussed further at this point.

Thirdly, the Physical Attractiveness Scale – Revised (see appendix j) was used in order to assess self-perceived physical attractiveness. Analysis of the reliability of the original scale showed good internal consistency, the Cronbach alpha coefficient being .83. In this study the Cronbach alpha coefficient was also good, with an alpha coefficient of .855. Again items were rated on a Likert scale with scores ranging from 1 to 5. A higher score indicated that the rater perceived themselves to be more physically attractive. Items 4, 5 and 9 were reverse scored.

13.3.3 Participants

138 female volunteers participated in the study, recruited primarily from university undergraduate psychologists. A number were also recruited through personal contacts of the author and university staff. Of the 138 participants, one participant failed to complete all of the cosmetic usage questions and three more failed to complete all of the sociosexuality questions. A further twelve did not supply age or ethnicity or failed to complete all of the self perceived attractiveness questions, which meant that a total of 122 responses were analysed through the partial correlation.

Ages ranged from 18 to 61 years of age ($\underline{M}$ = 30.58, S.D. = 11.5). As with many such studies, there was a positive skew (.936) with many participants being at the younger end of the range. Additionally there was a negative kurtosis value of -.222, indicating that the distribution was relatively flat, with many of the cases lying out towards the extremes. This was confirmed by Kolmogorov-Smirnov analysis which indicated a violation of the assumption of normality. However, as the sample was reasonably large, analysis of the boxplot indicated no outliers, and the 5% trimmed mean was close to the overall mean (29.73 and 30.58 respectively), normality was deemed to be acceptable.

13.3.4 Procedure

As in previous experiments which included use of the Revised Socio-Orientation Inventory, participants were informed that the study was being conducted to investigate aspects of human sexual strategy. All were given an information sheet explaining what they would be asked to do, and providing a consent form which participants were asked to sign if they were willing to participate. This also included demographic data, including age and ethnicity. Procedures regarding confidentiality and anonymity were fully explained and adhered to, which was particularly important due to the sensitive nature of the questions asked. This involved the separation of and collection of the consent form prior to the completion of the questionnaires. It was explained that only an identification number connected the consent form to the questionnaire data, and this connection was retained to enable the removal of anyone's data should they wish it to be removed after submission. It was also stressed that participants did not have to answer all questions if they chose not to, and that this would not invalidate the rest of their answers in future analysis. For this reason the results show differing N and Degrees of Freedom on occasions.

Once participants had had the time to read the information sheet and to complete the consent forms, these were collected and the participants were asked to complete the three questionnaires, i.e. the Socio-Orientation Inventory, the Cosmetic Usage Questionnaire and the Physical Attractiveness Scale - Revised.

13.3.5 Results

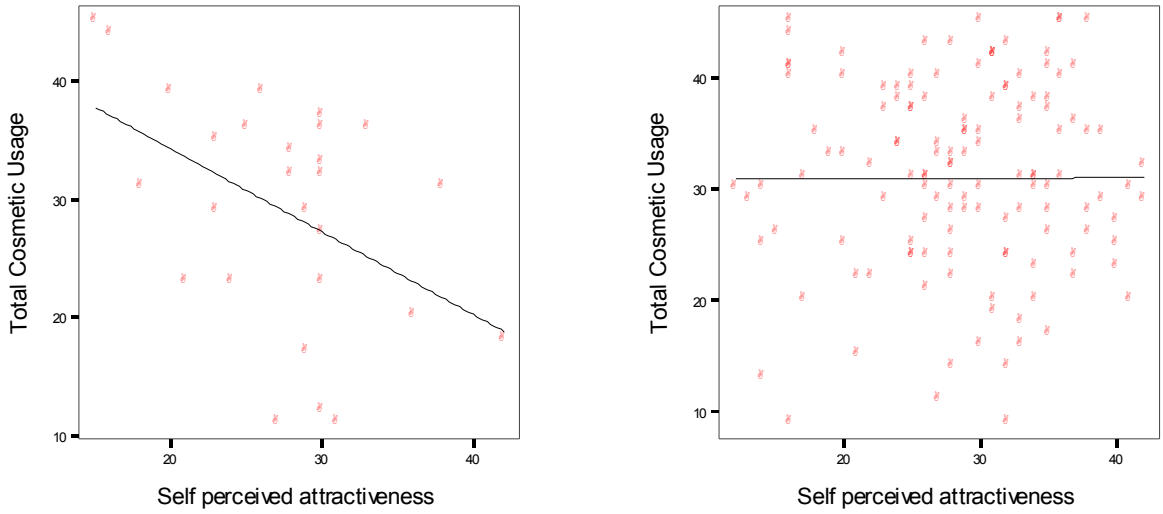
The relationship between cosmetic usage (as measured by the Cosmetic Usage Questionnaire) and self-perceived physical attractiveness (as measured by the Physical Attractiveness Scale - Revised) was investigated using a two tailed Partial Correlation, controlling for age. Preliminary investigation of the scatterplot confirmed that there was no violation of either homoscedasticity or linearity. No correlation was found between the two variables (r = .039, df = 121, p = .672).

When re-analysed by group as discussed below (high scorers in self-perceived physical attractiveness scoring 33+, medium scorers scoring 27-32 and low scorers scoring 26 and below), ANOVA again showed no significant difference between participants who rated themselves as high, medium and low in physical attractiveness and their cosmetic usage (F (2,124) = .404, p >.05)

13.4 Discussion

As an extension of the previous two chapters, this study investigated the relationship between cosmetic usage and self-perceived physical attractiveness. In view of the dearth of existing empirical evidence and the conflict in those investigations which have been reported, two tailed hypotheses were offered. Despite the findings of the previous study (12.6.5.2) this investigation found no significant correlation between cosmetic usage and self-rated physical attractiveness. This was surprising as the previous results were strong, showing a highly significant negative correlation between the two factors (p=.006). Scatterplots highlighting this discrepancy may be seen in Figure 15. However, in view of other research and some theoretical arguments, a two tailed hypothesis had been chosen as it was clear that there were both theoretical and empirical arguments for either a positive or negative relationship between these factors.

Figure 15 Scatterplot with regression lines showing the relationship between Cosmetic Usage and self-perceived physical attractiveness in Chapter 12 (content mixed with other variables) and Chapter 13 (content explicit).



In view of these findings and the discrepancies in prior research it was deemed possible that a non-linear relationship might exist, which might account for the lack of a significant correlation in either direction in this study. In other words, it was hypothesised that whilst people high in attractiveness might use more cosmetics (as appearance-enhancing strategies might be more successful for more attractive females than for less attractive females) and people low in attractiveness might use more cosmetics (as self-objectification increases with increased negative affectivity, and increased self objectification is linked to increased cosmetic usage), investigation of the relationship between cosmetic usage and physical attractiveness might be better investigated using a between groups analysis. Thus participants were split into three groups of high (scoring 33+), medium (scoring 27-32) and low self rated attractiveness (scoring 26 and below) and ANOVA was conducted on the transformed data.

ANOVA again showed no significant difference between participants who rated themselves as high, medium and low in physical attractiveness and their cosmetic usage ($\underline{F}$ (2,124) = .404, p >.05). However, inspection of the means of

the groups did indicate a trend towards increased cosmetic usage for participants who rated themselves as both low and high in self-perceived physical attractiveness (M low self-perceived attractiveness = 32.10, M average self-perceived attractiveness = 30.43, M high self-perceived attractiveness = 31.19).

It would appear, then, that the relationship between cosmetic usage and physical attractiveness is a complex one, mediated by many issues. This research neither refutes nor confirms the theoretical arguments proposed. However, it does suggest that there may be truth in all of these propositions. For example, it may be that physically attractive females are, indeed, more accustomed to evaluative gazing and greater sexualisation than less physically attractive females. If that is true, and it seems likely in view of the recognised male preference for physical beauty in females, then they may well also be more liable to self-objectification and the resultant attractiveness-enhancing behaviours (as per Davis et al, 2001). However, it may also be true that more 'average' looking females practice attractiveness-enhancing behaviours in order to gain a physical advantage over similarly attractive conspecifics (as per the theoretical but not empirical position of Singh, 2004). Additionally, it may *also* be true that less attractive females feel the need to compensate for their reduced physical attractiveness, as the visual evaluation of female physical attractiveness is an elemental facet of male sexuality (homosexuality notwithstanding). Thus, if reduced physical attractiveness is, indeed, a marker of reduced health and fecundity, the opportunity to mask this deficit through cosmetics as Law-Smith et al (2006) suggest, should be of significant value in mate attraction behaviour.

13.4.1 Methodological constraints.

The current study has highlighted the extreme complexity of the way in which cosmetics may be utilised by different people for a variety of purposes. However, it is right and proper that the methodological procedures should be robustly explored to ascertain possible biases which may account for the

difference in results in this investigation from others (and perhaps, most surprisingly, from this author's prior research reported in chapter 16).

The lack of a significant correlation between this study and the prior research is difficult to understand. Both studies used the same measures for both cosmetic usage (the Cosmetic Usage Questionnaire) and self-perceived physical attractiveness (the Physical Attractiveness Scale - Revised). Both studies also employed the participation of a similar participant group, that being predominantly university undergraduates with a number of, generally older, colleagues. As such, the skew in terms of age was similar. Table 17 provides a comparison of the demographics and results of the two studies.

Table 17 A comparison of the demographics and results of the two studies into cosmetic usage and self rated physical attractiveness.

	Mean Age	Skew	Physical Attractiveness	N	Cosmetic Usage	N
This study	30.42	1.09	28.70	132	30.73	137
Previous study (Chapter 12)	28.66	.97	27.48	27	29.03	29

The most obvious difference between the two investigations is that in the present study a much larger participant group was used. If the results had therefore been significant for this group but not for the last that might have been reasonably attributed to sample size and Type II error. However, failure to replicate the results of the prior study is clearly not, in this case, a result of sample size.

The only other quantifiable difference between the two studies was the difference in 'presentation' of the Physical Attractiveness Scale - Revised. In the prior study these nine questions were mixed in with 135 other questions from fourteen different questionnaires, so questions regarding physical attractiveness were not highlighted as such. In this study all nine questions regarding perceptions of physical attractiveness were presented together in a more identifiable format. As ratings for physical attractiveness were marginally higher

(M 28.70 as compared to M 27.48) it is speculated that the individualisation of this questionnaire encouraged a self-enhancing bias in which participants felt encouraged to rate themselves more highly than they would if the emphasis were not as clear. Cosmetic Usage was measured in the same way (i.e. as an individual questionnaire) in both studies. It is possible, therefore, that there was a possible inflation of attractiveness ratings in this study, and this may have reduced the negative relationship between the two factors to one of non-significance. Future research involving the large scale questionnaire and a large sample size would be beneficial, therefore, in addressing this possibility.

Nevertheless, decisions regarding the use of a large scale questionnaire incorporating questions on perceived attractiveness, as opposed to a specific questionnaire on the same, are not straightforward, with advantages and limitations to both. Recognition of the possible drawbacks associated with the use of either is required, with the proposition that qualitative studies may be able to cast further light on this difficult subject.

It is also suggested that further consideration be given to the way in which self-perceived physical attractiveness is measured. The measure used asked the following questions: I like to look at myself in the mirror; I have a pleasing physique; I attract attention from the opposite sex; I don't consider myself attractive; I dislike looking at myself in the mirror; I like to look at my body; I like to show off my body; I am considered attractive by others; I dislike looking at my body. Of these, four specifically refer to the body and not facial features, and all *may* refer to bodily attractiveness. Therefore the link between facial attractiveness and cosmetic usage (presumably the more relevant link) is weakened. Whilst this does not account for the difference in results between the two experiments, it does suggest a methodological problem. Future research is therefore recommended using a purpose written facial attractiveness questionnaire in order to address this issue.

Lastly, it is possible that the participants' backgrounds, with the large majority working, either as staff or student, in an academic environment, had some impact upon the apparent lack of relationship between self-perceived physical

attractiveness and cosmetic usage. It may be that in this particular environment the focus of male attention is less overtly on physical characteristics than it is for the general population. Furthermore, females themselves may be more likely to focus their attention more on intellectual and less on physical concerns, as tentatively indicated in chapter 16. Thus both factors may have been instrumental in reducing the likelihood of a relationship between these two factors. Future research might improve this study, therefore, by investigating a broader and more representative population.

13.4.2 Further comment and recommendations for future research.

Assuming that the results offered are reflective of true opinion (and caution is recommended when accepting this position), then the evidence would suggest that the use of cosmetics cannot be simply explained by looking in one direction, i.e. that of the relationship between cosmetics and physical attractiveness. Rather it would appear that cosmetics are utilised by females for a multitude of differing reasons - as a response to the visual scrutiny and sexualisation of females by heterosexual males; in order to enhance physical attractiveness as a response to intrasexual competition; as a means of masking detectable signs of fecundity; as a means of presenting a manipulated and conforming image to the world. Future research would be useful in order to ascertain the relative strength of conflicting factors. For example, would a female of lower fecundity, but high in self esteem and self confidence, use more or less in the way of cosmetics than a female of greater fecundity but low in self esteem and self confidence? With female beauty (and the manipulation of it) being so central to male mating preferences, this is an area of research that is worthy of future investigation.

13.5 Cosmetics: honest markers of sociosexuality? The relationship between cosmetic usage and sociosexuality.

Methodology

13.5.1 Design

This study employed a quasi-experimental correlational design in which participants completed questionnaires on cosmetic usage and sociosexuality. Both questionnaires were as previously used; i.e. the purpose written questionnaire, designed to assess the degree to which cosmetic usage is of practical and psychological relevance to the user (see appendix n) in conjunction with R-SOI assessing sexual behaviour, attitude and desire (see appendix h - ii). The Scores from the Revised Socio-Orientation Inventory provided the predictor variable and scores from the Cosmetic Usage Questionnaire provided the criterion variable.

13.5.2 Materials

See Study One (13.3.2)

13.5.3 Participants

See Study One (13.3.3)

13.5.4 Procedure

See Study One (13.3.4)

13.5.5 Results

The relationship between cosmetic usage (as measured by the Cosmetic Usage Questionnaire) and sociosexuality (as measured by the R-SOI) was investigated using Partial Correlation. Preliminary investigation of the scatterplot

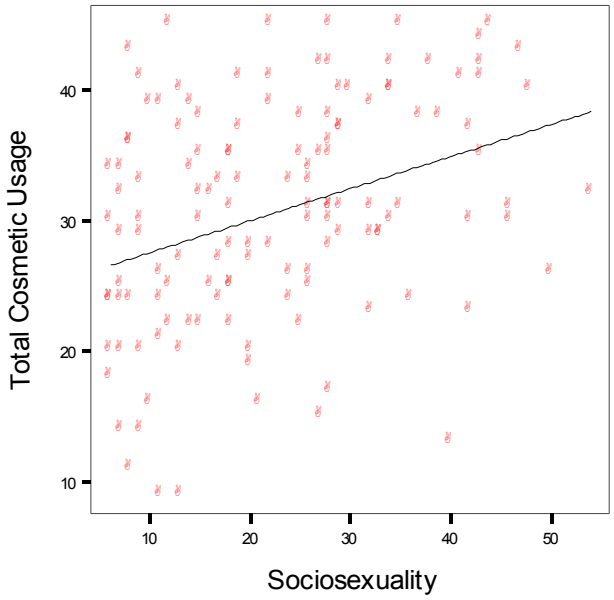
showed there was no violation of either homoscedasticity or linearity. After controlling for self-perceived physical attractiveness and age, there was a strong positive correlation between the two variables (r = .319, N = 122, p = .001), with high scores for sociosexuality being associated with high scores for cosmetic usage. This was also true of each of the component parts of the sociosexuality scale, sociosexual desire, sociosexual attitude and sociosexual behaviour all of which were moderately positively correlated with cosmetic usage. See Table 18 and Figure 16.

Table 18 Partial Correlation coefficients for the relationship between aspects of sociosexuality and cosmetic usage, after controlling for self-perceived physical attractiveness, age and ethnicity.

Scale	Correlation Coefficient	Zero Order Coefficient	Significance (2 tailed)	df
Sociosexuality	.319	.329	.001**	117
Sociosexual Desire	.234	.240	.01**	117
Sociosexual Attitude	.262	.272	.004**	117
Sociosexual Behaviour	.249	.258	.006**	117

** Significant at the p<.01 level

Figure 16 Scatterplot showing relationship between Cosmetic Usage and Sociosexuality



13.6 Discussion

After controlling for self-perceived attractiveness, this study showed that there was a strong, positive correlation between cosmetic usage and sociosexuality. In other words, females use more cosmetics the greater their sexual desire, the more relaxed their attitude towards uncommitted sexual relationships, and the less restricted their behaviour. This appeared to be true of all facets of sociosexuality, with the relationship between the use of cosmetics becoming increasingly stronger as one moves from desire, through attitude to behaviour. This is reasonable as a progression. As female sexual desire increases, so attitudes concerning uncommitted sexual relationships become more relaxed in order to accommodate that desire. Resultant behaviour, furthermore, is accentuated as a result of the outward visual indication of availability to her proposed partner, and his positive pursuit of her as a consequence. So it would appear that cosmetics are used, as Milroy et al (2002) suggest, as an honest signal of sociosexuality. By providing a visual behavioural signal which improves appearance in terms of femininity and health, it would appear that

females are providing males with the cue that they are interested in sexual relationships.

However, it may be that this relationship is complicated by personality differences. For example, it may be that females who are low in self esteem and high in the need for social conformity use more cosmetics (as previously found), and that as a product of these personality traits, these females are both less sociosexually restricted and more likely to wear cosmetics. Considering the three facets of sociosexuality separately may help to clarify the issue. As we have seen, there is a highly significant correlation between cosmetic usage and behaviour ($r = .249$, $p=.006$) and attitude ($r = .264$, $p=.004$) and slightly less so with desire ($r = .234$, $p= .01$). However, the latter result is still highly significant. If one suggested that the less restricted sociosexual orientation was as a result of lower self esteem, one might expect to see a high correlation between sexual behaviour and cosmetic usage and sexual attitude and cosmetic usage, but less of a correlation between sexual desire and the use of cosmetics (the argument being that a more relaxed sociosexual orientation as a result of lower self esteem would not necessarily indicate a behavioural response to increased desire, but rather relationship-enhancing behaviour, or behaviour that may help to cement a new relationship; O'Sullivan and Allgeier,1998). Whilst it is true that desire is marginally less significantly correlated with cosmetic usage than the other two facets of sociosexuality, there remains a highly significant correlation, and the effect size between the three is very similar. Thus it is proposed that the more likely explanation for this small differential is one of male mate preference and his positive pursuit of a sexual liaison as a result of the cues that he is receiving.

It would appear, then, that cosmetics are used as both honest markers of sociosexuality and deceptive markers of female health, fecundity and positive affectivity.

14. CONCLUDING DISCUSSION

14.1 Experimental review and discussion

This thesis has investigated intra-sex differences in human sexual strategy at the genomic, psycho-physiological and psychological levels, with an evolutionary perspective providing the fundamental link between each. The rationale for doing so was uncomplicated - intra-sex differences had, until relatively recently, been largely under-researched, taking as they did a minor role in comparison to the multiplicity of inter-sex difference studies in human mating strategy and tactics (Buss, 1998; Gangestad and Simpson, 2000). However, as a result of theoretical advances in our understanding of contingent mating strategies, intra-sex differences are now playing a larger role in evolutionary research.

For the most part these studies drew upon the tenets of both Conditional Mating Strategies as specified by Gross (1996), and Strategic Pluralism Theory as specified by Gangestad and Simpson (2000), and the joint premise that the variability within each sex in mating tactics (or behaviours) is contingent upon environmental cues. In terms of Conditional Mating Strategies, the essential elements are firstly, that there must be a choice of different behavioral tactics, and these choices are made, either consciously or, more probably, subconsciously, as a result of environmental cues or features. These environmental cues may be, quite literally, the environment, the pathogen load for example, or differential indicators of the value of bi-parental care, or it may be the individual's mate value relative to others through relative attractiveness or status. Furthermore, Conditional Mating Strategies requires that all individuals are genetically designed to enact the same behaviour given the same cues. As was pointed out in Chapter 5, however, a*lternate* conditional strategies do allow for a difference in the conditions under which the behavioural tactic will be enacted. The example offered was that of the passage of time and impact upon extra-pair mating. Under a conditional mixed mating strategy a male in a long-term partnership may engage in an extra-pair mating if his primary mate has been absent for a period of time. An *alternative* conditional

mixed mating strategy would allow differences in the time limit elapsed before extra-pair matings would be pursued. The key issue is, however, that under a Conditional Mating Strategy, the chosen behavioural tactic must afford greater reproductive success than alternative tactics.

Similarly, Strategic Pluralism contends that variability within each sex in mating tactics (or behaviours) is contingent upon environmental cues. The essential proposal argues that differences in individual behaviours can only be fully appreciated when one recognises the trade-offs made between selection for good genes and selection for good parenting. It is suggested that for females this trade-off is influenced by the environment in which the female lives. So, for example, if the environment in which the female lives carries a high pathogenic load, females should prefer males offering good genes, due to the advantage to her offspring of potentially higher immunocompetence, over males offering greater parenting. However, if the environment requires bi-parental commitment in order to ensure her offspring's viability, she should conversely be more inclined to look for males offering indicators of good parenting than good genes. For males, on the other hand, their primary interest is in the behaviour and preference of females, and tactics and preferences are adjusted accordingly. Thus, when females are indicating a preference for good genes, those males who are able to offer good genes should be successful pursuing a short-term mating tactic. However, when preference for good parenting is greater, even those males offering good genes should have to temper their short-term mating preference in favour of greater commitment and long-term investment. As Gangestad and Simpson (2000) point out, there would be very few males who would be successful in pursuing short-term mating tactics exclusively, whatever the environmental situation.

So the impact of the environment on female preference, and the influence of female preference on male behaviour, is fundamental to an understanding of human sexual strategy according to Strategic Pluralism Theory. So, too, the notion that differing tactics should be enacted as a result of environmental cues (in this case within a broader context, and specifically including relative attractiveness and mate value), and the principle that the chosen tactic should

yield optimal fitness benefits, according to Conditional Mating Strategies. These are the tenets which have guided, and have been central to, the experimental hypotheses of the majority of the studies within this thesis. However, they cannot and do not account for all intra-sex differences. The first of the studies to be considered in more depth, in fact, examines one form of intra-sex difference attributable solely to genetic factors without any environmental influence.

14.1.1 Male intra-sex difference and genetic polymorphism

The first of the studies, then, considered male intra-sex difference at a purely genetic level. Entitled “The gay and straight male: Are gay males more attractive?”, it endeavoured to address one of the major challenges for evolutionary researchers, that being the continued existence of homosexuality in the human population. If, it was argued, homosexuality is at least partially genetically determined, as there is much evidence to suggest, why has selection not eliminated these reproductively deleterious genes from the gene pool? Intra-sex differences in male sexual orientation were therefore considered at a genomic level with genetic polymorphism being offered as a putative explanation for the emergence of at least one sub-type of male homosexuality (genetic polymorphism being the concept that two genetic phenotypes may exist within the same species, in this case those phenotypes being same or opposite sex sexual orientation).

It was suggested that to remain within the gene pool the homosexual gene or genes (for simplicity we shall call it a gene) must either offer directly or indirectly (through linkage), some reproductive or survival advantage. This study investigated the possibility that at least one sub-type of homosexuality could be explained as a genetic trade-off, or as a product of both genetic linkage and female advantage outweighing male disadvantage (i.e. an explanation consistent with sexual antagonistic theory).

Using a novel methodology, composite images of both a male homosexual and a male heterosexual were produced. The results of analysis showed that, consistent with expectation, the homosexual image was deemed to be more

attractive, and was seen to be less aggressive, than the heterosexual image. Furthermore, it tentatively appeared that attractiveness was perceived to be as a result of the increased femininity of the homosexual morphed image over the heterosexual morphed image. This was consistent with prior research into preference for feminised male faces as a probable indicator of feminine characteristics such as kindness and empathy (Perrett et al, 1998; Rhodes et al, 2000). It was subsequently argued that females carrying the homosexual/ attractiveness genes may be more feminised and hence more attractive than females not carrying the genes, thus offering them a reproductive advantage. (This was not, of course, investigated, but would offer an interesting line of future research). Similarly, males carrying the genes would be more attractive, though in this instance as it is proposed that the attractiveness gene is linked to the recessive homosexuality gene on the X chromosome, there would, in fact be an evolutionary disadvantage for them due to their restricted desire for sexual relationships with a potentially reproductive partner.

These results were not only in concordance with existing research proposing a genetic factor in sexual orientation (Allen and Gorski, 1992; Bailey and Benishay, 1993; Bailey and Pillard, 1991; LeVay, 1991). They also supported the previous research suggesting that the gene for sexual orientation may be carried on the X chromosome, as suggested by the evidence that sexual orientation appears to be carried down the maternal side (Camperio Ciani et al, 2004; Hamer et al, 1993). Furthermore, the results of this study are consistent with the genetic modelling theories of homosexuality as posited by Gavrilets and Rice (2006) in which, using a theoretical model, they conclude that either overdominance (heterozygote advantage) or sexual antagonistic theory (in which the one sex is more greatly advantaged by the presence of the gene than the other is disadvantaged) could lead to a stable representation of the homosexual gene within a population. The present study, of course, suggests that sexual antagonistic theory is the most likely explanation.

It is not, however, entirely in agreement with a recent paper examining this issue, though there are significant and important similarities. In this paper (Camperio-Ciani et al, 2008) argue, through the use of a systematic

mathematical analysis, that all known empirical data can be accounted for by a two-locus genetic model with at least one locus on the X chromosome, and in which gene expression is sexually antagonistic. However, unlike this study, they also argue that 'androphilia' (the increased attraction to males in both sexes) is a better explanation of genetic factors influencing male homosexuality (GFMH) than their alternative proposition, a more feminised phenotype. This is based on the premise that androphilia is more naturally consistent with the sexually antagonistic hypothesis than with overdominance. This does not, of course, explain the attractiveness (and putative femininity) of the faces of male homosexuals as established in this research. The present study suggests then, that sexual antagonistic theory accounts for GFMH, through feminisation of both the male and female phenotype. Accordingly, with the addition of the empirical data from this research suggesting, as it does, the apparent feminisation of the male phenotype, and in concordance with the modelling theories of Gavrilets and Rice (2006) and the mathematical models of Camperio Ciani et al (2008) it seems reasonable to conclude that overdominance and sexual antagonistic theory offer a logical evolutionary explanation for the intra-sex differences in male sexual orientation.

14.1.2 Male intra-sex difference, Conditional Mating Strategies and Strategic Pluralism.

Whereas the previous study investigated genetic explanations for intra-sex differences, the following studies used conditional mating strategies as a starting point for investigation, by considering the potential behavioural tactics which might be enacted as a result of the conscious or sub-conscious appreciation of the environmental context and appropriate response to it (as opposed to the non-environmental explanation proposed for intra-sex difference in sexual orientation, as just discussed). It starts with the proposition, under genetic monomorphism, that all individuals should be genetically designed to enact the same behaviour given the same environmental cues. Frequently for males the environmental context, as explained earlier, meant the individual's ability to satisfy female mate preference relative to that of their conspecifics. Thus a conditional mating strategy contends that the chosen behavioural tactic

should be one that, subject to their status and attractiveness relative to their peers, most closely matches female mate preference, ensuring that this behavioural tactic yields greater fitness benefits (in the evolutionary sense of the word) than alternative strategies.

In these studies, then, female mate preference, and the male's relative ability to satisfy these preferences, has been taken as the primary environmental cue. The behavioural tactics employed as a response to an individual's relative ability to satisfy female preferences are therefore considered, with the expectation that the greatest fitness benefits, or the optimal reproductive result, will be enjoyed through employment of the most appropriate behavioural tactic. The theory of Conditional Mating Strategies was therefore employed as a starting point firstly for a number of psycho-physiological studies involving phenotypic diversity in male mating tactics.

The first investigation (chapter 8 – study one) considered the impact of female preference for male height, the environmental cue (Buss and Schmitt, 1993; Ellis, 1992), on male tactics. The hypothesis was that, as a negative correlate of good genes (Kuh and Ben-Shlomo, 1997; Mueller and Mazur, 2001; Nettle, 2002; Silventoinen et al, 1999), males of restricted height would less readily satisfy short-term mating preferences in females, and therefore score lower in aspects of sociosexuality than males of greater height. The hypothesis that shorter males should therefore invest more in parenting as a tactic by which to secure optimal reproductive success, consistent with both Conditional Mating Startegies and Strategic Pluralism Theory, was considered in the following study. This study, however, considered another, perhaps less 'obvious' possibility, that being that shorter males may have adaptively evolved a greater sociosexual desire and a less restricted sociosexual attitude in order to optimise any opportunities presented with regard to short-term or extra-pair matings. Such a possibility cannot be accounted for by Strategic Pluralism Theory (there being no trade-off between good genes and good parenting). Indeed, it could be argued that this proposition would run counter to Strategic Pluralism Theory in that this theory would contend a decreased sociosexuality (through inability to satisfy female preference for genetic quality in a short-term or extra-pair mating)

and increased parental investment would represent appropriate behavioural tactics in response to their environmental cue. However, as an alternate conditional mating strategy, this possibility is viable.

This study therefore investigated male response to the female preference for taller males in terms of strategically altered desire for and attitudes towards short-term relationships. It was hypothesised that shorter males may have an increased sociosexual desire and a less restricted sociosexual attitude, but through the constraints imposed by female preference, there would be no significant relationship between height and sociosexual behaviour. It was also hypothesized that shorter males would rate themselves as less physically attractive than taller males.

Interestingly this was shown to be only partially true. Surprisingly, it appeared that shorter males did not rate themselves as less physically attractive than taller males, despite the widespread evidence to suggest that, at least to females, they are. Though putative explanations were offered, future research into this unexpected result would be worthwhile. With respect to the central research question, however, shorter males were not found to have a significantly higher level of desire. It was suggested that this could be a reproductive strategy in itself, as to have a particularly high level of desire may have had the detrimental effect of undermining long-term relationships which may, in the end, represent a more successful reproductive strategy. Thus an explanation based upon the tenets of Strategic Pluralism Theory is neither accepted nor rejected with regard to male height and sociosexual desire as whilst sociosexual desire was not elevated as a response to restricted height, neither was it was seen to decline. It may be, then, that both conditional mating tactics (increased sociosexual desire) and Strategic Pluralism (decreased sociosexual desire) represent potential behavioural tactics but the ‘choice’ of tactic by any one individual requires further research.

There was, however, a significant difference in sociosexual attitude, with shorter males showing a less restricted attitude. Additionally, shorter males had significantly more ‘one night stands’ than taller males. It was concluded that as

taller males are more attractive to females generally, and particularly in terms of short-term and extra-pair matings, shorter males must compromise in some way in order to have a reasonable degree of success in attracting sexual partners. One such behavioural tactic does appear to be, then, through a more relaxed sociosexual attitude. It appears that this results in a greater number of 'once only' matings, a putative explanation for which may be a drop in standards or an adjustment in perceived attractiveness of the 'target' female. As discussed, this runs counter to a Strategic Pluralism explanation, in which shorter males would be expected to display a more restricted sociosexual attitude. It is, however, explicable in terms of a conditional mating tactic.

It was noted that sociosexual desire in shorter males did not significantly exceed that of taller males, and this was attributed to the possibly detrimental effect of an increased sociosexual (as opposed to sexual) desire on long-term relationships. Would reduced male height impact upon investment in parenting? This was the focus of the next study (chapter 8 - study two) which looked at intra-sex differences in potential investment in offspring through both a Visual Preference Test and a Forced Choice Scenario. Such an investigation directly tests Strategic Pluralism Theory, as there should be a clear and negative correlation between male height, as a correlate of Good Genes, and parental investment. In the former case (i.e. the VPT) the study considered 'honest' differences in interest in infants. It was recognised, however, that there may, in fact, be no 'honest' difference between males of differing heights, and therefore 'self-reported' interest via the Forced Choice Scenario was also investigated, as it was felt that in the absence of an honest difference, there might still be a *reported* difference in investment in offspring in order to improve mate value by shorter males.

Contrary to expectations correlational analysis indicated that there was no significant relationship between height and either the VPT or the Forced Choice Scenario. However, whilst no relationship of any kind was found with the Forced Choice Scenario (indicating that shorter males appear to have evolved no psychological adaptation to *indicate* interest in children), there did appear to be some relationship between reduced height and *actual* increased interest in

children through the VPT. This relationship demonstrated a small effect size (r = -.155), which, though non-significant, suggested some trend in the hypothesised direction. Thus it seems that there may be a small but honest difference in interest and potential investment in children as a correlate of height, but this is not one that appears to be recognised at a conscious level (as indicated by the Force Choice Scenario).

The fourth study (chapter 9) considered another area of intra-sex difference in males, that being the 2D: 4D Digit Ratio. As a correlate of genetic fitness (due to the correlation between exposure to intra-uterine androgens and the Digit Ratio; Manning, 2002; Manning et al, 1998; Roney and Maestripieri, 2004), both conditional mating strategy and Strategic Pluralism Theory would contend that for those with a low digit ratio (i.e. the more masculinised digit ratio) the appropriate behavioural tactic will, again, be in increased mating effort as opposed to parental investment. Accordingly, those males displaying a lower 2D: 4D digit ratio would score more highly in terms of sociosexuality than males displaying a higher (more 'feminine') ratio, indicating a higher level of sexual desire, a more relaxed attitude to sexual relationships and less restricted sociosexual behaviour. They would, however, show a decreased interest in parental investment.

With regard to digit ratio and sociosexuality, the hypotheses were partially upheld. In terms of sociosexual desire and attitude, the lower, more masculinised ratio, was indeed significantly correlated with an increased desire for and attitude towards sexual relationships. However, in terms of sociosexual behaviour a non-significant result was obtained, with, in fact, directional trends falling in the opposite direction (i.e. more feminised males showing a less restricted sociosexual behaviour). It would appear, then, that these results are only partially consistent with a Strategic Pluralism account, in that Good Genes should be positively correlated with sociosexuality. However, the fact that sociosexual behaviour did not correlate in the predicted way is a problem for Strategic Pluralism Theory as the theory would predict that through female preference for Good Genes, males with a low digit ratio should display a more relaxed sociosexuality.

Interestingly the more masculinised males indicated that they would be significantly less likely to need to be sure that they would be in a long-term relationship with someone before they would have a sexual relationship. It was suggested that females were able to sense this lack of commitment and hence were more reluctant to enter into sexual relationships with them as a result. Hence, contrary to Strategic Pluralism, the irony would appear to be that it is the same factors which drive a higher sexual desire and a less restricted sexual attitude that actually restrict sexual behaviour. Such an interpretation would, however, be consistent with prior research which showed that females do, in fact, prefer a less masculinised male as a partner overall, the exception being over times of peak fertility or for short-term relationships or extra-pair matings, under which circumstances more masculinised males *may* be more successful (Boothroyd et al, 2008; Perrett et al, 1998).

In terms of the 2D: 4D Digit Ratio and potential parental investment, contrary to the original hypothesis, no correlation was found, though the direction of the relationship was as predicted ($r = .082$, $p = .237$). So the more feminised male was not seen to be significantly more likely to display cues to potential parental investment than the more masculinised male. However, this may reasonably be explained by the fact that the more feminised male was, as has been seen, as successful, in terms of sociosexual behaviour, as his more masculine conspecific. If, as research indicates, more feminine physiological features are ascribed more feminine psychological characteristics - amongst which might well be an expected interest in and commitment towards the dependable rearing of offspring – these very characteristics may afford him elevated sociosexual success putting him on a par with his ‘good genes’ conspecific. There would therefore be no need for the more feminine male to trade investment in sexual effort with investment in potential parenting. Whilst these results are, again, consistent with a conditional mating tactics approach (as that behaviour which is most likely to achieve optimal fitness is enacted as a result of female mate preference), there remains a problem with regards to consistency between these results and those expected through Strategic Pluralism. Clearly, if Strategic Pluralism were to offer the only potential

explanation, one would expect to find a higher digit ratio correlating positively with parental investment.

The fifth study (chapter 10) again considered phenotypic diversity within males through consideration of self-perceived physical attractiveness, levels of sociosexuality and cues to parental investment. Firstly the putative trade off between parental and mating investment was investigated by looking at cues to parental investment and the relationship with the three facets of sociosexuality, sociosexual desire, sociosexual attitude and sociosexual behaviour. Again, consistent with Strategic Pluralism Theory, It was hypothesised that there should be an inverse relationship between the two, with scores regarding cues to parental investment increasing as scores in facets of sociosexuality decrease.

Analysis of the whole and the individual facets of sociosexuality firstly indicated that there was, consistent with theory, a small but significant trade-off between mating and parenting effort ($r = -.228$; $p=.024$) with parenting effort increasing as mating effort reduces. Of particular interest, however, was an analysis of the sub-components of sociosexuality as they highlighted, very clearly, the influence of societal expectation on behaviour and, to a lesser extent, attitude. It was found that whilst there was significantly reduced interest in parental effort when sexual desire was very high ($r = -.266$, $p=.009$), at the next 'level' of sociosexuality, i.e. sociosexual attitude, the strength of this relationship was weakened ($r = -.157$, $p=.083$). It was suggested that societal expectations and norms begin to influence sociosexual attitude, the cognitive by-product of desire, and its relationship with parental investment, into something which is more culturally acceptable. This was even more graphically represented when considering sociosexual behaviour, in that the relationship between parental and mating effort had completely lost significance ($r = -.019$, $p = .432$). Again, due to the powerful cultural interest in the investment in our children, it was suggested that to explicitly reject this cultural attitude would be a socially unattractive position to adopt, creating in itself a potential reproductive disadvantage through the negative impression this would create. In other words, whilst the more 'innate' facet of sociosexuality clearly highlights the trade-off

made between parenting and mating effort, this is lost as cultural and societal expectations influence the more culturally influenced aspects of sociosexuality. Nevertheless, with regard to Strategic Pluralism Theory, these results support the proposition that a high sociosexuality should be inversely related to interest in parenting.

The second part of this study hypothesised that there should be a significant relationship between self-perceived attractiveness and sociosexuality, that being that males scoring more highly in self-perceived physical attractiveness will similarly score more highly in terms of sociosexuality, based on the claim made by Strategic Pluralism Theory that the more attractive a male is, the higher their mate value, and the less they therefore need to commit to long-term relationships. This was found to be the case. Males who perceived themselves to be more physically attractive scored significantly higher in terms of sociosexual desire, attitude and behaviour than males who felt they were less attractive. Furthermore, when each facet of sociosexuality was analysed separately, and whilst every level was significant, it was seen that an already greater desire was apparently matched by female preference for physical attractiveness, resulting in a more relaxed attitude towards sexual relationships (in order to facilitate the enactment), as well as a more unrestricted behaviour as a result of increased desire, a more relaxed attitude and female compliance.

Lastly, the fifth study also considered the relationship between self-perceived physical attractiveness and a possible trade-off with parental investment, the hypothesis being that, consistent again with Strategic Pluralism Theory, males who do not score highly with regard to self-perceived physical attractiveness should be more willing to invest in parenting effort as a means of improving their overall mate value in comparison to males who rate themselves more highly in terms of physical attractiveness. In other words, and consistent with conditional mating strategy, males who are less likely to be successful in pursuing a short-term strategy should benefit reproductively by reducing mating effort and increasing parental effort (Gangestad and Simpson, 2000; Gross, 1996). This relationship was not found, though there was a directional trend ($r = -.098$, $p = .192$), with lower scores in parental investment being slightly associated with

higher scores for self-perceived physical attractiveness. Although possible explanations were offered for this result, the findings again present a problem for a Strategic Pluralism approach.

14.1.3 Inter-sex difference, and the theory of sexual selection and parental investment (Trivers, 1972)

The sixth study (chapter 11), entitled “When trade-offs are expected and when they are not: Gender differences in the relationship between self-perceived physical attractiveness and sociosexuality”, took a short but hopefully legitimate break from looking at intra-sex differences to take one look at inter-sex differences. It was argued that based on Trivers’ theory of sexual selection and parental investment (1972), there was good reason to predict a positive relationship between self-perceived physical attractiveness and sociosexuality for males, but not for females (as females have less to gain from increased sociosexuality than males, due to their different reproductive capacities).

As predicted there was both a highly significant correlation between sociosexuality and self-perceived physical attractiveness in males, and no such relationship in females (either in terms of sociosexuality as a complete measure, nor in any facet of it). Perhaps not surprisingly therefore it was found that there was a significant gender difference in the relationship between self-perceived physical attractiveness and sociosexuality, with self-perceived physical attractiveness explaining significantly more of the variance in sociosexuality in males than in females (z_{obs} value = 2.2). This was entirely consistent, then, with Trivers’ theory of sexual selection and parental investment, as well as with Conditional Mating Startegies (as for males, female preference for attractiveness should predict a mating tactic based on the greater potential for short-term sexual success, but for females her own attractiveness does not provide a strong cue for differential sociosexuality). It is also consistent with a Strategic Pluralism account, which would argue both for the detected relationship between male sociosexuality and self-perceived physical attractiveness in addition to the lack of a relationship between female sociosexuality and self-perceived physical attractiveness.

14.1.4 Female intra-sex difference, the Multiple Fitness Model, Conditional Mating Strategies and Strategic Pluralism.

In terms of female intra-sex difference, various studies were conducted into one relatively under-researched area, that being intra-sex diversity in the use of facial cosmetics. Firstly, intra-sex differences in the relationship between blood pressure and cosmetic usage were examined (Chapter 12 – study one), as were intra-sex differences in the relationship between cosmetic usage and personality traits (Chapter 12 – study two), cosmetic usage and self-perceived physical attractiveness (Chapter 13 – study one), and cosmetic usage and sociosexuality (Chapter 13 – study two). The relationship between self-perceived physical attractiveness and sociosexuality was, as discussed above, investigated in Chapter 11. Due to the relative dearth of empirical work conducted in this area, it was believed that the results from the former investigations in Chapter 12 would enable a more comprehensive understanding of the later research into the complex relationship between cosmetic usage, attractiveness and sociosexuality. The results and conclusions drawn from these empirical studies are now reviewed.

The first study (chapter 12 – study one), entitled “Cosmetic Usage and Psychophysiology” represented a preliminary study into the use of cosmetics by considering the relationship between two physiological correlates of cosmetic usage. According to the Multiple Fitness Model or MFM (Cunningham et al, 2002), a model which takes account of both social and evolutionary perspectives as a way to understand what makes faces attractive, individuals may undertake deceptive behaviour in order to cheat ‘honest’ signals of attractiveness, and hence health and fecundity. One of these deceptive behaviours, it is hypothesised, may be the use of facial cosmetics. The argument suggests that females use cosmetics in order to improve attractiveness, thereby improving their chances of attracting a high quality mate as well as improving their social status generally. However, it was also hypothesised that an understanding of the motivations behind cosmetic usage may not be complete if one were to assume that the only (or indeed primary) motivation behind cosmetic usage is to manipulate relative attractiveness.

With this possibility in mind, this study considered the proposition that cosmetics may be used more as a form of psychological (as well as physical) ‘mask’. It was proposed that those most in need of manipulating their image, as a result of elevated levels of negative affectivity, would be those who would be most likely to use cosmetics. By improving one’s apparent affectivity, after all, both mate value and social status may be similarly improved. One such element of negative affectivity is state anxiety. Thus, it was hypothesised that diastolic and systolic blood pressure, as physiological indices of anxiety, would be significantly correlated with cosmetic usage. Results partially supported this hypothesis, finding that there was indeed a significant relationship between baseline diastolic (but not systolic) blood pressure and cosmetic usage. As it had been noted that of the two, diastolic blood pressure has been more significantly associated with state anxiety than systolic blood pressure (O'Connor et al, 1993; Shapiro et al, 1996), this was reasonably consistent with expectation. Thus it was argued that cosmetics appear to be used in order to deceive others into perceiving a person of greater positive affectivity (with the resultant implications for future mate value and fitness) than may honestly be the case.

The second of the four studies (chapter 12 – study two), entitled “Who wears Cosmetics?: Individual Differences and their relationship with cosmetic usage” considered the relationships between cosmetic usage and psychological measures of a range of personality traits. Traits investigated included anxiety, self-consciousness, conformity and self-presentation, social confidence, emotional stability, self-esteem, physical attractiveness, intellectual complexity and breadth, intellect and social, personal and emotional intellect, extraversion and introversion. Although it should be acknowledged that not all relationships were significant, all followed the directional trends predicted. So, positive relationships were found between cosmetic usage and anxiety (thus providing psychological corroboration of the previous physiological results), self-consciousness, conformity and self-presentation, and negative relationships were found between cosmetic usage and social confidence, emotional stability, self-esteem, physical attractiveness, intellectual complexity, intellectual breadth,

intellect and social/personal and emotional intellect. With regard to the unpredicted variables, extraversion and introversion, (measured through separate scales), a negative relationship was seen between extraversion and cosmetic usage, and a positive relationship was seen between introversion and cosmetic usage (the inverse relationship between the two being as expected through their representation of dichotomous points on the same continuum).

It was clear that cosmetics are used more as negative affectivity increases, and it was thus suggested, as in the previous chapter, that cosmetics may be used as a tool in order to manipulate an outward image of greater positive affectivity. So, cosmetics appear to be used, at least in part, as a deceptive tactic in order to suggest improved psychological well-being. It was suggested that such manipulation may have significant consequences, in terms of both mate value and social positioning within a dominance hierarchy. Thus, the evidence drawn from the investigations into the physiological and personality correlates of cosmetic usage lead to the conclusion that cosmetics appear to be utilised as an effective tool, not just in the manipulation of outward appearance, as predicted by the MFM and investigated in the second study of chapter 12 , but also, and importantly, to enable the user to create a psycho-physical ‘mask’, in this way being consistent with the tenets of a conditional mating strategy.

The third of the four studies in cosmetics, entitled “Cosmetics: deceptive markers of female health and fecundity? The relationship between cosmetic usage and physical attractiveness” (chapter 13 – study one), explored the relationship between female beauty and cosmetic usage. Both theory and research in this area, limited as it is, has been equivocal. Nevertheless, if one is to consider the tenets of alternate Conditional Mating Strategies, it was argued that one might assume the use of cosmetics may be differentially utilised as a response to the environmental cue, in this case that cue being male mate preference. So, if female beauty is considered to be a fundamental feature of male mate preference, both in long-term and short-term mating, the ability to mask what is recognised as an indicator of health and fecundity may play an important role in female sexual strategy. The study therefore investigated the

possible correlation between cosmetic usage and self-perceived physical attractiveness.

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Despite the findings of the previous study in which a strong, negative correlation was found between cosmetic usage and self-perceived physical attractiveness, this investigation found no significant correlation between the two. This was surprising as the measures involved were the same and the participant demographics were very similar. However, in this study (which involved a much larger sample) self-perceived physical attractiveness was highlighted as a variable (in a way in which it was not in the previous study), and as this appeared to be the only distinguishing factor between the two studies, it was concluded that this must have been the factor which skewed the results. However, it can only be a matter of conjecture which of the two results was therefore the most 'honest', and future research was therefore recommended. Nevertheless, in an attempt to understand the finding that no significant relationship apparently exists between the cosmetic usage and self-perceived physical attractiveness, various hypotheses for the use of cosmetics were forwarded for those who rated themselves as high, average or low in terms of self-perceived physical attractiveness.

For those who rated themselves highly it was suggested that as a result of the increased evaluative gazing and sexualisation that physically attractive females are exposed to, they may also be more liable to self-objectification and resultant attractiveness-enhancing behaviours. For those who rated themselves as 'average' it was suggested that they may practice attractiveness-enhancing behaviours in order to gain an advantage over other similarly attractive females. For those who rated themselves as less attractive than their peers it was suggested that cosmetics might be used simply as way to improve their mate value, with beauty being an elemental feature of male mate choice.

Paradoxically, a Conditional Mating Startegies approach could, theoretically, be used to account for all of these scenarios. For example, in the case of the more attractive female one might argue that the environmental cue, that being increased evaluative gazing, promotes the use of cosmetics as an appropriate

behavioural response. Nevertheless, in this scenario one might argue that the fifth prerequisite of a conditional mating strategy may not be fulfilled, that being that the chosen behaviour promotes enhanced reproductive success. It is not clear that in this scenario this should necessarily be so. Future research may be of assistance in establishing the veracity of this possibility.

In the case of the 'average' female, the environmental cue dictating choice of behaviour may be her self-rated attractiveness against that of her peers, and the use of cosmetics her behavioural response in order to provide an 'attractiveness edge'. In this scenario, by improving her appearance, the fifth requirement of a conditional mating strategy should be fulfilled, that being improved reproductive success as a result of the chosen behaviour.

In the last scenario, the less attractive female seeks to enhance her relatively low mate value (her response to the environmental cue, that being male mate preference for beauty) through the use attractiveness-enhancing behaviour. Again, behaviour of this kind should improve reproductive fitness. It is interesting to note, therefore, that a Conditional Mating Startegies approach successfully accounts for the respective behaviours of high, medium and low attractiveness females as appropriate responses to environmental cues, and, in so doing, for the lack of a significant difference in cosmetic usage behaviour between high, medium and low attractiveness females.

It seems reasonable to argue that a Conditional Mating Startegies approach is therefore more relevant to an understanding of female sexual strategy, through its ability to account for the motivational diversity promoting cosmetic usage, than Strategic Pluralism Theory. In this latter theory the proposition is that females respond to the external physical environment, and this becomes the predictor of behavioural choice. However, for Strategic Pluralism Theory, 'environment' is much more tightly defined, and does not for females (as it does under 'Conditional Mating Startegies'), include partner preference (partner preference being the environmental cue that, according to Strategic Pluralism Theory, *males* respond to). As the behavioural responses in this study appear to be in the large part responses to male mate preference for beauty, Strategic

Pluralism in this case fails to account for the respective behaviours as appropriate responses to environmental cues.

The last study in the cosmetics section, entitled “Cosmetics: honest markers of sociosexuality? The relationship between cosmetic usage and sociosexuality” (chapter 13 – study two), looked at the most important relationship for females in terms of this thesis, and that was the relationship between cosmetic usage and sociosexuality. Having controlled for the effect of self-perceived attractiveness it was found that there was a highly significant positive correlation, with a moderate effect size of .319, between sociosexuality and cosmetic usage. This was found across all three facets of sociosexuality. Due to the link, however, between depressed self esteem and social confidence and elevated usage of cosmetics, it was felt necessary to question whether cosmetics and sociosexuality were linked not in the more immediately obvious way (i.e. as an honest indicator of female sociosexuality), but through the negative affectivity of the user. In other words, was low self esteem, lack of social confidence, elevated anxiety and so on the cause of both increased cosmetic usage *and* a more relaxed sociosexuality?

Through a consideration of the separate components of sociosexuality it was possible to conclude that this interpretation was unlikely. It was reasoned that if sexual relationships were taking place out of a need to promote intimacy and to bolster self-confidence in that way, this would be unlikely to be reflected in an elevated level of sexual desire. Rather one would expect to see lower scores in sociosexual desire than either sociosexual attitude or behaviour. This was not the case. Using the discriminative capability of a 3-component measure of sociosexuality, it was possible to show that a similar effect size existed across all three components. Thus, it was possible to conclude that the more likely explanation for the relationship between cosmetic usage and sociosexuality was that cosmetic usage provides an honest marker of a female’s sociosexual orientation.

In sum, then, it would appear that cosmetics may be used in two ways; firstly, as an honest marker of sociosexuality, and secondly as a deceptive marker of female health, fecundity and positive affectivity.

With regard to Strategic Pluralism Theory and the relationship between sociosexuality and cosmetic usage, it may be that in this scenario the theory holds the most weight. It appears that females *are* using a particular behavioural strategy, increased cosmetic usage, in order to promote the likelihood of attracting a short-term mate (and therefore, presumably, the potential for good genes). Furthermore it seems probable that this intra-sex difference cannot convincingly be accounted for by personality differences, for the reasons just discussed.

Further research may be constructive, therefore, in casting light on which environmental factors appear to be most strongly correlated with increased cosmetic usage. These might include access to personal resources. Research has certainly indicated that female preference for male attractiveness is positively correlated with the proportion of females who are active in their economy (Buss, 1989). Interestingly, however, corresponding research has also shown that female preference for indicators of parental investment appears to bear no relationship to the proportion of females who are active in the economy (Buss, 1989). It is also possible that differences in female sociosexuality, and indicators of such through cosmetic usage, may be influenced by patterns of parental care experienced in childhood. For those who experienced reduced or absent paternal parenting, the perceived value of bi-parental care may be diminished. Conversely, for those brought up in a warm and supportive environment in which the father played an important role, the value of bi-parental care may be perceived to be more important. These factors may therefore influence the significance females subsequently place on the good genes versus good parenting trade-off.

14.1.5 Sociosexuality and the Revised Sociosexual Orientation Inventory.

Whilst the primary objective of this research project was to investigate phenotypic diversity in human sexual strategy, it was also felt necessary to review the reliability and validity of the Revised Sociosexual Orientation Inventory or R-SOI (see appendx b). There were two reasons for this review. The first was simply that though it appeared to address problems that had been highlighted with the existing measure, that being the Sociosexual Orientation Inventory (Simpson and Gangestad, 1991), and for that reason became the proposed choice of instrument in this research, nevertheless it still represented a relatively new and untested measure of sociosexuality. Secondly, issues regarding the unidimensionality of the scale had, more recently been raised. Empirical analysis of the scale was therefore considered appropriate both to determine it's efficacy as a measure of facets of sociosexuality in this research project, as well as to inform future research decisions.

Analysis of the data firstly confirmed that the scale did, indeed, offer good internal reliability (Cronbach's Alpha = 0.87). Furthermore, analysis of the underlying structure of the scale using Principal Components Analysis revealed the presence of three components, consistent with both theory and prior investigations conducted by Penke and Asendorpf (2008). This therefore provided the strong empirical support necessary for analysis of sociosexuality via the three sub-scales, sociosexual desire, sociosexual attitude and sociosexual behaviour in this research project. Furthermore, and perhaps more importantly, whilst it was accepted that, dependant upon the research question in mind, there remains room for a more global, unidimensional approach to sociosexuality, nevertheless, the revised instrument offers the opportunity for a more differentiated approach to a future understanding of, and investigation into, facets of sociosexuality.

14.2 The applicability of Conditional Mating Strategies Theory and Trade Offs and Strategic Pluralism Theory to the empirical work conducted.

The preceding pages have offered a fairly detailed account of the respective application and value of the two main theories informing our understanding of intra-sex mating strategies, Conditional Mating Strategies Theory (Gross, 1996) and Trade Offs and Strategic Pluralism Theory (Gangestad and Simpson, 2000). Both have been shown to have been of value in understanding possible differences in such strategies. Nevertheless, it would appear that whilst Trade Offs and Strategic Pluralism is well placed to explain strategies in quite specific circumstances, it may lack the ability to explain the breadth of differences which a conditional mating strategies approach may be better able to explain. Thus, the true strength of the latter theory is in its comprehensiveness. Specifically, by inclusion of 'mate value' as one of the environmental factors which inform mating strategies, Conditional Mating Strategies Theory accounts for female mating strategies more completely than can Trade Offs and Strategic Pluralism. In this theory focus is placed neatly on the environmental background (exposure to pathogens, need for bi-parental care etc), which, though undoubtedly relevant, precludes the vital importance of mate value in female 'decision-making'.

14.3 Future Research.

It is hoped that this research has been able to add something of interest to our discipline's ever-expanding knowledge of intra-sex differences and phenotypic diversity in human sexual strategy. In this pursuit, however, new areas of investigation have also been identified – sometimes through unexpected results, sometimes as a result of the methodological constraints imposed by a particular area of study. It is not my intention to repeat those recommendations made in the conclusions of each chapter. Nevertheless, it may be worth considering a few more generic recommendations.

One such recommendation would be in the greater use of qualitative research generally. This set of studies employed, as in the overwhelming majority of

studies in this area, a quantitative approach, based on the desire to provide measurement of phenomenon that would be reliable, valid and generalisable in its prediction of cause and effect. Furthermore, this allowed clearly defined research goals to be set, the unambiguous statement of the research hypotheses, and a clear route towards the collection of analysable data enabling the determination of causality. It also enabled the more direct comparison of these studies with preceding studies, and may offer like opportunities for future research.

However, as with all quantitative research, the imposition of a priori hypotheses restricted the outcomes, by definition, to only those outlined in the research goals. The drawback, as with all quantitative analysis, was that the opportunity for the discovery of emergent themes and idiographic description was lost, and this may have been to the detriment of some studies. For example, had both a quantitative and qualitative approach to the response to the composite images of gay and straight males been employed, this may well have added to our more comprehensive understanding of the differences between the two. This was noted in the discussion, in which it was mentioned that many had commented, during the debriefing, that they felt that the homosexual image was more ‘feminine’. Qualitative analysis may have been able to ascertain why this was so, and if personality attributions were, indeed, made, as was latterly surmised. Similarly, qualitative research into the contexts of ‘one night stands’ as considered in the study on male height and sociosexuality may have been useful in order to establish whether a functional short-term drop in standards was, indeed, at the root of the negative relationship between male height and this aspect of sociosexual behaviour.

Of particular interest, too, would have been a qualitative analysis of the factors behind cosmetic usage. Quantitative analysis concluded that cosmetics are utilised by females for a multitude of differing reasons. It was felt that they may be utilised in reaction to the constant visual evaluation and sexualisation of females, as a response to intra-sex competition, as a means of masking detectable signs of health and fecundity, as a means of presenting a manipulated and conforming image to the world, and also as a means of

providing an honest indicator of one's sociosexuality. Qualitative research would be helpful in order to ascertain the relative strength of these sometimes conflicting factors. In all, then, more triangulation in research methodologies would be particularly beneficial in some studies, particularly where that area is relatively under-researched.

Triangulation would also be useful in other areas which may not be comprehensively addressed by researching through one methodology alone. One such area is that of physical attractiveness and the generally dichotomous decision, to measure through self-perception or to measure through the perception of others. Should time and financial constraints not be an issue, it would be recommended that both be employed, as to leave either side of the coin out is to leave a permanent question mark attached to the results of any one study. Did self-perceptions accurately reflect the perceptions of others? And if not, how would any differential impact upon mate value, self-esteem, and any of the other potential variables to be analysed? Whilst it is always possible to replicate a study by using the alternative approach to the original (i.e. substituting self-perceptions for other ratings, and vice versa) this can never be as convincing as a triangulated approach. After all, it could never be guaranteed, in using different sample groups, that any differences in results were entirely restricted to the difference in measurement of attractiveness.

Another more generic recommendation for future research concerns, as has been discussed on many occasions, the preponderance of university students as participants. This is, of course, not a new concern, and is rightly highlighted as a problem when discussing issues of generalisability (Borgerhoff Mulder, 2004). However, it is, perhaps, especially relevant when conducting research in evolutionary psychology as much of this area, as we have seen, is engaged in human sexuality (Paul et al, 2000). There is, after all, a generally recognised, more sexually permissive culture within universities in which a more relaxed sociosexual orientation is accepted (Paul et al, 2000). Thus to generalise findings regarding human sexuality and sexual strategy from a population known to represent a more relaxed sociosexuality is problematic and needs to be seriously considered. The answer may lie in the use of the internet, enabling,

as it would, the access of a wide demographic group. As an ever-increasing number of households now have access to the internet, this may well allow access to both a larger and a more diverse population, eradicating problems of positive skew with regard to age and student populations, which customarily have been an issue in so many research studies. With respect to this set of studies, whilst every effort was made to obtain as many participants from the non-student population as possible, this was an area which could, in retrospect, have been improved upon in order to have allowed more confidence in drawing conclusions beyond the student population.

14.4 General Discussion – research within an evolutionary framework.

In addition to investigating areas of human sexuality which have hitherto been largely under-researched, this research has attempted to remain conscious of the criticisms rightly or wrongly levelled at research within an evolutionary framework.

With this in mind these studies have attempted to avoid over-reliance on observation driven or explanatory methodology in order to staunch criticism familiar to evolutionary psychologists – that being the accusation of ‘just so’ story telling. As a result, many of the studies have taken a theory driven or predictive methodology. In other words, an existing theory or adaptive problem faced during our Environment of Evolutionary Adaptedness is investigated with specific psychological adaptations in mind, and the empirical results have then been evaluated. Examples of this type of methodology would include the male investigations into differential mate value and anticipated differences in mate tactics as a result. It also includes some of the research into the relationships between cosmetics, personality traits and self-perceived attractiveness.

Nevertheless, as the chapter on research methodologies concludes (chapter 6.3), the post-positivist approach to research in the social sciences advocates a triangulated approach in which both theory driven and observation driven methodologies support each other. This approach, otherwise known as the critical realist approach, argues that the objective of social science is, after all,

to understand the world through a diversity of methods. There are, then, studies which have been conceived within an explanatory or inductive framework, the study entitled “The gay and straight male: Are gay males more attractive?” being a good example. This study considered clear, intra-sex difference in sexual orientation for which there has been no convincing theoretical explanation from an evolutionary perspective. Taking that observation, and the ‘popular’ observation that many homosexual males appear to be more attractive than heterosexual males, provided the starting point for this study.

Chapter 6 also pointed out that, just as with the natural sciences, evolutionary explanations must be consistent with, or at least as good as explanations from, other disciplines, as well as providing consistency within the discipline. As such it was again suggested that triangulation of studies both within and across disciplines would be beneficial in order to achieve a more comprehensive understanding of the subject matter at hand. This group of studies has attempted to follow that advice in a number of ways. For example, when considering the impact of personality on cosmetic usage, it was recognised that self-report questionnaires have inevitable weaknesses. It was therefore decided to triangulate results with an investigation into a physiological correlate, blood pressure, of one of the psychological traits considered, that being anxiety. By so doing it was possible to strengthen our confidence in the results. Additionally, triangulation of investigation into cosmetics, attractiveness, personality and sociosexuality allowed a deeper more holistic understanding of cosmetic usage than if any of these studies had been carried out in isolation. By considering the relationships between all of these factors it was possible to be more confident of our final conclusions (that cosmetics were used as both honest markers of sociosexuality and deceptive markers of psychological well-being), a conclusion which could not have been as confidently reached in the absence of any one of these studies.

Cross-disciplinary explanations were also considered in various studies. For example, when trying to account for the continuing prevalence of homosexuality, psycho-social and developmental theories were considered alongside alternative evolutionary theories as possible predictors of

homosexuality. Nevertheless, in this case it was argued that empirical research was not consistent with the various alternative theoretical explanations offered. Additionally, various sociological explanations for the use of cosmetics were incorporated into the evolutionary explanations for cosmetic usage. One such example would be that of the research conducted by Davis et al (2001) in which self-objectification theories were incorporated to account for an evolutionary explanation for cosmetic usage in high attractiveness females.

Finally, Chapter 6 also discussed the need for evolutionary psychologists to be especially aware of the concerns people may have over an evolutionary approach to understanding human psychology - that evolutionary psychologists may be either advocating a moral viewpoint, or that they uphold the stance that human behaviour is genetically determined. Neither is true. It is worth reiterating and is freely acknowledged that an inclination to behave in a certain way does not mean that it is either acceptable to act upon those desires, nor that it is inevitable that one will do so. In general, our genetic inheritance does not determine our behaviour – the enormous influence of the environment, as well as our own freewill, will undoubtedly modify, to a greater or lesser extent, the manifestation of any innate predispositions. Nonetheless, to deny the influence of our genetic inheritance on human sexual strategy is as to deny the importance of the length of a rectangle in determining its overall area. The question should not be whether it is the environment or genetics that explain a given trait, but how they interact. Thus, both environmental and genetic explanations are imperative if one is to achieve a comprehensive understanding of human sexual strategy. Neither can stand in isolation. It is nevertheless hoped that from a genetic viewpoint this research project has gone some small way towards adding to our ever growing understanding of human sexual strategy.

APPENDICES

Appendix a Defining Sexuality

Appendix a (i) Sexual orientation or sexual preference?

According to the Colman (2006), there is no real difference in definition between sexual orientation and sexual preference, with both meaning “The predominant predilection or inclination that defines a person as a heterosexual, homosexual or bisexual” (2002, p.673). However, others would argue that such terms should not be viewed as interchangeable (McKnight, 1997). One should be aware of the subtle if important shifts in bias when one refers to sexual ‘preference’, indicating a behavioural choice, as opposed to ‘orientation’ suggesting a more physiological (and therefore immutable) position. To elucidate, whilst one’s sexual orientation may be homosexual, one’s sexual preference, particularly in less tolerant societies, may be heterosexual. Or conversely, when choice does not exist (as in, for example, single sex schools or prison), heterosexual orientation may be subsumed in favour of homosexual preference. One should be aware, therefore, in the literature of the propensity to influence by the use and misuse of these terms.

Nevertheless, the terms do highlight the essential conundrum regarding the aetiology of homosexuality – is it an orientation or is it a preference? Nature or Nurture? Should social or biological accounts win the day?

The argument continues. Indeed, as recently as 2006 Savic-Berglund was to acknowledge that it was not possible to be sure whether differences discovered in brain responses to pheromones in lesbian females were as a result of existing differences in the brain or whether they were as a result of the influence of prior sexual behaviour. That is not to suggest, however, that researchers have not been vociferous in both camps. Nevertheless, as a study into a possible genetical explanation of a sub type of homosexuality, this study adopts the term sexual orientation in order to reflect a more biological aetiology.

Appendix a (ii) Who is a homosexual, who is not?: The measurement of sexual orientation

On first consideration this might seem to be a strange and pointless question. Those who consider themselves to be homosexual presumably are, those who don't presumably aren't. However, the question is perhaps not as straightforward as it might at first appear. For instance, different people may have different criteria for classifying themselves as homosexual or not. And if they do, should these classifications be regarded as reliable?
For example, should sexual orientation be determined by consideration of behaviour alone? After all, if behavioural choice is restricted (for example in single sex boarding schools or in prison), it may not be representative of the individual's free choice. Alternatively, behaviour may be affected by social acceptance and mores, in which situation homosexual desire may be mediated in favour of more socially accepted sexual behaviour. Perhaps, then, desire, or its co-relation fantasy, should be the measure and not behaviour? Many, however, would argue that these are equally difficult as reliable criteria for the measurement of sexual orientation. Desire and fantasy may well be inconsistent with actual behaviour, but one should not assume that the former is necessarily any more representative of preferred behaviour than behaviour itself. Research has shown that a significant percentage of respondents in fields of sexual investigation have negative thoughts about their sexual fantasies (Byers, Purdon and Clark, 1998) and that they may feel both guilty and embarrassed as a result (Davidson and Hoffman, 1986; Knoth, Boyd and Singer, 1988).

Furthermore, Kinsey, Pomeroy and Martin (1948) suggest that sexual orientation is not fixed throughout a lifetime. Rather, individuals may experiment at times as an exploration of their sexuality. Thus, he argues, measurement should not be restricted categorically (heterosexual, homosexual or bisexual) but should preferably be represented on some sort of continuum between exclusive homosexuality on the one hand and exclusive heterosexuality on the other.

Along a similar vein, more recent assessments have been made through multi dimensional scales in which participants are rated along a number of scales, including behaviour, fantasy and so on (Gonsiorek, Sell and Weinreich, 1995). Additionally, the relative significance of indicators of putative orientation has also been investigated by researchers considering adolescent sexuality. Adolescents themselves participated in focus groups and interviews to explore this area and two types of attraction were found – physiological and cognitive (self-labelling and behaviour were not rated as significantly important). As a result new scales to measure sexual attraction have been developed (Mark, Friedman, Silvestre, Gold, Markovic, Savin-Williams, Huggins and Sell; 2004).

For this study, however, with recognition of the difficulty in attracting participants (discussed within the main text) which it was felt would be exacerbated by the requirement to complete lengthy questionnaires on their sexuality, and following example set by prior research (Gonsiorek et al, 1995; Nash et al, 2005) it was decided to pursue the most common classification of heterosexual, homosexual and bisexual to identify sexual orientation, with participants self-labelling their orientation (Nash, 2005).

Appendix b Background literature review and discussion informing chapter 7.

Appendix b (i) The aetiology of homosexuality

Psychological theories of homosexuality.

Perhaps the best known of all psychological theories of homosexuality was proposed by Freud (1905) in which he proposed a developmental explanation. For Freud all children are born with their sexual desires undetermined. It is through childhood experience that sex drive becomes directed to members of the same or opposite sex. Some still hold this view (Nicolosi, 2004; Whitehead and Whitehead, 1999), arguing that homosexuality is as a result of deficits in the developmental stages of psycho-social development towards adult heterosexuality. The view represented is that 'normal' behaviour is heterosexual (i.e. exclusively choosing partners of the opposite sex) whereas homosexuality (i.e. exclusively choosing partners of the same sex) is representative of atypical behaviour which may, potentially, be remedied. Indeed, Nicolosi, Byrd and Potts (2000) reported the successful conversion of 32% of 882 dissatisfied homosexuals following conversion therapy, with Spitzer (2003) reporting similar 'success'. However, the problem with purely sociological accounts of homosexuality is their inability to account for the now burgeoning evidence of biological differences.

Unlike those above, some psychological views do, in fact, acknowledge the influence of the now almost incontrovertible biological contribution to sexual orientation. Perhaps the most influential of the psycho-biological theories of homosexuality has been that proposed by Bem (1996, 2000). Bem's 'Exotic becomes Erotic' (EBE) theory acknowledges the importance of prenatal androgens on a child's temperament and early activity choices. Sometimes these preferences, involving behavioural choices and types of play, will conform to those of their own sex, sometimes they will conform to the behaviours and types of play typically enacted by the opposite sex. A gender conforming child will, as a result, feel different to children of the opposite sex whereas a gender

non conformist will feel different to those of their own sex. Perception of this difference induces a physiological arousal when the child is close to members of the sex who, to them, are ‘different’. As the pubertal hormones gain strength, Bem argues, this physiological arousal is transformed into sexual arousal. Thus gender conformists become attracted to members of the opposite sex whereas gender non conformists become attracted to members of their own sex.

There is much to recommend in this theory. Bem accounts for both biological and sociological influences, and by so doing offers a plausible and unitary account for the emergence of homosexuality and heterosexuality. For empirical support it would be appropriate to expect a correlation between Childhood Gender Non-conformity (CGN) and adult sexual orientation. This has found to be so. Indeed, a meta-analysis of 48 studies showed childhood gender non-conformity to be the biggest predictor of later homosexuality in both males and females (Bailey and Zucker, 1995). Further, if the prenatal development of male and female foetuses is different, one would also expect to find that certain cognitive abilities of males and females would be different. Again this has been found to be so. Significant differences have been found showing that males are superior to females in terms of target-directed motor skills (Buffery and Gray, 1972), spatial skills (Levine, Huttenlocher, Taylor and Langrock, 1995; Law, Pellegrino and Hunt, 1993), mathematical reasoning (Benbow and Stanley, 1983; Steinkamp, Harnisch, Walberg and Tsai, 1985) and the mental rotation task (Kalichman, 1989) amongst others. Similarly females have been shown to be superior to males in terms of social judgement (Hall, 1977), empathy (Toussaint and Webb, 2005) verbal ability (Hyde and Linn, 1988) and emotional intelligence (Petrides and Furnham, 2000) amongst others.

Further support for Bem’s EBE theory might be found through the consideration of differential exposure to prenatal androgens; with differing exposure it might be expected that differences in preferences and behaviours would be observed. Again evidence is forthcoming. For example, Hines, Brook and Conway (2004) reviewed the links between prenatal androgens and psycho-sexual development, and in particular in the case of congenital adrenal hyperplasia (CAH), a condition in which the female foetus is exposed to unusually high

levels of androgens. They found that females with CAH showed greater tomboy like preferences than their unaffected sisters, both in terms of their play preferences and in terms of their chosen playmates. Such differences were highlighted though direct observation, through both interviews and questionnaires. It was also noted that girls exposed to high levels of prenatal androgens, as a result of prescribed hormones during pregnancy or through individual differences in maternal androgen levels, showed similar proclivities (Ehrhardt and Money, 1967; Hines, Golombok, Rust, Johnston and Golding, 2002). In a similar vein, males with Klinfelter's syndrome (a condition in which the male has an extra X chromosome, making his chromosomal combination XXY) have been shown to have a lower than male average spatial ability (Nyborg, 1983). However, one should be cautious of relying too heavily on atypical cases due to methodological issues including the sample size and the ages of the participants. Both factors may reduce the reliability of the groups and thus render analysis uncertain until further corroborative evidence has been gained.

Biological theories of homosexuality

Although EBE theory is convincing there is no direct evidence that a combination of environmental and biological factors is a necessary prerequisite for homosexuality. Indeed the biological evidence alone seems to be equally persuasive. Essentially although preferences for one sex over another become manifest at the onset of puberty and the associated release of sex hormones, there is much evidence to suggest that the determinants of later sexual orientation may be caused by hormonal 'events' in utero. Such events may be genetic or 'environmental' (meaning as a result of factors in the uterine environment) as discussed shortly.

Genes and homosexuality.

The first important genetical evidence for a link between genes and sexual orientation was offered by LeVay in 1991 and paved the way for a shift in the conceptualisation of the aetiology of homosexuality from societal or

psychological influences towards biological, innate factors. LeVay's study of the third interstitial nucleus of the anterior hypothalamus (more briefly referred to as INAH3), an anatomical area that is customarily three times larger in males than females, was also found to be between two to three times larger in heterosexual males than in homosexual males. This was closely followed by research which showed that the anterior commissure, a small bundle of axons connecting the brain hemispheres, which this time is customarily larger in females than males, is again larger in homosexual males than in heterosexual males (Allen and Gorski, 1992).

Further genetical evidence for sexual orientation can be found through twin studies. For example, in a study involving monozygotic (MZ) or identical twins, dizygotic (DZ) or fraternal twins and adoptive brothers, in which one of the pair was known to be homosexual, Bailey and Pillard (1991) found that of the other 'half' of the pair, whilst only 11% of the adoptive siblings were also homosexual, this percentage rose to 22% of DZ twins and 52% MZ twins. A similar study (Bailey and Benishay, 1993) showed that for females the figures were similar, with 6% of both sisters being lesbian, 16% of DZ twins and 48% of MZ twins.

Through studying the pedigree of 114 families of homosexual males, it has also become apparent that sexual orientation appears to be carried down the maternal side "suggesting the possibility of sex-linked transmission in a portion of the population" (Hamer, Hu, Magnuson and Pattatucci, 1993: 321). On analysis it was revealed that there was a significant likelihood that at least one subtype of male sexual orientation is linked to a marker on the long arm of the X chromosome called Xq28. This study has also received further support through a study of 259 families of male homosexuals in which it was found that mothers of homosexuals have more sisters than brothers at a rate suggesting that half of the brothers conceived were spontaneously aborted (Turner, 1995). This figure corresponds with the spontaneous abortion rate of other 'semi-lethal' Xq28 disorders and provides an argument for linkage between sexual orientation and the markers on Xq28 (though see Rice, Anderson, Risch and Ebers, 1999).

The uterine environment and homosexuality

As already discussed, the uterine environment seems to play an important role in the aetiology of homosexuality in males. One important study was able to tease out the effects of prenatal versus postnatal mechanisms by looking at 944 homosexual and heterosexual males in non-biological and blended families (by which is meant raised with half or step-siblings or as adoptees). It was found that only biological older brothers, whether reared together or apart, increase the probability of homosexuality in younger brothers. As Bogaert (2006: 10772) states, “These results provide evidence that a prenatal mechanism(s), and not social and/or rearing factors, affects males’ sexual orientation development”. This confirmed results of an earlier study in which it was found that the more elder brothers a boy had the more likely he was to be homosexual, though this did not apply to elder sisters (Blanchard and Bogaert, 1996). Estimates suggest that probability of homosexuality increases by 38% with every additional older brother (Bogaert, 2003). Interestingly the fraternal birth order effect, (FBO) as it is known, has no such effect on the potential homosexuality of females.

Explanation for FBO is not fully resolved but a leading contender is the “maternal immunisation hypothesis”. This posits that the placental barrier protects the mother and the son from each other’s proteins until the birth. However, during the birth of the first son and due to the mixing of fetal and maternal blood, the mother is at this point exposed to proteins from her son including those on the Y chromosome. Potentially the mother then develops antibodies which future sons (but not daughters due to the absence of the Y chromosome) will be exposed to via the placenta. It is these maternal antibodies which may affect future sons, therefore, and potentially influence the direction of sexual orientation (Gualtieri, and Hicks, 1985). However, it is not suggested that this is an explanation for all homosexuality in males – one estimate suggests that this could account for one in seven homosexual males (Cantor, Blanchard, Paterson and Bogaert, 2002).

Further biological evidence for sexual orientation

Further investigations into the FBO effect have highlighted additional, curious findings. In a meta-analysis of studies, it was shown that the FBO effect is only true in right handed homosexuals – no effect was found for non right handedness. This was surprising as there is a significant correlation between left handedness and the likelihood of homosexuality (Blanchard and Lippa, 2007; Lippa, 2003), and yet left handedness negates the effect of older brothers on sexual orientation (Blanchard, Cantor, Bogaert, Breedlove and Ellis, 2006).

Additionally there are numerous other studies which indicate a biological basis for sexual orientation. Amongst these are studies on fingerprint ridges (homosexual males showing greater asymmetry in thumbs and little fingers (Hall and Kimura, 1994), 2D:4D Digit Ratio (homosexual males and females having significantly lower right hand 2D:4D ratios than heterosexual males; Rahman, 2005), masculinisation of auditory measures in lesbians (McFadden and Pasanen, 1998), and arm length to stature ratio (Martin and Nguyen, 2004)

Could there be a gene (or genes) for attractiveness, or is attractiveness either arbitrary, or the product of our culture? If, after all, there is no cross cultural agreement on what it is to be beautiful, it would be a nonsense to talk of ‘a gene for attractiveness’. The following section considers this question by considering whether or not there is cross cultural agreement on what it is to be beautiful, and if so, the effects of averageness and symmetry on beauty as well as the importance of masculinity and femininity on perceptions of beauty.

Appendix b (ii) Attractiveness and Beauty – in the eye of the beholder?

Cross cultural agreement on what it is to be beautiful.

Despite widespread popular belief, there is little that is arbitrary about perceptions of beauty. As Symons (1995) observes, “Beauty is in the adaptations of the beholder”. In other words, over evolutionary time our ancestors have learnt which signs to look out for to give them important reproductive clues as to a potential partner’s fecundity and health. Males who chose females with grey hair, wrinkles and sagging skin, who lacked energy may well have enjoyed happy relationships, but they would have been out-reproduced by those conspecifics who preferred females displaying signs of youth – lustrous hair, clear, unlined skin, bright eyes and a lively disposition. Over time, therefore, these preferences would have become standard and thus ideals of beauty emerged. How do we know this?

A wealth of literature now exists supporting this premise. For example, Cunningham et al (1995) conducted an important cross cultural study of facial attractiveness between Asian, Hispanic, Black and White females. They were to find remarkable consistency in the ratings, with an average correlation of +.93. Similar correlations have been found in prior research. As a result, Langlois, Kalakanis, Rubenstein, Larson, Hallam and Smoot (2000) carried out a meta-analysis and theoretical review of 94 empirical investigations into facial attractiveness. What they discovered was striking. As well as the anticipated agreement within cultures, there was remarkable consistency between cultures and between ethnic groups on what constitutes facial attractiveness, as well as consistency between age groups and the gender of the rater. It has even emerged that appreciation of beauty emerges early in life, with infants as young as two to three months fixing their gaze for longer on slides of Black and White females previously rated by adults as more attractive than those slides previously rated as less attractive (Langlois et al,1990) Such evidence is, perhaps, more easily explained through a biological perspective, supporting as it does, evolutionary explanations of perceived attractiveness, than through one of learning through cultural transmission. Nevertheless, one must not assume

that there is no cultural element in the perception of attractiveness. For example, whilst there is some cross cultural agreement in terms of the most attractive female waist to hip ratio, the preference for absolute size and distribution differs from one culture to another (Marlowe, Apicella and Reed, 2005). Nonetheless, there appears to be consensus regarding beauty, but how do we measure it?

Averageness, Symmetry and Beauty

Computer generated composites of the human face have been influential in research into what makes a face attractive. For example, when images are combined to create a composite image, the ratings for attractiveness of the composite image are higher than the ratings for any of the individual photographs (Langlois and Roggman, 1990). Furthermore, the more images are averaged, the more attractive the new composite becomes. Why would this be?

It has been suggested that the more average the image becomes, the fewer individual irregularities remain, with the composite as a result displaying heightened symmetry. Symmetry, it is argued, is a cue to developmental stability, with elevated asymmetry indicating either injury, disease or the prevalence of parasites. This has been found to be true in a range of empirical studies, both in flora (Sherzhukova, Krivtsova, Meluzova and Mishalenkova; 2002) and fauna (Møller, 1997). So, asymmetry can be an indicator of compromised health. Investigations into correlations between symmetry and attractiveness have supported this theory, with less symmetrical people across a range of measures (foot breadth, ear length and breadth etc) being rated as less attractive than those who display more symmetrical measurements (Gangestad et al, 1994). Furthermore, there is evidence to suggest that sexual dimorphism and symmetry are biologically linked and together have been linked to facial attractiveness, with greater masculinisation for males and greater feminisation for females being correlated with both symmetry and attractiveness (Little, Jones, Waitt, Tiddeman, Feinberg, Perrett, Apicella and Marlowe, 2008). Some cross cultural investigations regarding symmetry also support this theory, with similar morphing studies being employed to average both Chinese and

Japanese faces and with similar results. (Rhodes, Yoshikawa, Clark, Lee, McKay and Akamatsu, 2001). Similarly, preferences for symmetry in both the Hadza (an isolated group of hunter gatherers from Tanzania) and UK participants have been investigated and it was seen that whilst both cultures valued symmetry, the Hadza valued it more highly, attributable, perhaps, to the higher mortality rate amongst the Hadza than Europeans (Little, Apicella and Marlowe, 2007).

However, such findings have not been wholly consistent. A further study which examined preferences for averageness in two cultural groups, one from the West and the other, again, the Hadza, found that whilst the Western judges preferred the more average Western and Hadza faces, the same did not apply when the Hadza judged Western faces. It was proposed that as the Hadza had no norm reference for European faces they were less able to gauge 'averageness' than they could when judging Hadza faces, or, indeed, when Westerners judged Western or Hadza faces. Westerners have, after all, greater visual experience of African faces than vice versa (Apicella, Little and Marlowe, 2007).

Averageness was also shown not to be the whole story when considering attractiveness, as recent research has managed to 'tease out' the average from the attractive, with evidence showing that there are particular characteristics which are not average but which are regarded as particularly attractive (Debruine, Jones, Unger, Little and Feinberg, 2007). Additionally, it has been shown that a highly attractive face may have a degree of asymmetry, and, conversely, a highly symmetrical face is not always deemed to be attractive (Langlois, Roggman and Musselman, 1994). Thus it would appear that symmetry is a contributory but not deciding factor in judgments of attractiveness.

Masculinity, femininity and beauty.

Research has shown that whilst a highly feminised female face was found to be more attractive than an average female face, the reverse was not necessarily true of males. Research has been equivocal regarding female preference for

masculinised, feminised or average faces (Penton-Voak, Perrett, Castles, Kobayashi, Burt, Murray and Minamisawa; 1999). Some argue that masculinised males should be rated as more attractive than average or feminised males due to testosterone dependent facial characteristics and linked immunological competence. Consistent with this argument were the results of a study in which female volunteers had to indicate their preference for a face from 1200 frames of facial images ranging from supermale to superfemale presented using a 40-s QuickTime movie (Johnston et al, 2001). Females indicated a preference for males on the more masculine side of average (as well as a shift towards further masculinisation over the peak fertility phase of the menstrual cycle). Similarly, Scheib et al (1999) found a positive correlation between ratings of attractiveness and two markers of facial masculinity, cheekbone prominence and size of the jaw. Jaw size was also found to be a marker of attractiveness in a study by Cunningham, Barbee and Pike (1990).

Cross cultural investigations into female preferences have also been illuminating and support the hypotheses drawn from prior research. It was predicted that Jamaican females would prefer more masculinised faces than their British counterparts due to the higher parasitic load in Jamaica as well as the reduced parental investment from males. The results indicated that Jamaican females were, indeed, more interested in masculinised male faces than British females which supports the impression of strategic ‘decision-making’ when choosing a long-term or short-term partner (Penton-Voak, Jacobsen and Trivers, 2004).

However, whilst a more masculinised male face has been found to be attractive in some studies, this has not been a consistent finding. On the contrary, in many studies research has indicated a clear preference for a more feminised male face (feminisation being characterised by a rounder jawline, higher browline, larger eyes with wider positioning, smaller nose in both length and breadth and a shorter jawline). It has been suggested that these preferences could be attributed to a perceived link by the rater between enhanced masculinity and dominance, as well as other negative attributes including coldness, dishonesty, lack of emotion and co-operation, and aggression

(Perrett, Lee, Penton-Voak, Rowland, Yoshikawa, Burt, Henzi, Castles and Akamatsu, 1998). These findings have been corroborated by further research in which supermale and superfemale faces were produced (by exaggerating all spatial differences between an average male and an average female face) for both Caucasian and Chinese races. Results showed that the most attractive female faces for both races were the exaggerated female faces. As with Perrett et al's research, for males the most attractive face was also the most feminised. This indicated that feminisation, and not merely sex exaggeration, is attractive in humans (Rhodes, Hickford and Jeffery, 2000).

However, the temporal context of relationships and the partnership status has also been shown to be important in preference for degree of facial masculinity. For females in a relationship considering an extra-pair relationship, or for females simply considering a short-term partner, masculinised faces are preferred. However for long-term relationships the bias is in the direction of feminised male faces (as in the earlier research). This would be consistent with the argument that females prefer more masculine males for their 'good genes' but more feminine males for a longer term relationship in order to maximise parental investment and co-operation (Little, Jones, Penton-Voak, Burt and Perrett, 2002). Supporting research has considered the impact of environmental harshness. As predicted it was found that females prefer less masculine males when looking for a long-term partner under conditions of environmental harshness. Males prefer less feminised females under the same conditions. This would suggest that preferences are contingent upon environmental factors, and that high quality is negatively correlated with investment in partnerships and offspring (Little, Cohen, Jones and Belsky, 2007).

Different methodologies utilising computer graphics have since been employed to explore this area further and have returned complementary results (Burt, Kentridge, Good, Perrett, Tiddeman and Boothroyd, 2007). Research has also shown that symmetry is, like masculinity, preferred by females over times of peak fertility, but only with regard to extra-pair or short-term relationships (Little, Jones, Burt and Perrett, 2007). Interestingly, no such effect was found for

females using oral contraceptives, indicating that such use can mask evolutionary adaptive cues.

Appendix c The creation of the homosexual / heterosexual composite images and the use of Psychomorph 8.3

Stimulus materials for this study were developed through the use of a specialized software package, PsychoMorph 8.3. Developed by B.P Tiddeman at St Andrews University, Psychomorph enables manipulation of facial dimensions for a variety of experimental purposes. For example, transformations have been achieved in, amongst others, aging, gender and health (Nash et al, 2005; O'Toole, Vetter, Volz and Salter, 1997; Rowland and Perrett, 1995) although transformations of any homogenous object class should be possible. Such transformations are achieved through the production of a prototype image for each group, defining the salient features of each (e.g. Caucasian female adult aged 20-30 and Caucasian female adult aged 40-50) and then using the differences between the prototypes to construct an 'axis of transformation'. In this example the axis of transformation then allows the aging of any individual image from the first group into the second (Tiddeman, Burt and Perrett, 2001).

Facial templates are created by the manual marking of 179 specific points around the image. These points include main facial features (e.g. points around the eyebrows, eyes, pupils, nose, mouth etc) as well as points delineating the facial structure (e.g. jawline, hairline etc). As the individuality of any one participant is lost after the merging of six images, datasets in excess of six are required for optimal composite images (Little and Hancock, 2002).

Facial prototypes are created by averaging homogenous sets of images across both shape and colour. The average 2D shape is constructed by averaging the position of each delineated point (for example, the centre of the pupil or the tip of a nose) across the whole set of images. Having achieved an average of all points, original images are warped onto the average image points and mean colour is calculated at each pixel and blended for the final image. The averaging of the warped images creates the final prototype image.

As already indicated, PsychoMorph is then customarily used to apply facial transformations, from, for example, young to old, healthy to sick, one race to another. However, for the purposes of the study in Chapter 9, all that was required was a prototypical face of each of the homogenous groups, homosexual and heterosexual males.

Appendix d Attractiveness and Aggressiveness Questionnaire in Homosexual/ Heterosexual study.

VISUAL PREFERENCE TEST

Please enter your age……

Please tell us whether you are male or female:

□Male
□Female

Please indicate your ethnic group……

If you are female please answer the following questions about your menstrual cycle:

1. How many days would you say your average cycle lasts? (i.e. from beginning of your period to the beginning of your next period)…….days

2. How long ago was the first day of your last period?

   ……..... days

3. Are you menstruating normally? (Select "no" if you have irregular periods or have stopped menstruating due to pregnancy, menopause or any other reason)
   a. □Yes
   b. □No
4. Are you taking any hormonal contraception (e.g. the Pill, the Injection) or replacement therapy (HRT)?
   a. □Yes
   b. □No

Please rate Photo 1 on a scale of 1 – 7, 1 being ‘least agree’ to 7 being ‘most agree’.

PHOTOGRAPH 1	**Least agree**						**Most agree**
Assuming that you are/were single, do you feel that…	1	2	3	4	5	6	7
…this man is physically attractive							
…this man looks kind							
…this man looks as if he would be good with children							
…this man looks as though he could be aggressive							
…you would like to have a short-term relationship with this man							
…you would like to have a long-term relationship with this man							

Please rate Photo 2 on a scale of 1 – 7, 1 being ‘least agree’ to 7 being ‘most agree’.

PHOTOGRAPH 2	**Least agree**						**Most agree**
Assuming that you are/were single, do you feel that…	1	2	3	4	5	6	7
…this man is physically attractive							
…this man looks kind							
…this man looks as if he would be good with children							
…this man looks as though he could be aggressive							
…you would like to have a short-term relationship with this man							
…you would like to have a long-term relationship with this man							

Appendix e (i)

Table 19 Unrotated loadings of Two Factor Solution for Homosexual Attractiveness Items

Item	Component 1 Positive characteristics	Component 2 Negative characteristics
GLTR	.903	
GPhysAtt	.886	
GSTR	.818	
GKind	.808	
GGoodChild	.740	
RGAgg		.922

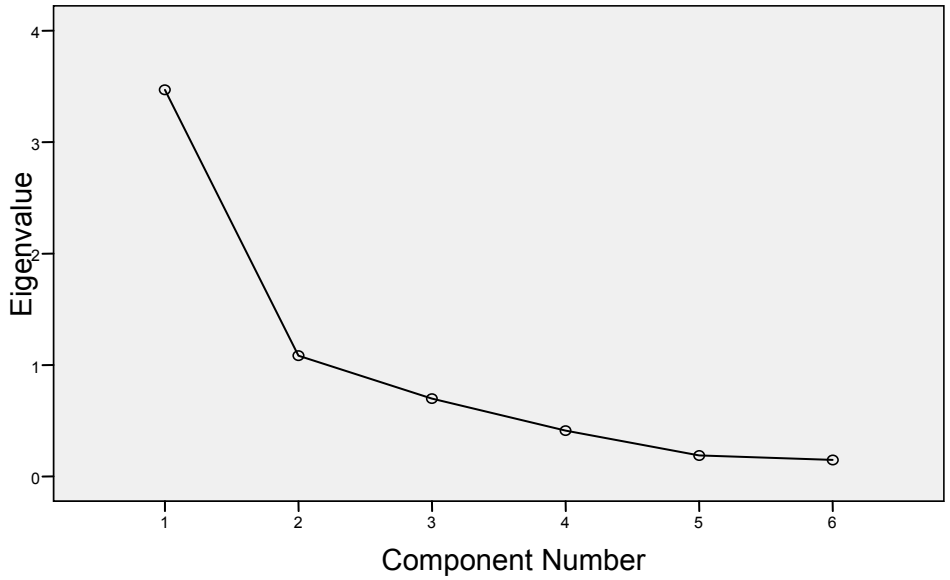
Appendix e (ii)

Table 20 Unrotated loadings of Two Factor Solution for Heterosexual Attractiveness Items

Item	Component 1 Positive characteristics	Component 1 Negative characteristics
SLTR	.879	
SKind	.836	
SPhysAttr	.821	
SSTR	.808	
SGoodChild	.731	
RSAgg		.954

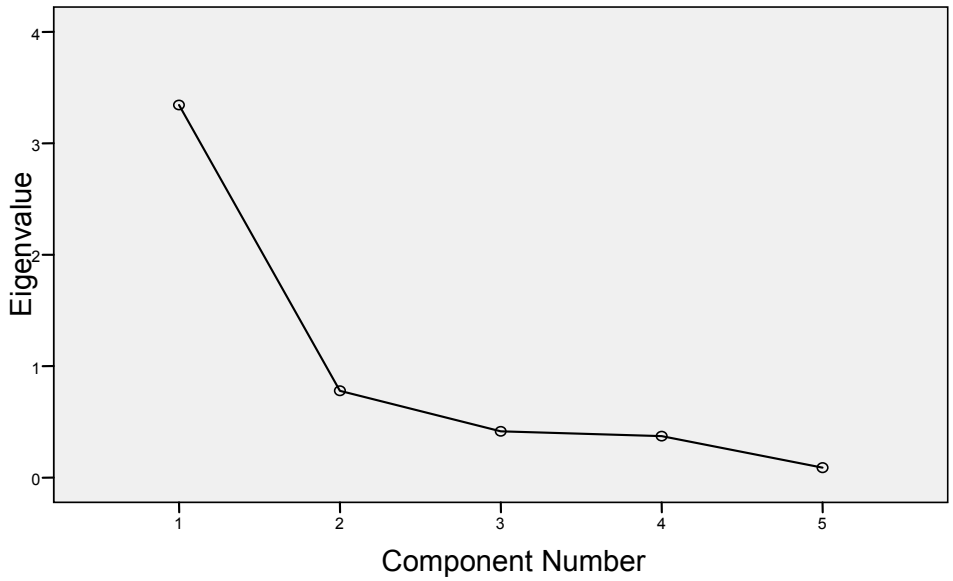
Appendix f

Figure 17 Screeplot for Homosexual Attractiveness Items.



Appendix g

Figure 18 Screeplot for Heterosexual Attractiveness Items



Appendix h

A discussion on the validity of sex-research based upon self-report measures

> "It is frightening to think that social science is in the hands of professionals who are so deaf to human nuance that they believe that people do not lie to themselves about the most freighted aspects of their own lives, and that they have no interest in manipulating the impression that strangers have of them" Lewontin, 1995: 24.

Synopsis

This appendix considers the methodological issues surrounding the empirical study of human sexuality, and in particular the use (and possible abuse) of self-reports to investigate this private and sensitive area. In view of the fact that there is a consistent discrepancy between male and female self-reports of lifetime number of sexual partners (a discrepancy which is empirically unlikely), the chapter considers the possible reasons for the discrepancy, conducts a small empirical investigation into the gender difference, and concludes by asking whether it is appropriate to use self-reports at all in studies of human sexuality.

Introduction

The study of human sexuality is, to the evolutionary psychologist, of supreme importance, because reproduction drives evolution and no domain can be more directly linked to reproduction than sexuality. In other words, as reproduction drives evolution, those domains most directly related to reproduction should be the main targets of selection pressures. And as the main target of selection pressures, human sexuality should therefore be a focal target for psychological adaptations (Buss, 1998).

It should come as no surprise, then, that human sexuality is at the centre of much empirical study in evolutionary psychology. As such, the importance of valid and reliable measures of sexuality cannot be overstated. The next chapter,

entitled “Sociosexual desire, attitudes and behaviour: why three factors are better than one”, considers the widespread use of the primary measure of sociosexuality, the Sociosexual Orientation Inventory, and asks whether it is the most appropriate measure for sociosexuality in view of the shifting research emphasis in human mating strategy from one of inter to intra-sex mating strategies. This chapter, however, considers an even more fundamental question, that being whether it is appropriate to measure sexuality through self-report at all.

The sexual ‘double-standard’.

As the opening quotation suggests, there is, indeed, much to be concerned about, though to suggest that professionals are deaf to the problems of socially desirable responding is misleading. Indeed, the value of self-report measures has been of concern for more than seventy years, with issues being raised by, for example, Bernreuter in 1933. This has been exacerbated, in the study of sexuality, by the particularly sensitive and private nature of the subject, as well as by the sexual ‘double-standard’ in which females are now ‘permitted’ to engage in sexual relations as long as that happens within a committed and recognised relationship, whereas for males it is permissible to have as many sexual partners as they can attract without fear of social ostracism, at least within the majority of “Western” cultures (Milhausen and Herold, 1999). Thus males are socialised to desire and to pursue sexual opportunities with a number of partners, whereas females are socialised to eschew casual sexual relationships in favour of sex within the confines of the committed relationship.

It is suggested, however, that at least within more westernised cultures, there appears to be a steady relaxation of the double standard, attributable to a number of factors including, amongst others, the changing roles of females in the workforce, generally more liberal norms regarding sexual behaviour, and improved health care and the easy availability of contraception, (Milhausen and Herold, 1999). Empirical support for this proposition is offered. In a study of 174 female undergraduates it was shown that there was near unanimous agreement that the double standard still exists, with ninety-five percent indicating that they

believed that there was still a standard which allowed males to have more sexual partners than females, and ninety-three percent agreeing that females who have had a large number of sexual partners are judged more harshly than males who have had a similar number. However, and most interestingly, participants were then given two versions of the same question (i.e. “What words would you use to describe a man (woman) who has had many sexual partners”) with one half being requested to give labels for males and the other half being requested to give labels for females. It was found that despite virtually all the participants stating that they believed there was a double standard, females gave an equal number of negative labels for more promiscuous behaviour to males as well as females, with some traditionally ‘female’ names for promiscuous behaviour (e.g. slut) being used to describe males. Thus it was suggested that whilst females believe that there is a societal standard or norm which allows the double standard, the feelings of this particular participant group were distinct from their understanding of those societal norms (Milhausen and Herold, 1999).

This is further supported by a large and more recent study in which 8,080 online participants and 144 undergraduates were asked to evaluate targets, both male and female, who had differing numbers of sexual partners (Marks and Fraley, 2005). Whilst female targets were more likely to be derogated for having a larger number of sexual partners than females who had had a smaller number of sexual partners, this was also true of males. This suggests that contrary to popular belief, the double standard does not exist, though people do judge both males and females more harshly the higher the number of sexual partners they have.

Socially desirable responding and self-report measures.

The issue with the double standard, in terms of sexuality self-reports, is that if socially desirable responding takes place, females will be more likely to indicate a more restricted and monogamous approach to their sexuality than is actually true, whereas males are more likely to suggest a less restricted, more promiscuous approach. Thus, even if the double standard is now more likely to

be rejected by an individual than it once was, an awareness within that individual of a societal norm that accepts a differentiated approach to sexuality may still impact upon a tendency to bias reports in a way which may make the respondent appear to conform more closely to approved societal behaviour and attitudes. It is therefore important to gauge the likelihood of responding to the perceived double standard in self-report measures.

To my knowledge, the only empirical investigation into the relationship between socially desirable responding and sexuality self-reports was a Canadian study (the generalisability of which must therefore be restricted to “Western“ cultures) conducted by Meston, Heiman, Paulhus and Trapnell (1998). Interestingly socially desirable responding was broken down into two elements, response biases that involved deceiving oneself (self-deception enhancement) and response biases that involved deceiving others (impression-management). It was expected that impression-management scores would be low due to the low-situational demand of an anonymous questionnaire. This was essentially true for males, with only a small negative relationship being seen between impression management and unrestricted sexual attitudes and fantasies (i.e. a small relationship between a greater need to ‘look good’ and a more restricted approach to sexuality in terms of attitude and desire). For females there was a small relationship between impression-management and sexuality scores, with high impression-management females, (i.e. females scoring high in the need to create a good impression), being slightly more likely than low impression-management females to report being more restricted in both sexual behaviour (including being more likely to report being a virgin) and sexual attitude. Essentially, relationships between impression-management and sexuality were small and linked almost exclusively to females.

In terms of self-deceptive enhancement it appeared that the only relationship of any note was that between self-deceptive enhancement and some of the items in the sexual adjustment scale (i.e. items related to global sexual satisfaction and specific causes of possible dissatisfaction - arousal, sexual frequency etc). However, no relationships were found between self-deceptive enhancement and inter or intra-personal sexual behaviour, body image or sexual orientation.

The general conclusion reached was that impression-managers (usually females) may be inclined to portray themselves in a positive light, even in anonymous conditions under which one might assume situational responses would be reduced. However, the relationship between impression-management and sexuality self-report remains small, allowing Meston et al to conclude that most of the self-report variance is not biased (1998). This is consistent with the findings of Paulhus (1991) who similarly argued that under anonymous conditions respondents are unlikely to respond in an intentionally socially desirable manner. It is also consistent with the study by Clark and Tiffit (1966) in which having completed a questionnaire, male participants were connected to a polygraph and given the opportunity to amend their earlier statements. Whereas homosexual and masturbatory experience was underreported, heterosexual behaviour remained consistent, with as many participants being likely to have under-reported their experiences as over-reported.

It appears, then, that self-enhancing biases cannot adequately account for the large gender discrepancy in self-reported number of lifetime partners. As Johnson and DeLamater (1976) argued, removing participants who had expressed a lack of candour or honesty in their completion of an earlier sexuality questionnaire had very little effect on the overall account of sexual experiences.

Lifetime number of self-reported sexual partners: why do males consistently report more than females?

There is, then, growing evidence to support the proposition that the sexual double standard in some cultures is on the wane, and that sexually desirable responding in anonymous self-report measures is not as prevalent as may have been supposed. However, researchers should not accept this as reason for complacency as, for whatever the reason (and this is to be considered), one of the most robust findings in research into human sexuality is the fact that consistently males report a greater number of lifetime partners than females – a fact which remains empirically unlikely.

How can this be so? In a closed population each new sexual partner that a male has means a new sexual partner that a female has. Thus males and females should report roughly the same mean number of sexual partners, but research shows that this is virtually never the case (Brown and Sinclair, 1999; Johnson, Wadsworth, Wellings, Bradshaw, and Field, 1992; Smith, 1992). As Wiederman (1997) reports, considerable gender discrepancy has been found in the self-reported number of lifetime partners in many national surveys including surveys from the U.S., U.K., France, New Zealand and Norway. He also reports studies which have found gender discrepancies between adolescents and between college students. Indeed, according to Brown and Sinclair (1999), males tend to report a lifetime number of opposite-sex partners two to four times higher than the number reported by females. Whilst this is possible (if, for example, a few highly promiscuous females exist, it is logically possible that the majority of females may truthfully claim only one partner, and the majority of males may claim several), this remains unlikely and will be considered shortly.

The first question to be asked is whether these discrepancies are best explained as ‘good-faith’ explanations, or ‘bad-faith’ explanations (Brown and Sinclair, 1999). ‘Bad-faith’ explanations argue that participants mislead both themselves and others with males over-inflating and females underreporting sexual behaviour. However, if this is the case one should be able to assume that similar biases should be seen when asked to report on other sensitive issues. This is not the case. Male and female participants have been seen to show consistency when asked about the frequency and duration of sexual contact, as well as their acknowledgement of having taken part in specific forms of sexual activity (Laumann, Gagnon, Michael and Michaels, 1994). Perhaps even more significant is the fact that male and female reports of sexual behaviour over the previous year tends also to be more consistent (Laumann et al, 1994; Morris, 1993). These findings and those discussed under the heading “Socially desirable responding and self-report measures” appear to suggest, then, that bad-faith accounts represent only a small amount of any bias, and cannot account for the large gender discrepancies in apparent lifetime number of partners found in most research.

‘Good-faith’ explanations, on the other hand, would argue that participant responses are accurate, but that biases in the sampling or responses in terms of definitions, accuracy etc skew the results. For example, Weiderman (1997) considers a variety of possible explanations. Under sampling bias, Weiderman considers firstly the possibility that a discrepancy may be explained by the possibility that sexual activity occurs outside of the sample group. However, this cannot explain why males consistently report greater numbers of partners than females. Unequal gender ratios have also been offered, on occasion, as an explanation for the apparent discrepancy. However, after statistically correcting for the unequal ratios of males to females in four countries, Smith (1992) found that whilst the gender discrepancy reduced in the US and Canada (as there were slightly more females than males), the gender discrepancy actually increased when considering Britain and Norway (due to the slightly larger number of males than females).

Other researchers have suggested that the male preference for younger female partners may offer a possible explanation as males who have had sexual relationships with females less than 18 years of age include them in their reports, but these females are not old enough to be included in the sample (Johnson, Wadsworth, Field, Wellings and Anderson, 1990). However, if this scenario is calculated it appears that two thirds of adult males’ partners would have to be less than 18 years for the size of the gender discrepancy to be explained (Morris, 1993). The young age of female partners cannot, therefore, offer a plausible explanation.

Another putative explanation (Laumann et al, 1994; Walsh, 1993) is that of prostitution and hypersexual females (i.e. a number of females who have an exceedingly large number of sexual partners). However, there is more empirical support for the existence of the hypersexual male than for the hypersexual female (Einon, 1994). Furthermore, when considering the number of male clients that a prostitute would have to service in order to satisfy the gender discrepancy, Einon concludes again that prostitution cannot offer a plausible explanation.

It appears then, that sampling bias cannot adequately explain self-reported gender differences in lifetime number of sexual partners. Weiderman (1997) also considers potential response bias as a potential explanatory source. Definitions are first considered, both in terms of what constitutes a sex partner (someone with whom one has had sexual contact, or someone with whom one has been in a romantic, sexual relationship) and what constitutes sex (any form of sexual contact including kissing, or partners with whom they have shared sexual intercourse). Whilst some researchers (Laumann et al, 1994; Mark and Miller, 1986) argue for gender differences in appreciation of definitions, this seems to be unlikely in view of the relatively explicit definitions proposed by the majority of measures, thus reducing the potential for different interpretations of a term.

What, then, can explain the gender differences in self-reported lifetime partners? According to two studies which looked into this issue, both conclude that inability to recall accurately the number of sexual partners one has had at the higher end of the scale may be the root of the issue (Brown and Sinclair, 1999; Weiderman, 1997). According to Weiderman, evidence to suggest that inaccurate recall or estimation, as opposed to deliberate deception, provides a more convincing explanation lies in the fact that those who report greater numbers of sexual partners have a tendency to round the numbers up (or down) to finish in a 0 or 5. If, as Weiderman points out, the participants had a genuine interest in deceiving, they would be more likely to produce an ‘accurate’ figure. However, this still does not explain why males tend to over-report in comparison to females. For Weiderman, a possible explanation lies in the fact that males tend to have a less restricted approach to sexuality, and tend to fantasise more about sex than females (Leitenberg and Henning, 1995). So as males have greater mental ‘experience’ of sexual relationships, so self-deception occurs as their estimates of the number of sexual relationships they have had with females may be biased accordingly.

Brown and Sinclair (1999), on the other hand, argue that self-deception is unlikely to be a major explanation for the gender disparity as when asked to recall the number of sexual partners one has had over the past twelve months,

participants are much more likely to be in agreement than when asked to report over a lifetime (Brown and Sinclair, 1999; Laumann et al, 1994; Morris, 1993). If deception were a factor in the disparity, a similar disparity should be found in the report of partners over the past-year as for partners over a lifetime. Rather, Brown and Sinclair suggest that the explanation may be found in the different estimation strategies employed by males and females. It appears that when recalling sexual relationships, males tend to make rough estimates of the number of partners they have had whereas females tend to enumerate. There may be a number of explanations for this different cognitive style. One such explanation may be that as memory for relevant instances decreases estimations are liable to increase. As females are more likely to think about sex from a relationship perspective, they are more likely to have encoded the experience more deeply. It is also possible that females take the answering of sex surveys more seriously than males, and are therefore more likely to take the more timely but more accurate enumeration strategy than the quicker estimation approach. Both explanations would be consistent with the apparent disparity between past-year and lifetime reports.

The proposition that there should be no significant difference between male and female self-reports of sexual partners over the past year, as predicted by prior research (Brown and Sinclair, 1999; Laumann et al, 1994; Morris, 1993) is investigated within this research. The formal hypothesis was therefore as follows:

Hypothesis

It was hypothesised that there would be no significant difference between male and female self-reports of number of sexual partners over the previous 12 months.

Methodology

Design

An independent quantitative design was used to investigate the difference in male and female self-reports of number of sexual partners over the past year.

Materials

The first question of the Revised Sociosexual Orientation Inventory (R-SOI), devised by Penke and Asendorpf (2008), was used to obtain male and female self-ratings for number of sexual partners in the past year. Exact wording was "With how many different partners have you had sex within the past 12 months?" and participants were able to score 0, 1, 2, 3, 4, 5-6, 7-9, 10-19, 20 or more. Scores respectively were from 1 to 9.

Participants

137 females (age range, 18 to 61 years, M = 30.58, S.D. = 11.5) and 82 males (age range 18 to 69 years, M= 27.85, S.D. = 12.19) participated. The majority were psychology undergraduates, with a number of participants being staff at the university.

Procedures

This question was asked as one of a range of questions within the Revised Sociosexual Orientation Inventory as set out in appendix h (ii). As data was collected from a range of experiments, full procedural details may be found under the relevant procedure for each study.

Results

An independent samples t-test was conducted to evaluate the impact of gender on self-reported number of sexual partners over the past year. The analysis showed that equality of variance could not be assumed (Levene's test, p = .019), and therefore the appropriate measure under "Equal Variances not assumed" was taken. Contrary to the experimental hypothesis, there was a significant difference between the number of self-reported sexual partners over

the past year between males (M= 1.62, S.D. = .162) and females (M= 1.18, S.D. = .101), t (217) = 2.42, p = .023. The magnitude of the difference in the means was very large (Eta squared = .995)

Discussion

Despite using a measure which reportedly reduces the gender disparity in number of self-reported sexual partners in the past year, this study showed, again, a large disparity, in such reports. This was contrary to expectations as, as has been discussed, the gender disparity customarily seen is said to be reduced or negated by reducing the time-span for self-reports from over a lifetime to over the past year (Brown and Sinclair, 1999; Laumann et al, 1994; Morris, 1993). What impact does this have in terms of the studies using this measure?

Clearly a reduction (or indeed negation) of the gender difference would have been a preferable result as concerns regarding self or other deception could have been much reduced. However, this result is consistent with general research regarding male and female self-reports of the number of sexual partners they have had (albeit generally over a lifetime as opposed to the past year), and therefore it is not completely surprising (Brown and Sinclair, 1999; Johnson, Wadsworth, Wellings, Bradshaw, and Field, 1992; Smith, 1992). In terms of the impact this has on the forthcoming studies it is suggested that the result is not too problematic. If, as research suggests, differences in results are more a question of gender differences in estimation strategies than of self or other deception, then we may be reasonably confident that other questions using this or other scales have been answered equally honestly by both males and females.

Furthermore, whilst, clearly, the absolute values may not be relied upon, the relative values are more robust. Therefore validity of the use of this measure is dependant upon the type of research questions asked. For questions regarding relationships between variables, inflation at one end of the scale should not be problematic. However, for studies which consider the differences between

genders there is clearly an issue. Similarly, for studies that require absolute values (in, for example, studies investigating the spread of sexually transmitted diseases), such a finding would be a significant problem. It is concluded, therefore, that due to the nature of the studies within this research the gender difference in self-reports of sexual behaviour should not be of great concern, except with regard to chapter 11 (Gender differences in the relationship between self-perceived physical attractiveness and sociosexuality), in which this issue is discussed further.

Methodological constraints

It should be noted that the exact wording used to investigate self-reports in sexual behaviour was “With how many different partners have you had sex within the past 12 months?” This wording was used as it is the wording used by Penke and Asendorpf in their Revised SOI. However, and as discussed, there was the potential for differences in interpretation of what both “a partner” (someone with whom one has had sexual contact, or someone with whom one has been in a romantic, sexual relationship) and “sex” (any form of sexual contact including kissing, or partners with whom they have shared sexual intercourse) might mean. However, it was chosen for two reasons. Firstly, it was deemed preferable to use a scale, the R-SOI, which is now within the general research domain, in order to enable this research to be compared with other research. For this reason all items used within this research had to be as the R-SOI. Secondly, it was not possible to know, prior to its use, whether the restricted time period (i.e. 12 months) would, in fact, eradicate the gender difference issue in these reports. It was only by conducting the empirical study that it was possible to ascertain that the gender difference in self-report remains within this area. Nevertheless, and as just concluded, depending upon the research question asked, the gender difference discovered is not deemed to be too problematical.

Appendix h (i) The seven items from Simpson and Gangestad's (1991) Sociosexual Orientation Index (SOI)

1. With how many different partners have you had sex within the past year?
2. How many different partners do you foresee yourself having sex with during the next five years?
3. With how many partners have you had sex on one and only one occasion?
4. How often do you fantasise about having sex with someone other than your current partner?
5. Sex without love is okay.
6. I can imagine myself being comfortable and enjoying "casual" sex with different partners.
7. I would have to be closely attached to someone (both emotionally and psychologically) before I could feel comfortable and fully enjoy having sex with him or her.

Simpson, J. and Gangestad, S. (1991). Individual differences in sociosexuality: Evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology*, 60: 870-83.

Appendix h (ii) The Revised Sociosexual Orientation Inventory (R-SOI)

Please respond honestly to the following questions:

1. With how many different partners have you had sex within the past 12 months?

☐	☐	☐	☐	☐	☐	☐	☐	☐
0	1	2	3	4	5-6	7-9	10-19	20+

2. With how many different partners have you had sexual intercourse on *one and only one* occasion?

☐	☐	☐	☐	☐	☐	☐	☐	☐
0	1	2	3	4	5-6	7-9	10-19	20+

3. With how many different partners have you had sexual intercourse without having an interest in a long-term committed relationship with this person?

☐	☐	☐	☐	☐	☐	☐	☐	☐
0	1	2	3	4	5-6	7-9	10-19	20+

4. Sex without love is OK.

1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐
Strongly disagree							Strongly agree	

5. I can imagine myself being comfortable and enjoying “casual” sex with different partners.

1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐
Strongly disagree							Strongly agree	

6. I do not want to have sex with a person until I am sure that we will have a long-term, serious relationship.

1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐
Strongly disagree							Strongly agree	

7. How often do you have fantasies about having sex with someone you are not in a committed romantic relationship with?

□ - never
□ - very seldom
□ - about once every two or three months
□ - about once a month
□ - about once every two weeks
□ - about once a week
□ - several times per week
□ - nearly every day
□ - at least once a day

8. How often do you experience sexual arousal when you are in contact with someone you are *not* in a committed relationship with?

□ - never
□ - very seldom
□ - about once every two or three months
□ - about once a month
□ - about once every two weeks
□ - about once a week
□ - several times per week
□ - nearly every day
□ - at least once a day

9. In everyday life how often do you have spontaneous fantasies about having sex with someone you have just met?

□ - never
□ - very seldom
□ - about once every two or three months
□ - about once a month
□ - about once every two weeks
□ - about once a week
□ - several times per week
□ - nearly every day
□ - at least once a day

From: Penke, L., and Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology*. 95 (1113-1135)

Appendix h (iii) Participant Information and Consent Form

STUDY TITLE: AN INVESTIGATION INTO HUMAN SEXUAL STRATEGIES

WHAT IS THE PURPOSE OF THE STUDY?
We are investigating aspects of human sexuality, and in particular how men and women choose and attempt to attract their romantic partners. Until now a lot of research has considered differences between men and women. This study looks at the very big differences that occur within each sex and attempts to establish the factors behind these differences.

WHY HAVE YOU BEEN CHOSEN AND SHOULD YOU TAKE PART?
We are simply looking for men and women, of any age who are interested and willing to participate. It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect your position in any way at all.

WHAT YOU WILL BE ASKED TO DO
Men: We will ask you to complete two nine-item questionnaires. We will measure your height. We will also ask you to record your preferences in ten pairs of photos, and to make a choice of preferred option from a Forced Choice Scenario.
Women: We will ask you to rate two photographs of men for how attractive you think they are. We will also ask you to complete two nine – item questionnaires, one on when and how you use cosmetics, and the other on interest in sex.

WILL MY TAKING PART IN THE STUDY BE KEPT CONFIDENTIAL? If you consent to take part in the research all information which is collected about you during the course of the research will be kept strictly confidential and anonymised in any papers, thesis etc. The consent form, which will be the only form containing both your name and your participant ID number, will be kept in a locked cabinet on BCUC premises**.**

WHO HAS REVIEWED THE STUDY? The Human Sciences and Law Ethics Committee of Buckinghamshire Chilterns University College has reviewed the study and has given consent for the research to take place.

CONTACT FOR FURTHER INFORMATION If you have any questions or require further information please feel free to contact us:

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E mail: jrober01@bcuc.ac.uk

Dr George Fieldman
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Appendix i

Sociosexual desire, attitudes and behaviour: why three factors are better than one.

Synopsis

This study aims to review and analyse the Revised Sociosexual Orientation Inventory (R-SOI; Penke and Asendorpf, 2008). The purpose of doing so is two-fold. Firstly, as a newly available instrument, the R-SOI appeared to address extant problems with the universal measure of sociosexuality, the Sociosexual Orientation Inventory, devised by Simpson and Gangestad (1991). Nevertheless, as with all new instruments, empirical investigation is necessary in order to ensure both reliability and validity, and this study aims to provide such an empirical investigation. Furthermore, this study also aims to address more recent concerns regarding the appropriateness of a unidimensional instrument for the measurement of sociosexuality. Due to these concerns it was felt that additional empirical investigation into the underlying structure of the R-SOI would be of benefit for future research decisions into the value of this new measure. It should also, more immediately, inform decisions regarding the sub-analysis of data in the forthcoming chapters of this thesis, which may benefit from a more differentiated consideration of the relationships between aspects of sociosexuality and other factors.

Introduction

Since 1991 and the publication of Simpson and Gangestad's Sociosexual Orientation Inventory (SOI – see appendix h-i) there has been a surge of interest in the concept of sociosexuality, or the individual differences in readiness to engage in uncommitted sexual relationships. As a result of the apparent correlations between sexual behaviour, sexual attitudes and fantasies, Simpson and Gangestad devised this short (7-item), self-report instrument to reflect these constructs, with a single combined score as an indicator of one's overall sociosexuality. Such individual differences are therefore measured along

a single bi-polar continuum, with high scores representing an *unrestricted* orientation (i.e. a proclivity to sexual relationships with little or no interest in the longevity of the relationship – a more promiscuous orientation) and low scores representing a more *restricted* orientation (i.e. requiring a greater degree of commitment before engaging in a sexual relationship – a more monogamous orientation).

As the leading measure of sociosexuality, the SOI has since been widely utilised as an appropriate instrument to gauge long-term versus short-term mating strategies (e.g. Buss, 1999; Greiling and Buss, 2000; Mikach and Bailey, 1999; Schmitt, Shackleford, Duntley, Tooke and Buss; 2001). Indeed, it has become the single most used measure of sociosexuality in current research and has been successfully employed in the publication of over 40 peer-reviewed studies (see Simpson, Wilson, and Winterheld, 2004) on subject matter including relationships with mate preferences (Simpson and Gangestad, 1992), courting strategy (Simpson, Gangestad and Nations, 2006) and relationship stability (Simpson, 1987) amongst others. The SOI has therefore been enormously successful in providing an instrument that measures broad aspects of sociosexuality, satisfying, as it does, the original remit set by Simpson and Gangestad (1991) when devising the instrument.

However, there have, more recently, been criticisms of this measure on a number of grounds based upon both theoretical argument and empirical data, the most important perhaps being the notion of unidimensionality in the SOI (Jackson and Kirkpatrick, 2007; Penke and Asendorpf, 2008; Webster and Bryan, 2007). At the time the measure was devised the prevailing interest in evolutionary psychology was in between-sex differences in mating strategy and tactics. However, as the focus has shifted towards a conceptualisation of human mating strategies as contextual and pluralistic, with both males and females engaging in long and short-term mating tactics dependant upon the context, the ability of the SOI to portray the pluralistic nature of human mating strategies has been questioned.

One of the first teams to raise the issue of the questionable unidimensionality of sociosexuality were Bailey, Gaulin, Agyei and Glaude (1994), who proposed that to aggregate sociosexual attitude and sociosexual behaviour might be misleading. They argued, consistent with current theory, that mating strategies reflect a set of psychological adaptations which are then manifested through behaviour, though the manifestation of such psychological adaptations is restricted by environmental constraints (Buss and Schmitt, 1993). As such Bailey et al proposed the separate analysis of attitudinal and behavioural components, believing that the existence of differential relationships might be captured. This proved to be so. When looking at two groups of males, one homosexual and one heterosexual, they found that whilst they shared similar sociosexual attitudes, they differed significantly in terms of behaviour. Their conclusion was that differences exist in the opportunities but not in the motivation to engage in unrestricted behaviour, a factor which would not have been apparent through a unidimensional analysis.

The heterogeneity of the constructs has since been supported by further research analysing the relationships between narcissism and hostility and their effects on sociosexual attitudes and behaviour (Webster and Bryan, 2007). They were able to show, for example, that whilst as a single measure narcissism and sociosexuality were significantly associated ($p < .01$), as a dual measure narcissism was significantly correlated with sexual behaviour ($p < .01$) but not with sexual attitude ($p = .68$). Similarly, whilst as a single measure hostility and sociosexuality were significantly associated ($p < .01$), as a dual measure there was a significant relationship between hostility and sexual attitude ($p < .01$), but not hostility and sexual behaviour ($p = .33$). Thus their conclusion is that a single measure of sociosexuality may mask the differential effects of sociosexual attitude and sociosexual behaviour. However, whilst Webster and Bryan did not support a unidimensional structure for the SOI, there were problems with their proposal for a dual-factor SOI. Results of their confirmatory factor analysis indicated that item 2 loaded equally onto both factors, suggesting that a dual-factor solution was, perhaps, not clear-cut.

Further problems with the SOI have included the quality of the scoring system as the first three behavioural items had open-response formats. As such figures for number of sexual partners tended to produce problems at the higher end of the scale, with issue over exaggerations, estimations and memory (Wiedermann, 1997). Whilst it has been recognised that high values in the open questions have needed some form of transformation, there has been no consistently reported treatment, resulting in problems when comparing results. Similarly the scoring of the SOI has also produced problems as the seven questions have three different response scales, and although suitable ways to transform the scores were offered by Simpson and Gangestad, they tend to produce different results (Voracek, 2005).

As a result of the issues surrounding the unidimensionality of the existing SOI and their belief that such a measure could mask differential correlates with other factors, Penke and Asendorpf (2008) devised a Revised Sociosexual Orientation Inventory (R-SOI – see appendix h - ii). Through a large online study and a separate behavioural, longitudinal study of both singles and couples, they established three theoretically distinct factors of sociosexuality – behaviour, attitude and desire.

In terms of behaviour, they argue behavioural differences reflect differential allocation of effort to either short-term or long-term mating tactics, with the former requiring investment in time, energy and money in finding and courting a number of potential mates, and the latter requiring like investment in a single mate and resultant offspring. Behavioural histories, they argue, are the result of individual desire constrained by both personal and external constraints, whether social or non-social, on the enactment of those desires.

In terms of attitude, Penke and Asendorpf describe it as an “evaluative disposition towards uncommitted sex” (p. 5), tempered as it is by socio-cultural factors including its institutions (e.g. marriage systems), traditions (e.g. religious rules) and values (e.g. the emphasis on chastity etc). Thus culturally accepted

attitudes towards sociosexuality may not reflect either an individual's desire or their behaviour, but should impact upon their attitude.

In terms of desire, sociosexual desire can be regarded as the level of sexual interest as characterised by sexual arousal and fantasies. It is distinct from a more general sexual desire in that whereas *general* sexual desire may be targeted towards anyone, including sexual desire for one's long-term partner, *sociosexual* desire reflects sexual desire for a potential mate with whom there is specifically no current relationship. In this way sociosexual desire more accurately reflects the motivational disposition to invest in short-term as opposed to long-term mating effort. As sociosexual desire shows one of the largest sex differences (Buss and Schmitt, 1993) it may be that the analysis of this particular sub-scale may show important differences between groups where analysis of sociosexuality as a one-dimensional factor may not.

The R-SOI, therefore, offers a 9-item questionnaire which both overcomes some of the problems associated with the original SOI (in terms of psychometric quality) as well as incorporates theoretically meaningful factors suitable for analysis as sub-scales. As a new instrument, however, the R-SOI has received virtually no empirical analysis. This study therefore investigates the responses of a population of male and female university undergraduates in order to analyse the loadings of the various components into uniquely identifiable factors. It also takes a precursory look at the ability of a 3-factor SOI to identify the potentially different relationships between sociosexual desire, attitudes and behaviours with a number of related factors.

Rationale and Aims.

The aim of this study is to assess the underlying structure and properties of the R-SOI. It also aims to investigate the appropriate level of analysis for this instrument – whether a unidimensional approach suffices as per previous research, or whether a three-factor approach is better able to distinguish the potential differential effects of sociosexual desire, attitudes and behaviour which

may hitherto have been masked by a unidimensional approach to sociosexuality.

Methodology

Design

229 participants completed the R-SOI as part of experimental procedures for chapters 8 (study one), 9, 10, 11 and 13 (study two). Full details of the experimental methodologies may be found under sections 8.3, 9.3, 10.3, 11.3, and 13.6 respectively. The resultant data was made available for Principal Components Analysis.

Materials

The Revised Sociosexual Orientation Inventory was used (see appendix h - ii) along with various other measures as discussed under the relevant chapters. For the purposes of this study, however, only the data from the R-SOI is considered.

Participants

138 females (M age = 30.58, S.D. = 11.47) and 86 males (M age = 27.85, S.D. = 12.19) participated, drawn from a primarily undergraduate population of mixed ethnicity.

Procedure

Procedure for participation differed as per the relevant chapters. However, common to all experiments participants were given a thorough briefing prior to participation concerning issues regarding anonymity and confidentiality. They were then asked to read and sign an information and consent form before completing the R-SOI.

Results

Principal Components Analysis

Reliability

The Cronbach alpha value for the R-SOI scale was .87, thus exceeding the recommended value of .7 (Nunnally, 1978).

Suitability for factor analysis and extraction of factors.

The 9 items of the R-SOI were subjected to Principal Components Analysis (PCA). Prior to performing PCA the suitability of the data for Factor Analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Keyser-Meyer-Oklin value was .83 exceeding the recommended value of .6 and the Bartlett's Test of Sphericity reached statistical significance ($\chi^2 = 980.91$, $df = 36$, $p<.005$), supporting the factorability of the correlation matrix (Tabachnick and Fidell, 2006).

Principal Components Analysis revealed the presence of three components with eigenvalues exceeding .96, explaining 49%, 65% and 76% of the variance respectively. An inspection of the screeplot revealed a break after the second and third components (see appendix i - i). Investigation of the Component Matrix (see appendix i - ii) showed that the loadings for each of the items in all three components (using the Kaiser criterion) load moderately across all three components. The decision was therefore made to retain all three factors for further investigation.

Rotation and interpretation of the factors

To aid in the interpretation of these components, Direct Oblimin rotation was performed, allowing for the factors to be correlated. The rotated solution (presented in Table 21) revealed all variables loading substantially across the

three components, with all loadings exceeding .75. The interpretation of the three components was consistent with expectations and the previous analysis of the scale conducted by Penke and Asendorpf, and therefore provides support for the decision to analyse as three separate sub-scales.

Table 21: Direct Oblimin Rotation of Three Factor Solution for R-SOI

Item	Component 1	Component 2	Component 3
Desire 8	.885		
Desire 9	.853		
Desire 7	.822		
Behaviour 2		.882	
Behaviour 1		.768	
Behaviour 3		.759	
Attitude 4			-.889
Attitude 6			-.866
Attitude 5			-.777

Extraction method: Principal Components Analysis
Rotation Method: Oblimin with Kaiser Normalisation
Rotation converged in 7 iterations

Discriminant capability of a 3-factor R-SOI

The discriminant capability of a 3-factor R-SOI was investigated through correlational analyses with male height, the 2D: 4D Digit ratio, the Visual Preference Test (VPT) devised to assess interest and potential investment in offspring (Roney, Hanson, Durante, and Maestripieri; 2006), self-perceived male attractiveness and self-perceived female attractiveness (Physical Attractiveness Scale - Revised; International Personality Item Pool) and cosmetic usage. See Table 22.

Table 22: Table showing significance of correlations with aspects of sociosexuality.

	Sociosexuality	Sociosexual desire	Sociosexual attitude	Sociosexual behaviour
Male height	.213	.304	.066	**.021***
2D: 4D Digit ratio	.093	**.003****	**.040***	.217
Visual Preference Test	.024*	.009*	.083	**.432**
Self-perceived attractiveness (♂)	.001**	.025*	.001**	.004**
Self-perceived attractiveness (♀)	.277	.411	.391	.137
Cosmetic Usage	.001**	.010**	.004**	.006**

* Significant at the p <.05 level

** Significant at the p <.01 level

Figures in bold indicate a difference between that factor and the significance of sociosexuality.

Of the six factors, three were able to unmask differential effects of aspects of sociosexuality (male height, 2D: 4D digit ratio and the VPT) which would not have been discovered through a unidimensional approach.

For male height, whilst there was no significant correlation between male height and sociosexuality (r= ˉ.147, N= 77, p= .213), there was a significant relationship between male height and sociosexual behaviour (r= ˉ.23, N= 80, p= .021).

For the 2D: 4D digit ratio, whilst there was no significant correlation between the 2D: 4D digit ratio and sociosexuality (r= ˉ.198, N= 77, p= .093), there was a significant relationship between the 2D: 4D digit ratio and both sociosexual

desire (*r*= ¯.32, N= 77, p= .003) and sociosexual attitude (*r*= ¯.20, N= 79, p= .040).

For the VPT, whilst there was a significant correlation between the VPT and sociosexuality (*r*= ¯.228, N= 76, p= .024), there was no significant relationship between the VPT and either sociosexual attitude (*r*= ¯.157, N= 80, p= .083) or sociosexual behaviour (*r*= ¯.019, N= 80, p= .432).

Discussion

Consistent with theory and the empirical investigations conducted by Penke and Asendorpf (2008), factor analysis of the data from 229 participants revealed the presence of three components to the revised sociosexual orientation inventory. These were, as with Penke and Asendorpf, sociosexual desire, sociosexual attitude and sociosexual behaviour. Furthermore, following oblique rotation it was shown that all variables loaded substantially and independently across the three components, with all loadings exceeding .75. This study therefore provides strong empirical support for analysis of sociosexuality via the three sub-scales discussed.

With regard to the discriminant potential of the 3-factor R-SOI, and the relationships with male height, the 2D: 4D Digit ratio, the VPT, self-perceived male and female attractiveness and self-perceived female attractiveness and cosmetic usage, it has been noted that of the six factors three (male height, the 2D: 4D Digit ratio, the VPT) showed interesting discriminant capability. These are discussed in much greater depth in their relevant chapters. Therefore, whilst a more global measure of sociosexuality (i.e. a unidimensional approach as measured by the total R-SOI) may be useful for some purposes it is clear that this revised instrument offers the opportunity for a more differentiated approach to our future understanding of sociosexuality, whether that be in evolutionary psychology, sex studies or other related disciplines.

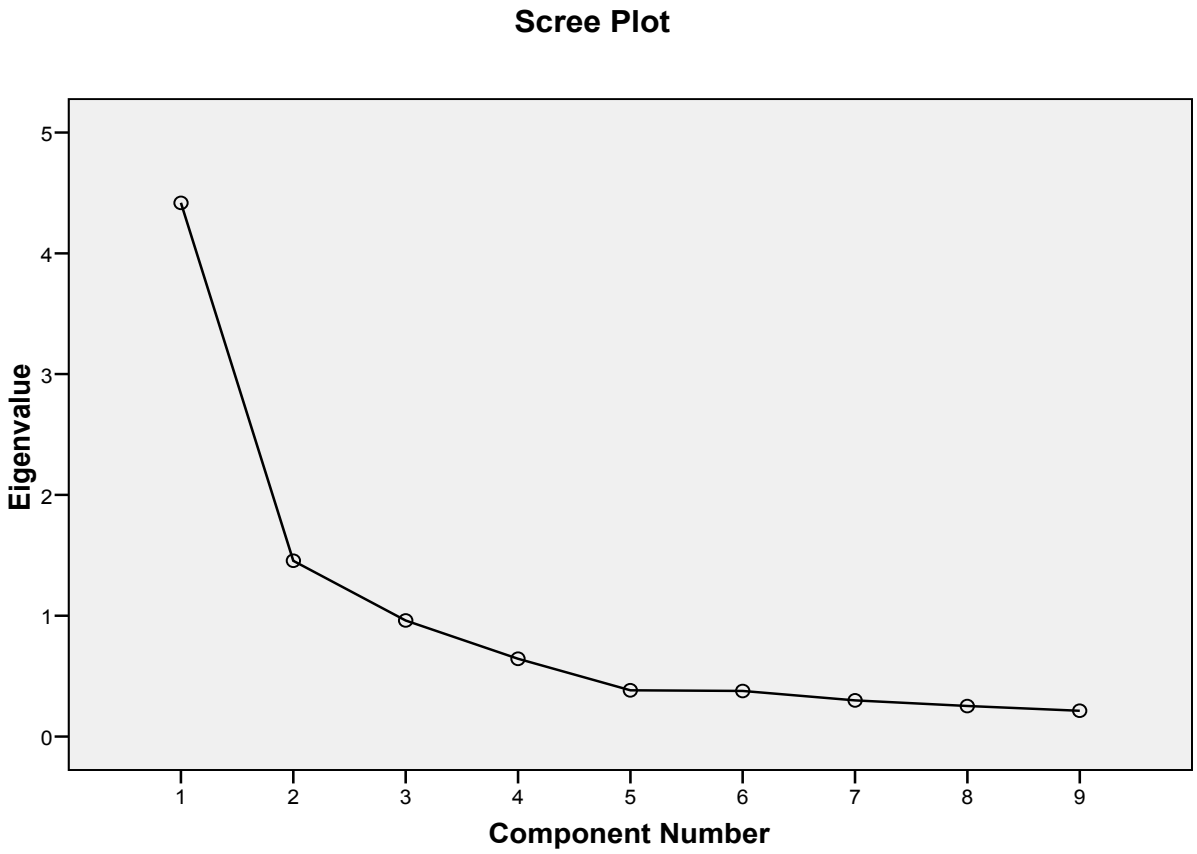
It should also be noted that running almost contemporaneously with the revision of the SOI by Penke and Asendorpf has been a further new measure devised

by Jackson and Kirkpatrick (2007). Again, through recognition of the advances made in our theoretical understanding of sociosexuality and the move from a conceptualisation of alternate to conditional mating strategies, Jackson and Kirkpatrick similarly argue that a single, bipolar continuum cannot adequately capture the pluralistic nature of sociosexuality. In recognition of this concern they devised a new scale from 25 questions (seven from the original SOI, five from the Interest in Uncommitted Sex scale by Bailey et al, 1994, a question about lifetime number of partners known to correlate with the original SOI by Ostovich and Sabini, 2004 as well as nine new items) which were subjected to principal Components Analysis. Again three factors were found, but in this case the factors were best understood as Short-term Mating Orientation (STMO), Long-term Mating Orientation (LTMO) and Previous Sexual Behaviour. Furthermore, in support of the separate measurement of STMO and LTMO, it was found that when compared to the SOI, whilst STMO was highly correlated, LTMO was only weakly correlated, indicating the primary measurement of Short-term Mating Orientation by the SOI. It was also found that there was considerable gender difference in attitudes towards casual sex, but less in attitudes towards long-term relationships, again supporting the argument for a separate attitudinal scale for long-term versus short-term mating orientation.

Due to the timing of the release of this last measure it was not possible to test the measure further in the forthcoming studies. However, as a footnote to all studies concerning sociosexuality, it would be recommended to consider the use of this new measure, as, dependant upon the research question, this may be better able to tap particular aspects of sociosexuality than the SOI, or, indeed, the R-SOI.

Appendix i (i)

Figure 19 Scree plot from Principal Components Analysis of the nine components of the R-SOI



Appendix i (ii)

Table 23 Component Matrix of the nine components of the R-SOI

Item	Component 1	Component 2	Component 3
Attitude 5	.796		-.344
Attitude 4	.788		-.444
Attitude 6	.757		-.440
Desire 7	.745	-.390	
Desire 8	.737	-.345	.384
Desire 9	.678	-.435	
Behaviour 3	.673	.558	
Behaviour 1	.499	.481	.343
Behaviour 2	.573	.657	

Extraction Method: Principal Component Analysis.
a 3 components extracted.

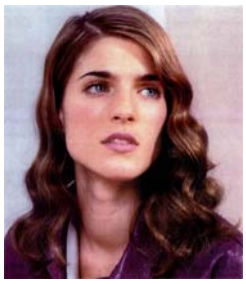
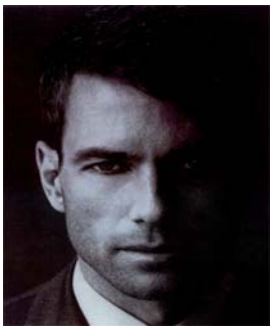
Appendix j

Physical Attractiveness Scale extracted from the Personal Attributes Survey (PAS – R); International Personality Item Pool

1	I like to look at myself in the mirror ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate	2	I have a pleasing physique. ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate
3	I attract attention from the opposite sex. ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate	4	I don't consider myself attractive ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate
5	I dislike looking at myself in the mirror ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate	6	I like to look at my body. ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate
7	I like to show off my body ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate	8	I am considered attractive by others ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate
9	I dislike looking at my body ▪ Very inaccurate ▪ Moderately inaccurate ▪ Neither inaccurate nor accurate ▪ Moderately accurate ▪ Very accurate		*Adapted from PAS – R International Personality Item Pool: A Scientific Collaboratory for the Development of Advanced Measures of Personality Traits and Other Individual Differences*

Appendix k

Figure 20 Experimental images used in V. P. T. (pp 1- 5)

Page 1		
Page 2		
Page 3		
Page 4		
Page 5		

Appendix k cont.

Experimental images used in Visual Preference Test (pp 6 - 10)

Page 6		
Page 7		
Page 8		
Page 9		
Page 10		

Full reference for Visual Preference Test:

Roney, J., Hanson, K., Durante, K. and Maestripieri , D. (2006) Reading males' faces: females' mate attractiveness judgments track males' testosterone and interest in infants *Proceedings of the Royal Society of London: B Series* 273 (1598): 2169-2175

Appendix I Forced Choice Scenario

Imagine you are 35 years old, happily married with a son of five years. You live in a reasonable three bedroomed detached house with a small garden and you drive an efficient but not exciting car. You have neither debts nor savings.

You have just heard that you have been left £100,000 by an elderly relative. Please choose one from the listed scenarios as your most likely way to invest/spend your new found wealth.

		Please tick
Scenario 1	You purchase a family saloon, take a trip to Disneyland and invest the rest in a trust fund for your son's future	
Scenario 2	You go on an amazing holiday and purchase the luxury sports car of your dreams.	
Scenario 3	You invest all of your money in a trust fund for your son's future.	
Scenario 4	You purchase a sports car and invest the rest in a savings plan.	

Appendix m (i)

Figure 21 Gender differences between the relationship between sociosexuality and self-perceived physical attractiveness

♂ $r_1 = .390$ $N_1 = 77$ $z_1 = .412$

♀ $r_2 = .073$ $N_2 = 129$ $z_2 = .075$

$$Z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1-3} + \frac{1}{N_2-3}}}$$

$$Z_{obs} = \frac{.412 - .075}{\sqrt{\frac{1}{77-3} + \frac{1}{129-3}}}$$

$$Z_{obs} = \frac{.337}{\sqrt{\frac{1}{74} + \frac{1}{126}}}$$

$$Z_{obs} = \frac{.337}{\sqrt{.0135 + .0079}}$$

$$Z_{obs} = \frac{.337}{\sqrt{.0214}}$$

$$Z_{obs} = \frac{.337}{.146}$$

$$Z_{obs} = 2.3$$

Appendix m (ii).

Figure 22 Gender differences between the relationship between sociosexual desire and self-perceived physical attractiveness

♂ $r_1 = .222$ $N_1 = 79$ $z_1 = .224$

♀ $r_2 = -.027$ $N_2 = 132$ $z_2 = .025$

$$Z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1-3} + \frac{1}{N_2-3}}}$$

$$Z_{obs} = \frac{.224 - .025}{\sqrt{\frac{1}{79-3} + \frac{1}{132-3}}}$$

$$Z_{obs} = \frac{.199}{\sqrt{\frac{1}{76} + \frac{1}{129}}}$$

$$Z_{obs} = \frac{.199}{\sqrt{.013 + .0078}}$$

$$Z_{obs} = \frac{.199}{\sqrt{.0208}}$$

$$Z_{obs} = \frac{.199}{.144}$$

$$Z_{obs} = 1.38$$

Appendix m (iii).

Figure 23 Gender differences between the relationship between sociosexual attitude and self-perceived attractiveness

♂ $r_1 = .341$ $N_1 = 81$ $z_1 = .354$

♀ $r_2 = .044$ $N_2 = 132$ $z_2 = .045$

$$Z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1-3} + \frac{1}{N_2-3}}}$$

$$Z_{obs} = \frac{.354 - .045}{\sqrt{\frac{1}{81-3} + \frac{1}{132-3}}}$$

$$Z_{obs} = \frac{.309}{\sqrt{\frac{1}{78} + \frac{1}{129}}}$$

$$Z_{obs} = \frac{.309}{\sqrt{.0128 + .00775}}$$

$$Z_{obs} = \frac{.309}{\sqrt{.02055}}$$

$$Z_{obs} = \frac{.309}{.143}$$

$$Z_{obs} = 2.16$$

Appendix m (iv).

Figure 24 Gender differences between the relationship between sociosexual behaviour and self-perceived physical attractiveness

♂ $r_1 = .295$ $N_1 = 81$ $z_1 = .304$

♀ $r_2 = .151$ $N_2 = 131$ $z_2 = .151$

$$Z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1-3} + \frac{1}{N_2-3}}}$$

$$Z_{obs} = \frac{.304 - .151}{\sqrt{\frac{1}{81-3} + \frac{1}{131-3}}}$$

$$Z_{obs} = \frac{.153}{\sqrt{\frac{1}{78} + \frac{1}{128}}}$$

$$Z_{obs} = \frac{.153}{\sqrt{.0128 + .0357}}$$

$$Z_{obs} = \frac{.153}{\sqrt{.0485}}$$

$$Z_{obs} = \frac{.153}{.220}$$

$$Z_{obs} = 0.69$$

Appendix n Cosmetics Usage Questionnaire

Please indicate your views on your current cosmetic usage by circling, on a scale from 1 – 5 (from Most agree to Most disagree), that number which you feel is closest to your opinion.

		Most agree				Most disagree
1.	I apply facial cosmetics every day	1	2	3	4	5
2.	I would not leave the house without having applied cosmetics.	1	2	3	4	5
3.	I would be happy for my friends to see me without cosmetics.	1	2	3	4	5
4.	I would be happy for work colleagues to see me without cosmetics.	1	2	3	4	5
5.	I would be happy to go to a party without cosmetics.	1	2	3	4	5
6.	I would be happy to attend an interview without wearing cosmetics.	1	2	3	4	5
7.	I believe the wearing of cosmetics makes a positive improvement to my appearance.	1	2	3	4	5
8.	I believe the wearing of cosmetics has a positive impact on my confidence	1	2	3	4	5
9.	I believe the wearing of cosmetics has a positive impact on my behaviour.	1	2	3	4	5

Appendix o Questionnaires from International Personality Item Pool

QUESTIONNAIRE A	Very inaccurate	Moderately inaccurate	Neither inaccurate nor accurate	Moderately accurate	Very accurate	
	1	2	3	4	5	
Am able to stand up for myself						4.10
Am afraid that I will do the wrong thing						1.1 4.2
Am afraid to draw attention to myself						4.4
Am comfortable in unfamiliar situations						4.8
Am easily discouraged						5.10
Am easily hurt						1.3
Am easily intimidated						4.1
Am good at making impromptu speeches						3.3
Am not bothered by difficult social settings						4.9
Am not easily bothered by things						1.9
Am not easily frustrated						5.5
Am not embarrassed easily						4.7
Am relaxed most of the time						5.4
Am skilled in handling social situations						2.3
Am the life of the party						2.4
Can’t do without the company of others						6.10
Dislike myself						5.8
Don’t let others discourage me						1.10
Don’t like to draw attention to myself						2.9 3.9
Don’t mind being the center of attention						3.2
Don’t mind eating alone						6.5
Don’t talk a lot						2.10
Don’t worry about things that have already happened						1.8
Enjoy being part of a group						6.8
Enjoy my privacy						6.7
Enjoy silence						6.6
Enjoy spending time by myself						6.3
Enjoy teamwork						6.9
Express myself easily						3.4
Feel comfortable around people						2.1 3.1
Feel comfortable with myself						5.2
Feel crushed by setbacks						1.7
Feel desperate						5.9

QUESTIONNAIRE A	Very inaccurate	Moderately inaccurate	Neither inaccurate nor accurate	Moderately accurate	Very accurate	
	1	2	3	4	5	
Feel guilty when I say “no”						1.6
Feel threatened easily						1.2
Find it difficult to approach others						4.3
Hate being the centre of attention						3.6
Have a natural talent for influencing people						3.5
Have frequent mood swings						5.6
Have little to say						2.6 3.1
Keep in the background						2.7
Know how to captivate people						2.5
Lack the talent for influencing people						3.7
Make friends easily						2.2
Often feel blue						5.7
Often feel uncomfortable around others						3.8
Only feel comfortable with friends						4.5
Prefer to do things by myself						6.2
Readily overcome setbacks						5.3
Seek quiet						6.4
Seldom feel blue						5.1
Spend time thinking about past mistakes						1.5
Stumble over my words						4.6
Want to be left alone						6.1
Worry about things						1.4
Would describe my experiences as somewhat dull						2.8
	1	2	3	4	5	

QUESTIONNAIRE B	Very inaccurate	Moderately inaccurate	Neither inaccurate nor accurate	Moderately accurate	Very accurate	
	1	2	3	4	5	
Am considered attractive by others						4.1
Am less capable than most people						1.7
Am not concerned with making a good impression						2.7
Am not highly motivated to succeed						3.10
Attract attention from the opposite sex						4.2
Believe that I am better than others						5.5
Believe that I am important						3.4
Boast about my virtues						5.9
Can't do without the company of others						6.10
Conform to others' opinions						2.2
Consider myself an average person						5.3
Dislike being the centre of attention						5.1
Dislike looking at my body						4.9
Dislike looking at myself in the mirror						4.8
Dislike myself						1.6
Dislike talking about myself						5.2
Do what others do						2.5
Don't care about dressing nicely						3.6
Don't care what others think						2.6
Don't consider myself attractive						4.7
Don't like to get dressed up						3.8
Don't mind eating alone						6.5
Enjoy being part of a group						6.8
Enjoy my privacy						6.7
Enjoy silence						6.6
Enjoy spending time by myself						6.3
Enjoy teamwork						6.9
Feel comfortable with myself						1.1
Feel it's OK that some people don't like me						2.8
Feel that I'm unable to deal with things						1.10
Feel that my life lacks direction						1.8
Get things done quickly						3.3
Have a high opinion of myself						5.7
Have a pleasant physique						4.3
	1	2	3	4	5	

QUESTIONNAIRE B	Very inaccurate	Moderately inaccurate	Neither inaccurate nor	Moderately accurate	Very accurate	
	1	2	3	4	5	
Just know that I will be a success						1.2
Keep improving myself						3.5
Keep myself well groomed						3.1
Know my strengths						1.5
Know that I am not a special person						3.7
Know the answers to many questions						5.8
Like to look at my body						4.4
Like to look at myself in the mirror						4.5
Like to show off my body						4.6
Like to take responsibility for making decisions						1.4
Like to tidy up						3.2
Make myself the centre of attention						5.10
Need the approval of others						2.3
Pay no attention to my appearance						3.9
Prefer to do things by myself						6.2
Question my ability to do my work properly						1.9
Seek quiet						6.4
Seldom feel blue						1.3
Seldom toot my own horn						5.4
Think highly of myself						5.6
Want to amount to something special in others' eyes						2.4
Want to be different from others						2.10
Want to be left alone						6.1
Want to form my own opinions						2.9
Worry what people think of me						2.1
	1	2	3	4	5	

QUESTIONNAIRE C	Very inaccurate	Moderately inaccurate	Neither inaccurate nor accurate	Moderately accurate	Very accurate	
	1	2	3	4	5	
Am able to fit into any situation						4.1
Am good at sensing what others are thinking						4.5
Am not interested in many things						2.3
Am not interested in abstract ideas						1.6 3.6
Am not interested in theoretical ideas						1.9 3.9
Avoid difficult reading material						2.9 3.1
Avoid philosophical discussions						1.8 3.7
Believe in the importance of art						1.1
Can handle a lot of information						3.4
Do not enjoy going to art museums						2.6
Do not like art						2.7
Do not like concerts						2.1
Do not like poetry						1.1
Enjoy discussing movies and books with friends						1.4
Enjoy examining myself and my life						1.3
Enjoy thinking about things						3.5
Find political discussions interesting						2.2
Get along well with people I have just met						4.4
Have a rich vocabulary						1.2 3.3
Have difficulty understanding abstract ideas						3.8
Have the ability to make others feel good						4.2
Know what makes others tick						4.3
Know what to say to make people feel better						4.6
Like to solve complex problems						3.1
Love to learn new things						2.4
Love to read challenging material						2.1 3.2
Prefer to stick with things that I know						2.8
Try to avoid complex people						1.7
Try to examine myself objectively						1.5
Want to increase my knowledge						2.5
	1	2	3	4	5	

Full reference for International Personality Item Pool (2001):

International Personality Item Pool (2001)A Scientific Collaboratory for the Development of Advanced Measures of Personality Traits and Other Individual Differences (http://ipip.ori.org/). Internet Web Site.

Appendix p

Table 24 Summary of Standardised Multiple Regression Analysis for personality variables predicting Cosmetic Usage

Trait	*B*	*SE B*	β	*t*	Sig.
Emotional Stability	-.316	.353	-0.168	-0.895	.380
Self-Esteem	-.529	.298	-0.354	-1.778	.089
Conformity	.224	.313	0.153	0.715	.482
Anxiety	-.298	.305	-0.225	-0.978	.339
Social Confidence	-.155	.379	-0.096	-0.408	.687
Physical Attractiveness	-.499	.286	-0.323	-1.743	.095
Self-Presentation	2.302	.700	0.569	3.287	.003*

*p<.05

Appendix q

List of Journal Publications and Conferences

Chapter 12:

Robertson, J., Fieldman, G. and Hussey, T. (2007) “Who wears Cosmetics?” Individual Differences and their Relationship with Cosmetic Usage. *Individual Differences Research* 6 (1): 38-56

Chapter 12:

Robertson, J., Fieldman, G. and Hussey, T. (2007)” Who wears Cosmetics?” Individual Differences and their Relationship with Cosmetic Usage. *In: the 19th Annual Meeting of the Human Behaviour and Evolution Society, Virginia. Available from: http://www.hbes.com/HBES/abst2007.pdf*

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