THE PSYCHOLOGY OF FEMALE CHOICE IN THE CONTEXT OF DONOR INSEMINATION

By

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ABSTRACT

Donor insemination is the most common type of assisted reproductive technology that healthy women use to achieve pregnancy. An increasing proportion of these women are single and their choices of sperm donors are likely to reflect criteria other than those of matching donor attributes to marital-type partners. I present work done to examine how women choose sperm donors. In the first paper, women's preferences for hypothetical sperm donors were compared to those for men in other potentially reproductive contexts, specifically long-term mates and extra-pair partners (i.e., sexual partners other than primary mates). As might be anticipated, there was heavy emphasis on health and physical attributes, but women were surprisingly concerned with the sperm donor's "good character", even though they believed that these character attributes were not genetically transmissible. These results suggested that women who assessed attributes in donors used some of the decision-making processes that are normally associated with long-term mate choice. In the second paper, women's preferences for hypothetical sperm donors and long-term mates were examined in a Norwegian sample of women to test the generality of the previous results. The Norwegians' preferences were remarkably similar to those of the Canadian women, and again suggested that women's preferences for sperm donors were influenced by their mate choice criteria. In the third paper, clinical and experimental work was reviewed that suggested that information and choices should be made available to women who use donor insemination. The literature on donor insemination remains devoid, however, of information on how women choose donors in clinical settings. In the final paper, we examined how both single women and women with partners chose sperm

donors in a clinical setting, by identifying information that predicted their choices. As found in earlier experiments, women used information about health, and there was some evidence that they used information related to desirable attributes in mates. These results were then compared to information that predicted experimental subjects' hypothetical choices of donors. Findings from this comparison suggested that these subjects used some of the same criteria as the donor insemination clients, and that results obtained in experimental studies of mate and donor selection can provide insight into women's choices of sperm donors.

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Introduction

The aim of this dissertation was to examine the psychology of women's choices in the context of the contemporary practice of donor insemination. The first goal was to examine how women select sperm donors. That is, I wanted to identify the information that women thought was important and that they used to select donors. The second goal was to examine whether women's choices reflected those made in other potentially reproductive contexts such as mate choice. Women's preferences for a donor might be similar to those for a mate because, throughout our evolutionary history, reproduction and mate choice were inseparable. That is, it is plausible that the attributes that a woman would find attractive in someone whose offspring she would carry would be related to her mate preferences. Additionally, as women's choices in either context would affect offspring condition and future reproductive options, it was likely that women would have some of the same criteria for a donor as they did for a long-term mate. These two goals were addressed in both experimental and clinical contexts. By examining these questions in both contexts, I found support for the idea that information obtained in experimental settings with undergraduate subjects can provide insight into women's choices at a fertility clinic.

I begin with a brief overview of the practice of donor insemination and describe the type of information that is available to recipients. I then introduce studies done to address how women choose hypothetical sperm donors in an experimental setting and how these choices compare to women's mate choice criteria. These studies are presented in detail in chapters 2 and 3. I also introduce studies of women's choices of sperm donors at a fertility clinic. These later studies

were done after an extensive review of the clinical literature uncovered little factual information about women's choices in the context of donor insemination, suggesting that an analysis of their choices was needed. The review of this literature is presented in detail in chapter 4, and includes an integration of the earlier experimental work (i.e., chapters 2 and 3) with the few clinical results that existed about choice in the context of donor insemination. The analyses of choices made by donor insemination recipients are presented in detail in chapter 5.

The Practice of Donor Insemination

The most common solution for infertile couples is insemination with sperm from a donor (Stephens et al., 1993; Office of Technology Assessment (OTA), 1988). In addition to these couples, single women and lesbian couples are gaining access to donor insemination services. Donor insemination (D.I.) is an old technique, dating back to at least 1793, but it has only become widely practiced during the past few decades (Achilles, 1992; Shapiro et al., 1990). It is also potentially the simplest and most effective form of the assisted reproductive technologies.

In most cases, the sperm donor is anonymous. Typically, only limited non-identifying information about the donor is available to the woman, including the donor's physical characteristics (e.g., hair, eye and skin colour, and height), ethnicity, and some medical and educational background. Often, women have no say in the choice of the donor; a physician or nurse makes the choice, that is usually based on the donor's physical similarity to the woman's marital partner (Stephens et al., 1993; OTA, 1988). However, an increasing proportion of women, including those without marital partners, are now making their own choices of sperm donors, and the basis of their choices has yet to be established.

Some Canadian D.I. programs are beginning to offer women more choice and are willing to give detailed information about a donor while maintaining his anonymity. Many clinics and sperm banks in the United States already do so. In these cases, donor information can include religion, occupation, interests, hobbies, special talents, and the donor's stated willingness to release his identity when D.I. offspring reach 18 years of age. Some D.I. programs also provide detailed descriptions of the donors' personalities and medical backgrounds (including family health history), as well as portrait sketches of the donors, while still maintaining their anonymity.

Although more donor information is now available to women, it is not clear how this information influences their choices. The goal of the experiments reported in chapter 2 was to identify the information that was important to women when choosing hypothetical sperm donors, and to examine whether they used any of the decision-making processes normally associated with the psychology of mate choice. I expected that women would value attributes that they believed would affect a resultant child, like a donor's health and perhaps his physical features. However, what was less clear was whether women would value other attributes found to be important in mate choice, such as traits indicative of a good companion and potential parent. Women's preferences for a donor might be similar to those for a mate since, throughout human history, reproduction and mate choice were inseparable. Alternatively, if women felt that attributes relevant to being a good companion and/or parent would not be passed on to the resultant child, then these attributes might not play a role in donor selection.

Women's preferences were first examined in an experimental setting with the use of hypothetical scenarios. Undergraduate women rated the importance of attributes in a sperm donor, a long-term mate or extra-pair partner (i.e., a sexual

partner other than one's primary mate). When their preferences were compared, two consistent findings emerged: 1) attributes that women believed were likely to be passed on from a donor to a child, such as health and physical attributes, were significantly more important in a sperm donor than in a long-term mate; and 2) attributes indicative of a male's character were rated as unlikely to affect a resultant child and yet were rated as very important in the selection of both a sperm donor and a long-term mate. The similarity between women's preferences for donors and for long-term mates suggested that women's mate choice criteria may have played a role in their preferences for sperm donors.

To test the generality of the Canadian subjects' choice criteria for sperm donors and long-term mates, a similar study was conducted with a sample of Norwegian women (reported in chapter 3). The results of that study were in general agreement with the Canadian experiments. Norwegian women reported that attributes likely to affect resultant children were more important in sperm donors than in long-term mates, while character was equally important in either context.

While chapters 2 and 3 examined women's choice criteria in experimental settings by assessing their preferences for hypothetical sperm donors and mates, the final chapters examined women's choices of sperm donors in clinical settings.

Chapter 4 integrated the experimental work with results from the few clinical studies that have examined whether D.I. recipients want information about sperm donors and the type of information they are interested in.

Chapter 5 examined how single women and women with partners (marital and de facto) chose sperm donors at a fertility clinic. Information used by the single women at the clinic provided the most insights. Although the information that was made available to D.I. recipients was quite limited relative to that provided in the previous experimental studies, several similarities were observed. As in the

earlier experiments, single recipients used information about the donors' health. There was also a similarity between recipients' choices based on donor height and women's preferences for mates of similar height (ideal height in mates is reviewed in Ellis, 1992). Unlike the earlier sperm donor experiments that used hypothetical scenarios, there was little evidence that the clinic recipients used character information in their choices of donors, perhaps because there was limited information that described the donors' character.

Information that predicted choices made by the single women at the clinic was then compared to that which predicted hypothetical choices made by undergraduate subjects, when these subjects were provided with the same donor catalogues as used by the recipients. To a certain extent, there were similarities in the donor attributes that predicted choices made by the actual recipients and the undergraduate women. In addition, character information did not appear to predict choices made by the undergraduate women. These findings suggest that differences between women's choice criteria in this study and those of women in the previous experiments may have been due to the limited information available to women when they made their choices of sperm donors.

Sperm Donor Selection and the Psychology of Female Mate Choice

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Women's preferences for hypothetical sperm donors were compared to preferences for long-term mates (Experiment 1) and to those for long-term mates and extra-pair copulatory (EPC) partners (Experiment 2). In Experiment 1, attributes believed likely to affect a resultant child were significantly more important in a donor than in a long-term mate. "Character," which was the most important factor in a mate, was the second most important factor after "health" in a donor, despite the belief that character had little likelihood of affecting a resultant child. These results suggest that women were partly relying on the psychology used to choose a long-term mate when they assessed attributes in a sperm donor. An additional construct ("resource potential") was introduced in Experiment 2, as well as an additional test condition (EPC). As with character, resource potential was believed to have little likelihood of affecting a resultant child, yet it was rated as moderately important to have in a donor, further supporting the hypothesis that women were partly relying on a mate choice psychology. Results did not provide support for the existence of an EPC psychology distinct from that used to select a long-term mate.

KEY WORDS: Female mate choice; Evolutionary psychology; Sperm donor.

In many species, post-zygotic investment in offspring is greater in females than in males. In humans for example, a woman is obliged to a substantial investment, such as nine-month pregnancy and postpartum lactation and care, should she become pregnant from mating. A male, alternatively, can sometimes get away with providing as little energetic effort as an ejaculate. This asymmetry in parental investment and the large potential cost associated with an ill-chosen mate creates a strong selection pressure on females to be discriminating with respect to when and with whom they mate (Trivers 1972; Daly and Wilson 1983). Accordingly, Symons (1979) proposed

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that women possess a specialized psychology, which functions to solve the problem of choosing a mate. A specialized psychology that aided a woman in responding only to those mates that would increase her reproductive success, would be selectively favored.

Trivers (1972) hypothesized that females would value specific attributes in their mates, such as the ability and willingness to invest time, energy, and provisions in offspring, which would increase the probability of successful reproduction. Additionally, where males compete for high standing within a group, high rank is also associated with greater fitness, as these males will have a greater probability of successfully competing for females. Thus females that preferred and mated with high status males would have an increased probability of having sons that were also reproductively successful (Trivers, p.170; Symons 1979, p.191). Dominance is likely to be closely associated with a male's ability to attain both status and resources (Ellis 1992; Kenrick and Keefe 1992). Women who preferred dominant, high status males, and their children might also benefit from both increased access to resources and protection from potentially harmful conspecifics, incentives that a low status male might not be able to offer (Ellis, p.274). Symons proposed that preferences such as these would form the ultimate basis of a specialized psychology for mate choice.

Evidence from pre-industrial societies suggests that women prefer men who have the most resources to offer. The Kipsigis, traditionally Nilotic pastoralists, are now settled as agro-pastoralists in south western Kenya. Borgerhoff Mulder (1990) found that among a group of these settlers, men who offered more acres of land per wife were preferred by women (and their parents) as husbands. Women's reproductive success was also found to correlate positively with this same measure of wealth (Borgerhoff Mulder 1987). This suggests that women can benefit reproductively from such a preference.

Among the Ache of Paraguay, Hill and Kaplan (1988) found similar results. Until recently (1970s), the Ache were nomadic hunter-gatherers. While living in the forest (representative of their traditional life as foragers), food acquired by the men is shared equally among the group. Women are dependent on the men, as almost all the food consumed is provided by them. Although this food is equally shared, children of better hunters have significantly greater survivorship. Hill and Kaplan suggest that this could be due to better treatment of the hunters' wives and children by members of the foraging group in order to keep these men in the group. They suggest that the increased survivorship might also be due to a heritable tendency toward better health in these hunters and their children. These men are also named as extra-pair partners and illegitimate fathers more often than less capable hunters. This suggests that women prefer and can benefit from choosing men that are better able to provide resources.

A number of studies in North America have directly questioned women about their preferences for a mate. Buss and Barnes (1986) found that some of the characteristics valued most in a mate by a sample of married couples were

considerate, honest, affectionate, dependable, intelligent, kind, and understanding, most or all of which are attributes that are likely to be indicative of a good companion (p.568) and might also be cues of useful parental abilities. Women also preferred that their spouses be fond of children, ambitious, career-oriented and have a good earning capacity; these are possible cues to a male's ability to acquire resources, as well as the willingness to invest them in offspring. Similar mate selection criteria have emerged in several other studies (e.g., Buss 1989; Buss and Schmitt 1993; Kenrick et al. 1990; Sadalla et al. 1987).

Townsend (1989) addressed one of Trivers's predictions with a somewhat different approach. He questioned whether attraction to men with high earning power was affected by women's decreased access to resources and would thus be attenuated in those women with potential for high socioeconomic status (SES) (e.g., female medical students). He found no reduction: women still preferred mates with equal or greater SES in comparison to themselves. Additionally, these women became even more discriminating in that their pool of acceptable mates shrunk with their own increasing SES.

Another factor that may influence females' mate selection criteria is the temporal duration of the liaison. A female will not directly benefit from a mate with good parenting abilities if he is not going to stick around. However, this may not be a problem if she already has a primary mate, supplying the paternal care. Although there is the significant cost of possible abandonment or physical harm caused by an enraged primary mate with decreased paternity certainty, it is possible that in past environments females benefited from extra-pair copulations (EPC). Physiological evidence suggests that polyandrous matings were a strong selection pressure on males in the evolutionary past: human males have moderately large testes (relative to body size) compared to other primates, suggesting that sperm competition was a selective force in human evolution (Harcourt et al. 1981). Smith (1984) proposed a list of possible benefits to an ancestral female who mated with one or more males other than her primary mate. The most obvious benefit would be the immediate acquisition of material resources (e.g., food) which would reduce a woman's risk of predation and time and energy associated with foraging. Additionally, an extra-pair male might also be more protective of (or at least less dangerous to) the woman and her offspring (potentially his), than of women with whom he had not copulated. More indirect benefits a woman might gain include the following: high quality genes that would increase offspring chance of successful survival; "sexy son" genes that would increase a son's chances of reproductive success through the same genes that gave his father the competitive edge; genetic diversity as an "evolutionary hedge" against an unpredictable environment; and fertility back up. Consequently if a female engages in an EPC, it is likely that her criteria will be slightly different than those used to assess a potential long-term mate. It is possible that attributes associated with parenting and companionship will decrease in importance, whereas those that increase the chances of producing reproductively viable offspring (through immediate resource acquisition and "good genes") will figure more prominently. One other

important factor should influence a female's choice of an EPC partner. The benefits listed above are associated with a woman who already has a primary mate, presumably from whom she and her offspring receive resources and care and with whom she may want to remain. She should therefore value an extra-pair male who will neither be harmful to her nor threaten the primary mateship.

Surprisingly little research has attempted to test whether women actually possess a set of criteria (i.e., a specialized psychology) for the context of an EPC. Kenrick et al. (1990) and Buss and Schmitt (1993) have investigated both female and male preferences for short-term mateships. However, an EPC differs somewhat from the short-term context in that an EPC implies you already have a long-term mate, whereas a "short-term mating" does not. Hill and Kaplan (1988) found that Ache women prefer better hunters as extra-pair partners. This preference could result in access to higher quality gametes. Recent work by Baker and Bellis (1993) suggests that the timing of a woman's orgasm can influence the outcome of sperm competition in polyandrous contexts, possibly in favor of extra-pair males. Such a mechanism would provide support for the benefits of engaging in an EPC.

Another related but evolutionary novel context is that of artificial insemination by donor. This is a potentially useful context in which to study female choice because of the similarities and differences of choice of sperm donor to mate choice. Given that decisions in both contexts often result in pregnancy and large maternal investment, similarities in responses between the contexts may reveal some of the cues that can activate mate choice decision mechanisms. Additionally, an alternative approach, such as questioning women about their preferences for a sperm donor, may circumvent certain problems associated with the traditional methodology. Much of the research has focused on directly questioning women about their preferences for a mate, which produces results consistent with Trivers's (1972) and Symons's (1979) predictions. However, it is possible that women's stated preferences may not reflect their mate choices, as the decisions upon which they make these choices are not necessarily conscious or articulate, and social desirability biases are likely to intrude (Ellis 1992). Utilizing an alternative approach in which one would expect similar responses to the aspects of donor choice that are shared with mate choice, but produced in a context which is less likely to be affected by the demand characteristics of a mate choice questionnaire, may provide convergent evidence about both Trivers' and Symons's predictions.

It has been estimated that 10% to 15% of couples in the United States experience infertility (Staub and Lipshultz 1990). The frequency of infertility in Canada is yet unknown (Achilles 1992). Therapeutic donor insemination (TDI) is the most commonly offered assisted fertility treatment (Achilles; Stephens et al. 1993), and has been in practice since the late 1800s, although it has only become widespread in the last twenty years (Shapiro et al. 1990). Literature has not addressed the question of what attributes recipient couples or

single females would want in a donor, but instead focuses on more technical aspects.

Mahlstedt and Probasco (1991) emphasize the importance of taking a more active role in choosing a sperm donor. They suggest that people would prefer to make well-informed decisions about a behavior that would require great investment if a child is produced. Some American clinics have recognized the demand for descriptive (non-identifying) information about the donors, which would allow patients more choice (Achilles 1992). If fertility clinics offer patients information about available donors, it is in the form of a list of attributes or a brief description. This can provide a somewhat controlled medium in which one might be able to identify those features that are repeatedly preferred. Exactly what attributes women value in their sperm donor has yet to be determined.

As no specific psychology for choosing a sperm donor is expected to have evolved, one might expect women to select a sperm donor as a result of the activation of one of two possible sorts of psychological mechanisms:

1. Relying on more domain general reasoning abilities, women might value only those attributes that they believe to be genetically transmittable; or
2. Women's preferences for a donor might correspond to evolved mate choice preferences. Given the importance of mate choice and its similarity to donor choice, mate preferences may generalize to related contexts like donor selection.

Two experiments were conducted in order to investigate what assessment mechanisms, if any, women would use to aid them in choosing a sperm donor. In the first experiment, using a between-subjects design, subjects assessed what attributes were important to have in a donor or in a long-term mate. Preferences between groups were then compared. The second experiment was conducted in order to examine whether preferences for donors were reflective of women's preferences for an EPC partner, as the EPC context is similar to fertilization by donor in that one often gets gametes and nothing more. Again using a between-subjects design, subjects assessed what attributes were important to have in a donor, a long-term mate or an EPC partner. Preferences were then compared across conditions.

EXPERIMENT 1

Previous literature (e.g., Buss and Barnes 1986; Buss and Schmitt 1993; Townsend 1989; Kenrick et al. 1990) suggests that women have a specialized psychology for choosing their mates. Specific attributes such as kindness, understanding, intelligence, good health, and the potential to acquire resources are highly desirable in potential mates. In order to compare women's preferences for mates to those for sperm donors, a questionnaire was constructed using items from previous studies (Buss and Barnes 1986; Buss and Schmitt

1993) and items used by physicians and patients to choose sperm donors (e.g., health-related items and physical attributes). When compiled, questions could be conceptually divided into five groups (though no formal analysis was performed at the time to verify this): physical attributes, health, abilities, character, and resource-accruing potential.

As women might value only those traits in a donor that they believe to have a strong genetic component, subjects' heritability beliefs were also assessed.

METHOD

Subjects

One hundred nineteen female subjects participated in the experiment for an undergraduate psychology course credit. Their ages ranged from 19 to 45 years with a median age of 21. Sixty subjects (mean age: 23.5 ± 6.6 years) assessed attributes in a sperm donor, whereas 59 subjects (mean age: 23.9 ± 6.3 years) considered attributes in a husband/mate (both labels were used, and were by implication synonymous in this version of the questionnaire). All subjects were heterosexual. Seventy-eight percent of subjects were single, 14% had children, 3% had known fertility problems, and 6% had previously considered using TDI. Groups did not differ significantly with respect to age, marital status or parity ($p > .36$ in all cases).

Design and Procedure

Each subject completed a three-part questionnaire, which consisted of a number of demographic questions, a donor or mate choice assessment section, and questions concerning the "heritability" of the donor or mate attributes. A between-subjects design was used in order to avoid order effects. All subjects answered identical non-identifying demographic questions about such factors as age and sexual orientation. In the second part, one group of subjects (N=60) answered questions about their preferences in a sperm donor after reading the following:

> Imagine that you are at a fertility clinic because you would like to become pregnant and you do not have a mate. A donor, from whom sperm will be taken, will be chosen according to your specifications. This clinic protects the anonymity of each donor in order to guarantee that he will not be contacted by the recipient and/or her potential offspring.

Another group (N = 59) considered questions about their preferences in a long-term mate after reading the following:

> Imagine that you are at a dating service. A male, who will eventually become your husband, will be chosen according to your specifications.

The questionnaires were otherwise identical except where the word "donor" was replaced with "mate."

Subjects were then instructed to "rate how important each (of several attributes) is to you in selecting a donor (or mate)." A modified five-point Likert rating scale, ranging from very important to not important at all, was used. Descriptors were included on either end of the scale to increase clarity. Fifteen of the attributes were from Buss and Barnes (1986) and Buss and Schmitt (1993): affectionate, ambitious, athletic, charming, considerate, creative, dependable, easy-going, handsome, honest, humorous, intelligent, kind, self-confident, and understanding. Items that physicians and patients commonly use to select a donor were also included: eye color, hair color, height, and (information about) health background and familial health history. Musical talent was added to the category of abilities, and family longevity record was added to health-related items.

In the last section of the questionnaire, subjects were asked to rate the "heritability" of the same attributes they had previously assessed for "importance." "Heritability" was defined as "biologically inherited, that is, transmitted from parent to child via one's genes." The technical, biological definition of the word was not intended. A modified five-point Likert rating scale was used again, ranging from "highly heritable" to "not heritable at all."

The two versions of the questionnaire were randomly distributed in a classroom setting with the experiment present. Anonymity was emphasized by the experimenter and guaranteed by the lack of identification questions.

RESULTS AND DISCUSSION

Factor Analysis

Factor analyses were performed in order to reduce the number of items for comparison and to increase the interpretability of the results (Tabachnick and Fidell 1989).

A principal components analysis was performed using varimax rotation to orthogonal factors. To increase reliability, the analysis was performed on data pooled across Experiment 1 and a second experiment that will be more fully described later. The second experiment included many of the same items, addressed to a different group of subjects, and only those items that were common to both studies were used for the principal components analysis. A similar analysis was performed on subjects' "heritability" scores to ensure that each item loaded highly on the same factor across analyses. Four factors emerged from analyses of both the "importance" and the "heritability" ratings, using Cattell's scree test (Norman and Streiner 1993) corresponding to and thus confirming the constructs of physical, health, abilities, and character. Several items (namely athletic, charming, easy-going, and humorous) were subsequently dropped due to loading highly on different or multiple factors across analyses. Table 1 presents the factor structure from the analysis of the "importance" ratings. The internal consistency (Cronbach's alpha) for each factor was as follows: character 0.89; health 0.81; physical 0.73; and abilities

Table 1. Orthogonal Factor Structure from Principal Components Analysis Displaying Constituent Variables and Their Loadings

FACTOR 1: Character (.25)		FACTOR 3: Physical (.09)	
kind	.888	hair color	.760
understanding	.844	handsome	.700
dependable	.811	eye color	.673
considerate	.807	height	.634
affectionate	.767		
honest	.699	FACTOR 4: Abilities (.07)	
self confident	.574	creative	.791
		musical talent	.633
FACTOR 2: Health (.17)		intelligent	.455
family health history	.841		
family longevity record	.771		
health background	.634		

Note: Numbers in parentheses represent proportion of variance in the variables' importance ratings accounted for by each factor.

0.56. All subsequent comparisons were made using subjects' four-factor scores (instead of 22-item scores). Scores were obtained by summing each item's rating in a factor and dividing by the total number of items that comprised that factor (Wainer 1976; Streiner personal communication).

In order to reduce the familywise error rate, a significance level of .01 was used instead of a significance level of .05.

Preferences for Sperm Donor and Long-term Mate Attributes

Figure 1 presents a comparison of the mean importance ratings for the four factors given by the donor and mate groups.[1] The factors ranked from most to least important when selecting a sperm donor were health, character, abilities, and physical attributes. Character was the most important factor in a long-term mate, followed by abilities, health, and physical factors.

The donor group rated three of the four factors significantly more important than the mate group: health, $t(115) = -13.54$, $p = .0001$; physical attributes, $t(116) = -3.47$, $p = .0007$; and abilities, $t(116) = -4.79$, $p = .0001$. The character factor was rated as significantly more important by the mate group than by the donor group ($t(117) = 3.31$, $p = .0012$).

Heritability ratings given by the two groups were also compared. One would expect that these ratings would be independent of experimental condition. However subjects did complete importance assessments before rating the items' heritability and it is possible that the framing of task (i.e., donor vs. mate) would affect the heritability ratings. In fact this did not appear to be a problem. No significant differences were found: character ($\bar{X}_{donor} = 2.11$; $\bar{X}_{mate} = 1.75$), $t(117) = -2.51$; health ($\bar{X}_{donor} = 4.14$; $\bar{X}_{mate} = 3.97$), $t(117) = -1.45$; physical attributes ($\bar{X}_{donor} = 4.69$; $\bar{X}_{mate} = 4.69$), $t(117) = -.01$; and abilities ($\bar{X}_{donor} = 3.37$; $\bar{X}_{mate} = 3.35$), $t(117) = -.20$. Subjects' heritability ratings were then averaged and a mean heritability rating was calculated for each factor (see Figure 1).

[1]For comparisons at the level of individual items see Appendix A.

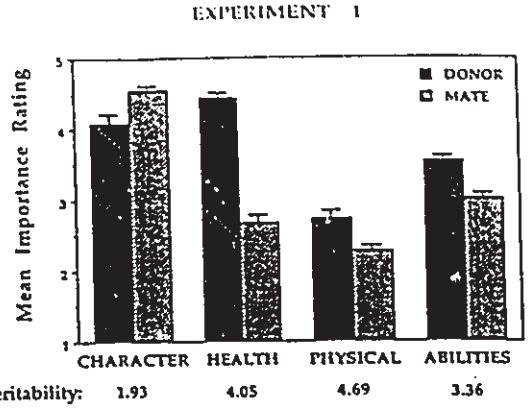

FIGURE 1. Comparison of mean importance ratings for factors in a sperm donor and a long-term mate where 1 = not important at all; 3 = moderately important; 5 = very important. Error bars indicate SE. Mean heritability ratings listed below each factor where 1 = not heritable at all; 3 = moderately heritable; 5 = highly heritable.

Factors that were believed to be moderately to highly heritable (abilities, health, and physical attributes) were significantly more important to the donor group than to the mate group. These results suggest that subjects in the donor group were able to keep a sperm donor in mind when rating the importance of different attributes, as they valued the factors that they believed likely to affect a resultant child.

Subjects in the mate group rated character as the most important factor and valued it more than did the donor group. This result is consistent with previous studies (e.g., Buss and Barnes 1986; Buss and Schmitt 1993; Kenrick et al. 1990) as the character factor consisted of attributes that subjects in these studies have identified as important in a long-term mate.

Character was given the lowest heritability rating, suggesting that subjects believed the factor had little probability of being "transmitted from (the male) to (the) child via one's genes." It is not surprising that character need not have a heritable component to be valued in a long-term mate, but character was also rated as being important when selecting a sperm donor, from whom one would receive only gametes. In fact it was the second most important factor after health. Subjects appeared to understand the task of assessing a donor, as they rated health, physical and abilities factors more important than subjects who selected a mate. The fact that character retained considerable importance in donor selection, suggests that subjects may have been partly relying on the psychology used to choose a long-term mate when they assessed attributes in a sperm donor.

EXPERIMENT 2

Results of the first experiment suggest that women possess a specialized psychology which functions to solve the problem of choosing a mate, and that

subjects' responses to the evolutionarily novel task of selecting a sperm donor were partly but not entirely reflective of this. The second experiment served to investigate this further. In order to test the reliability of the results of the previous experiment, donor and long-term mate conditions were again compared. A number of resource-related items were added to the questionnaires to provide an additional test of the hypothesis that subjects' preferences for a donor were partly reflective of a mate choice psychology. It has been previously demonstrated that resource-related attributes are important in female mate choice (e.g., Buss and Barnes 1986; Townsend 1989). If subjects who assessed a donor were partly relying on a specialized psychology for long-term mate choice, then resource-related items, which are important when selecting a mate, should be similarly valued when selecting a donor.

Experiment 2 was also designed to further explore the meaning of women's donor selection criteria. Donor preferences in Experiment 1 were similar, but not identical, to those for a long-term mate. It is possible that preferences for a donor reflect adaptation to some other naturally occurring context. Specifically, the EPC context is similar to fertilization by sperm donor in that one often gets gametes and nothing more. The EPC context is not evolutionarily novel and there may be substantial benefits as well as costs associated with it. Thus it is possible that adaptations for assessment of men in an EPC context exist in the form of preferences distinct from those for a long-term mate and that it was these preferences that were evoked by the sperm donor scenario. In order to investigate this, the criteria important when selecting an extra-pair partner were assessed and compared to those valued by women selecting a sperm donor and women selecting a long-term mate.

METHOD

Subjects

Eighty-eight female subjects participated in the experiment for an undergraduate psychology course credit. Their ages ranged from 20 to 47 years with a median age of 22.

Subjects completed one of three versions of the questionnaire: 28 subjects (mean age: 22.8 $\pm$ 5.0 years) assessed attributes in a sperm donor, 30 (mean age: 22.7 $\pm$ 2.7 years) considered attributes in a long-term mate, and 30 (mean age: 23.8 $\pm$ 5.5 years) assessed attributes in an EPC partner. All subjects were heterosexual. Ninety-one percent of subjects were single, 6% had children, 3% had known fertility problems, and 6% had previously considered using TDI. Groups did not differ with respect to age, marital status or parity ($p > .10$ in all cases).

Design and Procedure

The design and procedure were the same as those of the previous experiment with the additional experimental condition of an extra-pair partner. Five new

resource-related attributes were added (industrious, professional degree, sophisticated, spends money freely, well-off financially), as ambitious was the only resource-related item in Experiment 1. The donor and mate groups received the same instructions as in Experiment 1. The EPC group was given the following to consider:

> Imagine that you are in a long-term committed relationship (e.g., marriage). You are away on a business trip and will be spending a few days in a strange city by yourself. If you possibly can, imagine that you have a brief affair. You are not likely to ever see this man again. How would you choose this man?

Subjects were then required to rate the importance of each attribute when selecting an extra-pair partner. The three versions of the questionnaire and the procedure were otherwise identical except where the appropriate labels, "a man for the weekend," "donor," and "mate," were required.

RESULTS AND DISCUSSION

Resource Construct

As a factor analysis could not be performed on Experiment 2 (due to sample size), an informal construct was formed using the resource items in order to be able to include these in subsequent analyses. The internal consistency using Cronbach's alpha was 0.72, which was similar to those found for the factors. A "resource potential" score was calculated for each subject, by averaging across scores on the six items relevant to resources.

Preferences for Sperm Donor, Long-term Mate, and EPC Partner Attributes

Figure 2 presents the mean importance ratings for each factor given by the donor, mate and EPC groups and the mean heritability ratings for each factor.[2] Comparing only the donor and mate conditions for Experiment 2, the pattern of results replicated those of Experiment 1. Items that subjects believed were likely to affect a resultant child, such as those represented by the health and physical factors, were significantly more important to women who assessed attributes in a donor than to women in the mate group (see Figure 2). Within the mate condition, character was again the most important factor to have in a long-term mate. Within the donor condition, consistent with Experiment 1, health was the most important factor followed by character, which still retained considerable importance when women assessed attributes in a sperm donor.

The most important factor to have in an EPC partner was character (see Figure 2). Abilities, resource potential, health and physical factors were of much less importance to women who assessed attributes in an extra-pair partner.

[2]For comparisons at the level of individual items see Appendix B.

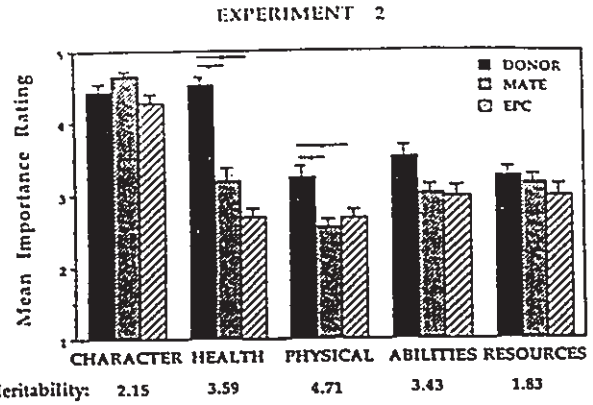

FIGURE 2. Comparison of mean importance ratings for factors in a sperm donor, long-term mate and an extra-pair partner, (where indicated: $p \leq .001$ for differences among groups; post-hoc pairwise comparisons significant at .01), where 1 = not important at all; 3 = moderately important; 5 = very important. Error bars indicate SE. Mean heritability ratings listed below each factor where 1 = not heritable at all; 3 = moderately heritable; 5 = high heritable.

Comparison of Preferences for Sperm Donor, Long-term Mate and EPC Partner Attributes

Analyses of variance were performed on the factor scores to compare preferences for attributes in a sperm donor, long-term mate and EPC partner (see Figure 2). A significant difference was found among the groups for the importance of health ($F(2,85) = 44.90$, $p = .0001$) and physical factors ($F(2,85) = 8.01$, $p = .0006$). Subsequent pairwise comparisons (Tukey tests) revealed that subjects in the donor condition valued both these factors significantly more than subjects in either the long-term mate or EPC conditions (all $p < .01$), but the differences between the latter two groups for these two factors were not significant.

The mean importance rating for character was slightly greater for the long-term mate group than for either the donor group (direction consistent with Experiment 1) or the EPC group, but the difference was not significant ($F(2,84) = 3.46$). Although the direction of the difference between the importance of abilities in a donor and a mate was replicated across experiments, the difference among conditions (and between a donor and a mate) was not significant ($F(2,84) = 4.80$). No difference was found among conditions for resource potential ($F(2,84) = 1.19$).

Results did not support the hypothesis that preferences for a sperm donor might reflect those for an extra-pair partner. Little difference existed between ratings given by women in the long-term mate group and those given by women in the EPC group. Additionally, the difference in the importance of health among the three groups suggests that preferences for an extra-pair

partner, in comparison to preferences for a mate, were even more different from preferences for a donor.

Heritability ratings given by the three groups were also compared. No differences were found: character ($\overline{X}_{donor}$ = 2.30; $\overline{X}_{mate}$ = 2.12; = $\overline{X}_{EPC}$ 2.04), $F(2,85) < 1$; health ($\overline{X}_{donor}$ = 3.82; $\overline{X}_{mate}$ = 3.53; $\overline{X}_{EPC}$ = 3.43), $F(2,85) < 1$; physical attributes ($\overline{X}_{donor}$ = 4.78; $\overline{X}_{mate}$ = $\overline{X}_{EPC}$ = 4.71), $F(2,85) < 1$; abilities ($\overline{X}_{donor}$ = 3.60; $\overline{X}_{mate}$ = 3.30; $\overline{X}_{EPC}$ = 3.41), $F(2,85) < 1$; and resource potential ($\overline{X}_{donor}$ = 1.82; $\overline{X}_{mate}$ = 1.81; $\overline{X}_{EPC}$ = 1.86), $F(2,85) < 1$. Hence, heritability ratings were averaged across conditions and a mean score was calculated for each factor (see Figure 2).

Of all the factors, physical attributes and health were again rated as the most likely to be "transmitted from the parent to the child via one's genes." As in Experiment 1, they were also significantly more important when selecting a donor than when selecting either a mate or an extra-pair partner. This again suggests that subjects were able to keep the sperm donor task in mind when rating the importance of different attributes.

Subjects rated resource potential as the least heritable of all factors. Nevertheless, no difference emerged between the importance of resource potential in the donor and mate groups. Although the ability to invest in offspring through access to resources is quite important when choosing a long-term mate, it is unlikely that this would be important when assessing a sperm donor from whom one would receive gametes and nothing else. However, this finding would be expected if subjects who assessed a donor were partly relying on the psychology for long-term mate choice.

GENERAL DISCUSSION

Factors believed to be moderately to highly "heritable" were more important to women in the donor group than to women in the mate group. Further comparison revealed however that character, which was rated as having little chance of being "transmitted from parent to child via one's genes," was very important when assessing a donor, as well as when assessing a mate. This similarity in responses suggests that subjects who assessed attributes in a sperm donor may have relied on the psychology used in mate choice, at least in part.

These results were replicated in the second experiment. Health and physical attributes were again significantly more important to women in the donor group than to women in the mate group. Character was again the most important attribute to have in a long-term mate, but this factor again retained considerable importance in a sperm donor too. Additionally, no difference was found between the importance of resource potential in a long-term mate and in a sperm donor, even though resource potential was rated as having little chance of affecting a resultant child. This result, in addition to the consistent importance of character, regardless of type of male assessed, provides further support

for the possibility that a mate choice psychology was accessed when attributes were assessed in a sperm donor.

One might argue that the preference for good character and perhaps resource potential in a donor reflects a general tendency to dispense benefits to those who deserve them and to see the opportunity to father one's child as a benefit. However, it is unlikely that this generalized response would have such an influence as to make character of equal or greater importance than the attributes one believed would be transmitted to, and thus influence the well being of, the resultant child. Another possibility is that preference for good character and resource potential in a donor may reflect a woman's desire for those attributes in her child. If it is very important to have good character in one's child and the factor is believed to have a small chance of being "biologically transmitted" to the child, then the importance of character in a donor would be a product of these influences. However good health, which is very important to have in a child and is believed to have a great chance of being "transmitted" to the child, would be expected to have far greater importance than character when selecting a donor. In fact, health was only slightly more important than character in both experiments.

The results of the second experiment provided little support for the existence of a separate psychology for the context of EPC partner selection. No significant differences were found between the importance ratings for factors in a long-term mate an in an extra-pair partner. It is possible that modifications to the scenario used in the EPC condition might elicit differences between preferences for a long-term mate and an extra-pair partner. In the present study, the EPC scenario was designed to maximize the differences between the contexts of choosing a long-term mate and an extra-pair partner. For example, the possibility of assessing the EPC partner as a replacement for one's present mate was eliminated, as one was "unlikely to ever see this man again," whereas the functional significance of an EPC as an alternative source of gametes was retained. A scenario might be used which more closely resembled an ancestral environment, such as having an EPC with someone living in the same village. This however might decrease the possibilities of finding differences between preferences for a long-term mate and an extra-pair partner as mate replacement would now become possible. An additional change to the EPC scenario might elicit responses more like those for a sperm donor and less like those for a long-term mate. Emphasizing the possibility of pregnancy in the EPC condition might increase the importance ratings for attributes likely to affect a resultant child.

In the present study, preferences for a sperm donor were used to investigate mate selection criteria. An alternate approach might be to investigate the effects of fluctuating asymmetry on long term mate and EPC partner selection. If a better source of gametes is one possible function of engaging in an EPC, then phenotypic quality as evidenced through developmental stability and parasite resistance should be very important in this context. Fluctuating asymmetry, or random deviations from ideally symmetrical, bilateral characters, is thought to be the result of an individual's reduced ability to withstand develop-

mental perturbations (Thornhill and Gangestad 1993). Facial attractiveness ratings of men have been found to negatively correlate with an index of fluctuating asymmetry (Gangestad et al. in press), where attractiveness is proposed to be an indicator of heritable fitness (Gangestad 1993). In contexts where the likelihood of receiving parental investment is low, such as in some cases of an EPC, heritable pathogen resistance and developmental stability should be highly valued, as this would enhance offspring viability (Hamilton and Zuk 1982). Thus physical attractiveness might be expected to be highly valued in an extra-pair partner (Gangestad 1993). Additionally in environments of high pathogen prevalence, pathogen resistance and phenotypic quality should be highly valued in any type of mate—extra-pair or not. Gangestad and Buss (1993) found a positive relationship between the importance of physical attractiveness in a mate and the prevalence of pathogens across 29 societies. A study that could provide cues of fluctuating asymmetry (such as through the use of photographs) might provide an alternative way of investigating the psychology for extra-pair partner and long-term mate selection.

Much research suggests that an evolved psychology exists to solve the problem of choosing a mate (e.g., Buss 1989, Buss and Barnes 1986; Kenrick et al. 1990; Symons 1979; Townsend 1989). Previous studies found that many of the items that constituted the character factor (e.g., kindness, dependable) were important when selecting a long-term mate (e.g., Buss and Barnes 1986; Kenrick et al. 1990). Consistent with this, character was highly valued in a long-term mate across experiments. Additionally, character was also very important when assessing attributes in a sperm donor. Historically, choosing a mate and producing offspring have been inseparable for women (except perhaps in the case of an EPC). When subjects were given the task of choosing a donor, women valued donor attributes that were most likely to affect a resultant child, but they also valued attributes that only would be useful if the male were to help with subsequent child rearing, such as in a long-term mateship. This similarity to long-term mate preferences suggests that subjects who selected a sperm donor may have used assessment mechanisms similar to those used to choose a long-term mate. Thus it is possible that women partly relied on the psychology used for mate choice when attributes were assessed in a sperm donor.

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Appendix A. Comparison of mean importance ratings for a sperm donor and a long-term mate for factors and their constituent items where 1 = not important at all; 3 = moderately important; 5 = very important.

	Donor $\bar{X}$ (SE)	Mate $\bar{X}$ (SE)	t	p
Character	4.10 (.12)	4.55 (.06)	3.31	.0012
kind	4.13 (.14)	4.56 (.11)	2.38	.0189
understanding	4.02 (.15)	4.61 (.09)	3.39	.0010
dependable	4.10 (.15)	4.48 (.12)	1.98	.0496
considerate	4.12 (.15)	4.64 (.07)	3.25	.0015
affectionate	3.97 (.13)	4.42 (.10)	2.84	.0054
honest	4.36 (.13)	4.95 (.03)	4.50	.0001
self confident	4.03 (.14)	4.19 (.11)	.87	.3885
Health	4.44 (.06)	2.67 (.12)	−13.54	.0001
family health history	4.75 (.07)	2.51 (.16)	−13.03	.0001
family longevity record	3.67 (.13)	1.85 (.14)	−9.51	.0001
health background	4.92 (.04)	3.62 (.17)	−7.73	.0001
Physical	2.73 (.10)	2.27 (.08)	−3.47	.0007
hair color	2.05 (.13)	1.64 (.12)	−2.18	.0313
handsome	3.58 (.12)	3.24 (.12)	−2.07	.0406
eye color	2.02 (.14)	1.35 (.09)	−3.90	.0002
height	3.27 (.12)	2.84 (.14)	−2.33	.0216
Abilities	3.54 (.07)	3.01 (.09)	−4.79	.0001
creative	3.48 (.10)	2.92 (.14)	−3.39	.0009
musical talent	2.47 (.14)	1.72 (.13)	−3.92	.0001
intelligent	4.67 (.07)	4.38 (.12)	−2.09	.0393

Note: Factors are presented in bold followed by the individual items. When considering these results, a more stringent significance level than .05 should be used as multiple comparisons were carried out.

Appendix B. Comparison of mean importance ratings for a sperm donor, a long-term mate and an extra-pair partner for factors and their constituent items where 1 = not important at all; 3 = moderately important; 5 = very important.

	Donor $\bar{X}$ (SE)	Mate $\bar{X}$ (SE)	E.P.C. $\bar{X}$ (SE)	F	p
Character	4.45 (.11)	4.66 (.06)	4.27 (.13)	3.46	.0359
kind	4.43 (.14)	4.73 (.08)	4.40 (.17)	1.88	.1590
understanding	4.32 (.13)	4.67 (.09)	4.24 (.18)	2.88	.0619
dependable	4.50 (.16)	4.73 (.08)	3.72 (.24)	9.44	.0002
considerate	4.50 (.12)	4.80 (.07)	4.62 (.14)	1.82	.1685
affectionate	4.54 (.15)	4.60 (.11)	4.45 (.18)	.27	.7649
honest	4.58 (.15)	4.97 (.03)	4.14 (.22)	7.68	.0009
self confident	4.25 (.16)	4.10 (.13)	4.31 (.17)	.52	.5971
Health	4.54 (.10)	3.19 (.19)	2.68 (.12)	44.90	.0001
family health history	4.75 (.13)	3.07 (.22)	2.30 (.21)	41.11	.0001
family longevity record	3.86 (.23)	2.47 (.22)	1.47 (.13)	36.71	.0001
health background	5.00 (.00)	4.03 (.21)	4.27 (.17)	9.88	.0001
Physical	3.24 (.16)	2.54 (.11)	2.67 (.12)	8.01	.0006
hair color	2.93 (.25)	1.93 (.19)	1.93 (.20)	7.20	.0013
handsome	4.04 (.17)	3.47 (.16)	3.93 (.17)	3.36	.0394
eye color	2.50 (.24)	1.57 (.17)	1.67 (.20)	6.21	.0030
height	3.50 (.19)	3.20 (.12)	3.17 (.17)	1.28	.2825
Abilities	3.52 (.15)	3.01 (.12)	2.97 (.15)	4.80	.0106
creative	3.57 (.18)	3.10 (.19)	3.07 (.23)	1.87	.1607
musical talent	2.43 (.25)	1.67 (.15)	1.69 (.17)	5.01	.0088
intelligent	4.57 (.12)	4.27 (.15)	4.14 (.20)	1.90	.1556
Resources	3.26 (.12)	3.16 (.11)	2.97 (.16)	1.19	.3100
ambitious	4.00 (.16)	4.37 (.11)	3.41 (.22)	8.15	.0006
industrious	3.63 (.18)	3.20 (.18)	2.93 (.23)	3.19	.0463
professional degree	3.61 (.20)	3.07 (.27)	2.35 (.21)	7.45	.0010
sophisticated	3.14 (.23)	3.10 (.22)	3.47 (.17)	.96	.3858
spends money freely	2.21 (.18)	2.27 (.17)	2.79 (.21)	2.85	.0635
well off financially	2.96 (.20)	2.93 (.20)	2.87 (.22)	.06	.9435

Note: Factors are presented in bold followed by the individual items. When considering these results, a more stringent significance level than .05 should be used as multiple comparisons were carried out.

A Norwegian Note on "Sperm Donor Selection and the Psychology of Female Mate Choice"

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One way to investigate the evolved psychology of female mate choice is to compare women's preferences for a long-term mate to those for a sperm donor (Scheib 1994). Artificial insemination by sperm donor is an evolutionarily novel but related context to that of mate choice, in that the function of both contexts is offspring production. Choice of a long-term mate and choice of a sperm donor will also have similar impacts on offspring condition and a woman's future reproductive options. Given this, one would expect similar responses to those aspects of the sperm donor context that are shared with mate choice. These responses may reveal some of the cues women pay attention to in mate choice while the actual choices are made in the more controlled setting of selection of sperm donor.

This approach to the characterization of the psychology for female mate choice was tested in two Canadian samples of women in an experimental setting (see Scheib 1994 for details). Here we report the results from a Norwegian sample that tests the generality of the Canadian results. In the original experiments, Scheib found that women were able to imagine assessing a sperm donor, as they valued attributes they believed were likely to affect a resultant child significantly more than the women imaging a long-term mate. One would expect women to similarly value the attributes affecting a child in long-term mates as in sperm donors, however their importance in sperm donors might be expected to be even more pronounced, which it turns out they were. Interestingly, women highly valued information about a man's character, whether he was a sperm donor or a mate, even though these women rated character as unlikely to affect a resultant child. Good character was expected to be important in a mate, in that he could make a good co-operator in shared interests, such as offspring well-being, and he might also be less threatening or harmful to the woman - an important consideration as mateships are not always harmonious (see Wilson and Daly 1996; Lancaster 1991). But it was less clear

why character would be so important in a sperm donor, from whom one would get gametes and nothing else. Scheib suggested that this great concern with character in not only a long-term mate, but also a sperm donor, might have been the result of women using some of the decision making processes that are normally associated with long-term mate choice in the context of sperm donor selection.

It is possible that these results were limited to the Canadian sample and that they would not generalize to women in other countries. Alternatively, if women's preferences for sperm donors are influenced by their mate choice criteria, and these criteria are thought to be part of psychological adaptations to decisions faced by women throughout evolutionary history, then women in other cultures should also show this overlap between their mate preferences and sperm donor preferences. In order to test this, we examined Norwegian women's preferences for sperm donors and long-term mates and compared them to those of the Canadian subjects. Norway has a population of approximately 4 million and has state-assisted medical care and child care (Barne og Familiedepartementet 1994). Trondheim, where the study took place, is a major port city 400 km north of Oslo. Norway is similar to Canada in many respects, but the availability of child care assistance may make it easier for women to have and successfully rear children alone. Therefore, it is also possible that attributes useful in a long-term mateship, such as a mate's good character, may be relatively less important to Norwegian women in selecting a sperm donor.

The Sample

Forty-four undergraduate women volunteered to be subjects at the University of Trondheim. All women were born in Norway (43) or Sweden (1) and spoke Norwegian as their first language. Ages ranged from 20 to 29 years with a

median of 24. Twenty-three women (mean age ± SD: 23.6 ± 2.1 years) assessed attributes in choice of a hypothetical sperm donor, while 21 (23.9 ± 2.2 years) assessed attributes in a hypothetical husband/mate. All women professed to be heterosexual. Sixty-four percent of the women were single. Seven percent had children. The two groups did not differ significantly with respect to age, marital status or parity. The Norwegian women were similar to the Canadian women in education, mean age, sexual orientation, and parity, although there were fewer single Norwegians (64% vs 91%).

Procedure

The experiment was described as an "international study of women's preferences for men in different contexts." Each subject received an English-language questionnaire identical to that used in Scheib's (1994) experiment 2 and a Norwegian-English translation sheet for reference. (Most text books used by Norwegian university students are English-language.) Both versions included non-identifying demographic questions, instructions to think about choosing either a sperm donor or a long-term mate and then rate the importance of attributes in the target man, and a final section in which subjects rated the "heritability" of each attribute, where heritability was defined as "biologically inherited, transmitted from parent to child via one's genes." All subjects answered demographic questions first and rated the "heritability" of the attributes last. Anonymity was emphasized. A significance level of .01 was used for all statistical comparisons between the two groups to minimize problems associated with multiple comparisons.

Comparison Of Norwegian Women's Preferences For A Sperm Donor And A Long-Term Mate

Figure 1(a) presents a comparison of the mean importance ratings for the five factors in a hypothetical sperm donor and long-term mate. Health and character were the most important factors to have in a sperm donor, followed by abilities, physical attributes and resource potential. Character was the most important factor to have in a long-term mate, followed by abilities, resource potential, physical attributes and health.

Women rated health as significantly more important in a sperm donor than in a long-term mate ($(\bar{X}_{donor} = 3.78; \bar{X}_{mate} = 2.41)$, $t(42) = 4.51$, $p = .0001$). Abilities and physical attributes also tended to be more important in a sperm donor than in a long-term mate, although not significantly so (abilities $(\bar{X}_{donor} = 3.67; \bar{X}_{mate} = 3.30)$, $t(42) = 1.74$; physical attributes $(\bar{X}_{donor} = 2.76; \bar{X}_{mate} = 2.49)$, $t(42) = 1.36$). A mate's character tended to be more important to women than a sperm donor's character, although the difference was not significant $((\bar{X}_{donor} = 3.83; \bar{X}_{mate} = 4.11)$, $t(42) = -1.51$). No difference was found in women's preferences for resource potential in a sperm donor or long-term mate $((\bar{X}_{donor} = 2.63; \bar{X}_{mate} = 2.69)$, $t(42) = -.29$).

"Heritability" ratings were also compared between groups, to test whether women in the two experimental conditions had different beliefs about the "heritability" of attributes. This did not appear to be so. No significant differences were found between the groups with respect to (1) character $(\bar{X}_{donor} = 1.96; \bar{X}_{mate} = 2.07, t(42) = -.47)$; (2) health $(\bar{X}_{donor} = 3.48; \bar{X}_{mate} = 3.67, t(42) = -.94)$; (3) physical attributes $(\bar{X}_{donor} = 4.47; \bar{X}_{mate} = 4.41, t(42) = .35)$; (4) abilities $(\bar{X}_{donor} = 3.54; \bar{X}_{mate} = 3.73, t(42) = -1.23)$; or (5) resource potential $(\bar{X}_{donor} = 1.60; \bar{X}_{mate} = 1.78, t(42) = -1.01)$. Subjects' "heritability" ratings were then averaged and a mean "heritability" rating was calculated for each factor (see Figure 1(a)).

Insert Figure 1 about here

Conclusions From The Norwegian Comparisons

Factors women believed were moderately to highly "heritable", such as health and physical attributes, tended to be more important in a sperm donor than in a long-term mate. The direction of these differences suggests that women who assessed attributes in a sperm donor understood the experimental task, since they valued attributes they believed were likely to affect a resultant child more than did the women in the long-term mate condition. Women who assessed attributes in a long-term mate valued his character above all other factors, which is consistent with findings from other countries (e.g., Buss's (1989) study of 37 societies). The importance of a long-term mate's character is not surprising given that one would have to interact with this man, unlike in the context of donor insemination. However, Norwegian women who assessed attributes in a sperm donor also valued character, and it was as important as the donor's health. This was so despite subjects' beliefs that character had a low probability of being "inherited" by a resultant child. This suggests that women used some of the same criteria in their assessment of a sperm donor as the women who assessed a long-term mate. Images of reproduction through a sperm donor seem to elicit some of the same decision-rules as those for mate choice, perhaps because mate choice and reproduction were inseparable until the development of modern medical technologies. These results also suggest that a man's character is a fundamental aspect of mate choice psychology since the importance of character persisted into the functionally similar context of choice of sperm donor.

Norwegian-Canadian Comparisons and Conclusions

The Norwegian pattern of choices replicated that of the Canadian women (see Figure 1(b)). In both countries, women reported remarkably similar beliefs about attributes likely to affect a resultant child, including health and physical attributes, and valued them more in a hypothetical sperm donor than in a long-term mate. Norwegian and Canadian women also reported similar preferences for a long-term mate and valued his character above all other factors. The replication in Norway of the finding that Canadian women placed great value on a sperm donor's character suggests some cross-cultural generality in the role of decision making processes associated with long-term mate choice in the context of choosing a sperm donor.

Women's mate preferences are also expected to vary contingent on an individual's circumstances and life experiences (for examples on the relationship between mate selection criteria and local pathogen loads see Low 1988; Gangestad and Buss 1993). Given that Norwegian women have ready access to medical and child care, it was possible that the women might have attributed less importance to cues of reliability and commitment in potential mates and subsequently in sperm donors. The Norwegian women did in fact give lower importance ratings to a long-term mate's character and resources than did the Canadian women. However, in general, they rated all the factors slightly lower and it is more likely that these rating differences were a product of using the scales differently in the two countries. As the overall pattern of results from Canada were replicated in Norway, it is likely that the most informative comparisons are between the groups within each country, rather than comparisons of absolute ratings between the countries.

Between-group comparisons within the Norwegian sample revealed that women were able to imagine choosing a sperm donor as were the Canadian

women. Moreover, the result that character retained considerable importance in a sperm donor regardless of the belief that this factor would not be "inherited" by the child was found in both Canada and Norway. In agreement with the Canadian results, character was considered important in both long-term mate and donor selection, lending further support to the proposition that a specialized psychology for mate choice persisted in the context of sperm donor selection.

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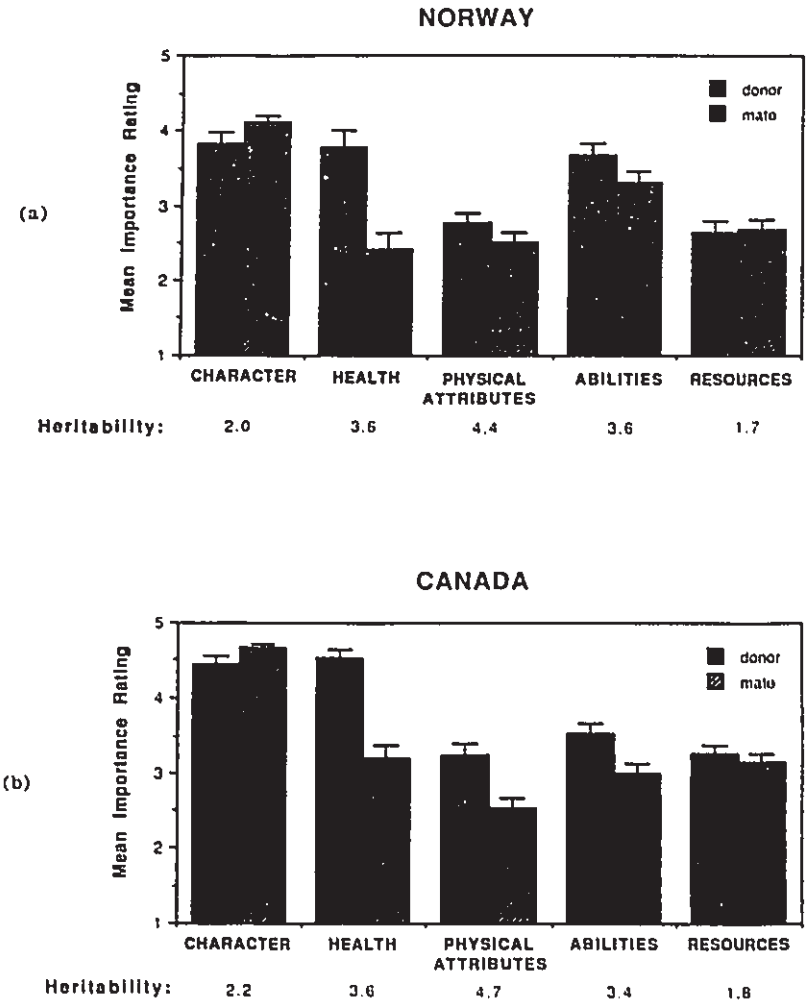

Figure 1. Comparison of the mean importance ratings for factors* in a sperm donor and a long-term mate in Norway (a) and Canada (b), where 1 = not important at all; 3 = moderately important; 5 = very important. Error bars indicate SE. Mean "heritability" ratings listed below each factor where 1 = not heritable at all; 3 = moderately heritable; 5 = highly heritable.

*Factors produced in Scheib (1994): character (comprised of the attributes kind, understanding, dependable, considerate, affectionate, honest, and self-confident); health (i.e., family health history, family longevity record, and health background); physical attributes (i.e., hair colour, handsome, eye colour, and height); abilities (i.e., creative, musical talent, and intelligent); and resource potential (i.e., ambitious, industrious, professional degree, sophisticated, spends money freely, and financially well-off).

Note: Figure 1(b) is adapted from "Sperm donor selection and the psychology of female mate choice" by J.E. Scheib, 1994, Ethology and Sociobiology, 15, p. 124. Copyright 1994 by Elsevier Science Inc.

Female Choice in the Context of Donor Insemination

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Female mate choice began to receive extensive scientific attention with the emergence of sociobiology, even though the study of animal behaviour had existed for centuries. Evolution-minded research on female choice thrived because of Trivers's (1972) focus on the role of parental investment in mate choice, and perhaps too because of a changing culture that included the feminist revolution (for reviews see Andersson 1994; Batten 1992; Buss 1994; Cronin 1991).

A Darwinian analysis of adaptive problems, such as choosing the "optimal" mate, entails the characterization of contingent responsiveness of the female to attributes of males and to other factors such as the female's alternative reproductive options. For example, a female who preferred the attribute of health in a potential mate would outreproduce females who did not have this preference, if healthiness conferred a selective advantage to the young. Over many generations, the preference for cues of health would become a part of the evolved psychology for female mate choice. Those individuals with psychological systems that lead to greater reproductive success will have been favoured by natural selection, resulting in a species-typical (sex-typical and life-stage typical) evolved psychology (Ellis 1992). This focus on the mental processes or mechanisms of behaviour, which uses evolutionary biology as the theoretical framework, is called evolutionary psychology (e.g., Barkow et al. 1992). Psychological systems of interest are those that evolved to solve problems consistently encountered in past environments in which selection occurred (see Wilson et al. this volume). Mate choice is one of these problems.

Psychology of Female Mate Choice

In many species, especially mammals, investment in offspring is often greater for females than for males. This asymmetry in parental investment and the large potential cost associated with an ill chosen mate creates a strong selection

pressure on females to be discriminating with respect to when and with whom they mate (Trivers 1972; Daly and Wilson 1983). Accordingly, in Homo sapiens, Symons (1979) proposed that women have a specialized psychology to solve the problem of choosing a mate. A psychology that aided a woman in selectively responding to potential mates with attributes that would increase her reproductive success would be maintained by natural selection. Since women make a large investment in each offspring, and the children benefit from paternal care (Lancaster 1991), the female sexual psychology is expected to include the preference for a male's ability and willingness to invest in her offspring (Symons 1979; Trivers 1972).

Male parental investment includes the allocation of material resources reliably directed at a woman and her offspring. In non-state societies women prefer men who have the most material resources to offer, and generally the women's children are more likely to be healthy and survive better if provided for by fathers with above average resources. Among the Kipsigis of Kenya, who are horticulturalists, men who offered more acres of land per wife were preferred as husbands by women (and their parents, as the Kipsigis practice "arranged" marriages) (Borgerhoff Mulder 1990). Among the Ache of Paraguay, who until recently were hunter-gatherers, better hunters were more often named as extra-pair lovers and illegitimate fathers than poor hunters. Moreover, children of better hunters were more likely to survive to adulthood than children of poor hunters (Hill and Kaplan 1988). Among villagers of Grande Anse in Trinidad, many of whom live by fishing and cultivation, women expressed a preference for wealthier males and these males did have greater reproductive success through a greater number of mates (Flinn 1986). Thus in a variety of traditional societies women exhibit preferences for attributes in mates that are likely to aid them reproductively (for a

review see Betzig 1988).

In societies like those of Europe and North America, women also appear to value cues of material and social success in potential husbands (e.g., Buss 1989; Buss and Barnes 1986; Landolt et al. 1995; Pérusse 1993; Sadalla et al. 1987; Townsend 1989), as revealed in data on income, job status and women's preferences. Women prefer that their spouses be ambitious, career-oriented and have a good earning capacity (Buss 1989), and men who meet these criteria tend to have greater mating success than men who don't (Pérusse 1993). Although women appear to value good economic prospects or material resources of a mate much more than men do in a wife, there are several attributes that both men and women value similarly. In general, both women and men value characteristics in a long-term mate, such as kindness, dependability and intelligence, that are likely to be indicative of a good companion (Buss and Barnes 1986). They also prefer that their mates be attractive and that they show fondness for children. These diverse criteria for selecting a long-term mate have been identified in a variety of studies (e.g., Buss 1989; Buss and Schmitt 1993; Kenrick et al. 1990).

Many of these studies utilize research protocols that rely solely on self-report data. While it may be the case that women are correct in identifying the attributes that underlie their mate choices, it is also very plausible that they do not have conscious access to all the factors that influence their particular decisions (Ellis 1992; Nisbett and Wilson 1977). Although self-report data may be limited by this, the preferences revealed by this method are often consistent with those from other behavioural measures. For example, Landolt et al. (1995) showed subjects pictures of hypothetical sexual partners and measured preference by time spent viewing the pictures, as well as by using self-report; the two methods produced similar results. Moreover, those results were also consistent with previous self-report studies (e.g.,

Buss and Schmitt 1993). Additionally, data from non-state societies, such as Ache women's preferences for good hunters as their sexual partners, provide a valuable validity check on mate choice experiments in general and are consistent with North American women's preferences (as reported above).

While valuing material and social resources in a mate has obvious benefits for women and their offspring, the utility of physical attractiveness in a mate has not always been clear. Recent Darwinian analyses of physical attractiveness with respect to "fluctuating asymmetry" theory suggest some answers. Bilateral symmetry is thought to be a marker of phenotypic quality as evidenced through developmental stability and parasite resistance (Thornhill and Gangestad 1993). High phenotypic quality is valuable in a mate as it can affect both offspring viability and the mate's ability to invest in offspring (Gangestad 1993). Women wouldn't necessarily report valuing phenotypic quality, but they do value one of its markers, attractiveness (e.g., Buss and Barnes 1986). Gangestad et al. (1994) have found that facial attractiveness in men is indeed predicted by the degree of symmetry in a male's body. Self-reports of valuing attractiveness in sexual partners was quite useful in identifying further directions for mate choice research.

Another context in which to investigate the characteristics of an evolved psychology for female mate choice is in the contemporary practice of donor insemination. Choice of a long-term mate and choice of a sperm donor share important similarities with respect to the man's genetic contribution to offspring. As women's choices in either context will affect offspring condition and future reproductive options, it is likely that women will have some of the same preferences for a donor as they do for a long-term mate. These similarities in preferences can be assumed to reveal some of the basic cues women normally attend to in long-term mate choice. An important benefit of analysing women's preferences for sperm

donors is that a male's genetic impacts on offspring can be isolated and investigated separately from other factors important in mate choice, such as his parental investment and companionship. In addition, a woman's choice of sperm donors is less constrained than in mate choice: what a woman prefers in a sperm donor can be exactly what she gets, whereas in long-term mateships the choices of one sex are constrained by the other's preferences and choices.

Donor Insemination

Infertility affects approximately 600 000 Canadians (Royal Commission on New Reproductive Technologies 1993, p. 188). This represents 8% of heterosexual couples who have lived together for at least one year, do not use any form of birth control and have not become pregnant. This estimate is very similar to the 7.9% estimate for the United States (Mosher and Pratt 1990, p. 5). The most common solution for infertile couples is assisted insemination with sperm from a donor (Stephens et al. 1993; Office of Technology Assessment (OTA) 1988). In addition to these couples, some women who do not have a male partner, such as single women and lesbian couples, use donor insemination (DI). DI is an old technique, dating back to at least 1793, but it has only become widely practiced during the past few decades (Achilles 1992; Shapiro et al. 1990). It is also potentially the simplest and most effective form of assisted reproduction: a medical practitioner or the recipient's partner places sperm in the upper vagina around the estimated time of ovulation. DI is not a cure for the male's infertility, but a replacement for it, and recipients are clients more than patients. However the medical establishment refers to recipients as patients and often calls donor insemination "therapeutic donor insemination".

In DI, sperm from an anonymous donor is usually used. Typically, only limited non-identifying information about the donor is available to the woman,

including the donor's physical characteristics (e.g., hair, eye and skin colour and height), ethnicity and some medical and educational background. Often however, women have no say in the choice of the donor; rather a physician or nurse makes the choice, usually on the basis of the donor's physical similarity to the woman's partner (Stephens et al. 1993; OTA 1988). In the case of heterosexual recipient-couples, matching can serve to mask the male's infertility (Daniels and Taylor 1993), by increasing the probability that a resultant child will resemble him. The child's resemblance may also enhance the man's inclination to accept the child as his own (Scheib and Daly 1996). Daniels and Taylor (1993) argued that minimal information about donors has become the practice because of the perceived need for secrecy: anonymity for the benefit of the donor and secrecy about the recipient-couple's infertility. Anonymity serves to minimize contact and possible obligations between the donor and recipients (Achilles 1993), which was thought to be necessary to find men willing to act as donors (Robinson et al. 1991). This practice also has the effect of relieving medical personnel of the task of collecting and providing recipients with extensive information, even though anonymity could still be maintained while making information available (see below). The need for secrecy, however, is now under question. Recent studies suggest that many donors are willing to remain in programs without the guarantee of anonymity (e.g., Mahlstedt and Probasco 1991; Purdie et al. 1992) and couples are starting to be more open about their use of DI (Daniels and Taylor 1993).

Given the decreased importance of secrecy, it is surprising that women are still not given much control or choice in their DI process. In the cases of single women or lesbian couples who use DI, (only about 40 per cent of programs in Canada would consider these women as possible recipients; Stephens et al. 1993), secrecy is often not a concern as there is no need to hide male infertility and DI is

often preferred to using a known donor with his own set of demands. Women (and men in the case of heterosexual recipient-couples) may very well be interested in a great deal of information about a donor in order to make more informed decisions and be content with them, especially as these decisions have lifelong ramifications of having and raising a child (Brewaeys et al. 1993; Mahlstedt and Probasco 1991). Moreover, if women's mate choices affect maternal investment by their impacts on the condition of offspring and by a sense of having chosen wisely and autonomously, then restricting information and choice about donors may deprive the women of the optimal psychological conditions for the pregnancy and subsequent care of the child.

Perhaps in response to women's demands, some Canadian DI programs are beginning to offer women more choice and are willing to give detailed information about a donor while maintaining his anonymity (e.g., those associated with ReproMed, Ltd.). Many clinics and sperm banks in the United States already do these things (e.g., Mattes 1994, Appendix A). In these cases, donor information can include religion, occupation, interests, hobbies, special talents, and the donor's stated willingness to release his identity when DI offspring reach 18 years of age (Achilles 1992; OTA 1988). When women express interest, a DI program might also provide detailed descriptions of the donors' personalities and medical backgrounds (including family health history), as well as portrait sketches of the donors while still maintaining their anonymity.

Even though DI programs are increasingly offering women more information about donors, few studies have addressed whether women in fact want information about their donors, what they want to know about them, how they would choose them, or what detrimental effects a lack of information may have. The results of Klock's and Maier's (1991) study of psychological factors related to

DI suggest that heterosexual couples do indeed want information about their donors. In a sample of 35 couples, recipients were primarily concerned with information about a donor's medical and genetic background, and with the future child's physical and personality resemblance to the recipient's partner. Purdie et al. (1992) addressed the question of what recipients wanted to know about their donors: women and men of 53 heterosexual couples independently listed the most important things they wanted to know about the donor should a pregnancy result, both for themselves and for potential offspring. Recipients wanted information that would "describe [the donor] as a person" (p. 28), such as his interests, physical attributes and family background. Medical history was also important, but was not the most important consideration perhaps because medical and genetic screening occurs before men can even become donors.

Only anecdotal information exists on the effects of withholding information about donors. Achilles (1992) and Mattes (1994) noted that a lack of information about the donor can lead to preoccupation and fantasizing about him, perhaps as part of fulfilling a need to make the pregnancy a less anonymous event. Mattes (1994) suggested that recipients often want information about the donor because they are interested in "find[ing] some real and positive connection with the man who is the biological father of [one's] child" (p. 34).

Sperm Donor Selection and the Psychology of Female Mate Choice

In light of the lack of research on how women choose their donors, I initiated a series of questionnaire studies to examine this issue (Scheib 1994; Scheib et al. 1996). As choice of donor has the probable result of producing a child, I hypothesized that if women were asked to rate the importance of various attributes in a sperm donor, their decisions could be interpreted in one of two ways: (1) Women value those attributes that they believed would affect a resultant child, such

as a donor's health or his physical attributes; or (2) Women value the same attributes as they do in a long-term "marital" partner, such as traits indicative of a good companion as well as those valued in the first interpretation. Women's preferences for a donor might be similar to those for a mate because the sperm of both a donor and a mate have equivalent impacts on offspring. This similarity might therefore elicit some of the same preferences for a donor as identified in studies of mate preferences. I designed three experiments to assess any differences in women's preferences for a mate versus a sperm donor.

In the first experiment using a between-groups design, women rated the importance of various attributes of (1) a hypothetical sperm donor or (2) a long-term mate (see Scheib 1994 for details).

Subjects were women between the ages of 19 and 45 from undergraduate psychology courses: 60 women rated the importance of attributes in a hypothetical sperm donor, and 59 women rated the importance of the same attributes in a hypothetical long-term mate (all their responses were anonymous). A questionnaire, constructed from items from previous mate choice studies (Buss and Barnes 1986; Buss and Schmitt 1993) and from items used by physicians and recipients to choose sperm donors (e.g., health related items and physical attributes), was used to compare women's preferences for long-term mates to those for sperm donors (see Scheib 1994 for details). Since women might value only those attributes in a donor that they believed to have a strong genetic component (e.g., physical attributes), subjects' "heritability" beliefs were also assessed. "Heritability" was defined for the purpose of the questionnaire as "biologically inherited, transmitted from parent to child via one's genes." Subjects in the donor condition were also instructed that "the anonymity of [the] donor [was protected] in order to guarantee that he [would] not be contacted by the recipient and/or potential

offspring" (p.118). This is similar to what is done in DI programs, and it made it explicit to subjects that there would be no contact with the donor, that is, they could expect nothing from him.

Women rated their preferences on a large number of attributes, so in order to reduce redundant analyses on attributes that represented similar underlying constructs, a factor analysis was conducted (Tabachnick and Fidell 1989). With this statistical procedure, the large number of attributes were reduced to four representative factors of character, health, physical attributes and abilities (see Table 1). Analyses were conducted on the composite scores for each factor (derived by averaging ratings across all attributes within each of the four factors).

Insert Table 1 about here

Health was the most important factor to subjects who rated attributes in a donor (see Figure 1a). This preference was consistent with Klock's and Maier's (1991) clinical study in which recipients' concerns included the health status of the donor. Character was the most important factor to subjects who rated attributes in a long-term mate. This was consistent with previous mate choice studies as attributes that made up this factor were also reported by women as very important in a long-term mate (e.g., Buss and Barnes 1986; Buss and Schmitt 1993). Character was also very important in a donor, second only to health. Physical attributes were rated as least important in donors and long-term mates.

Women's preferences for attributes of a donor and a long-term mate were compared: health, physical attributes and abilities were significantly more important in a donor than in a long-term mate (see Figure 1a) which is a rational outcome

given that subjects also rated health, physical attributes and abilities as having a moderate to high chance of being "biologically transmitted from parent to child" (see Figure 1a). Women rated character as significantly more important in a long-term mate than in a donor. This is not surprising as women in the donor condition were told that they would have no contact with the donor, whereas the women in the mate condition would assume that they would have to interact with the long-term mate. The result that is remarkable is that character was the second most important factor in a sperm donor after health, despite the fact that character was rated as least likely to be "biologically transmitted" to a resultant child. This apparent logical inconsistency was not the result of women in the sperm donor condition failing to keep the task in mind, since they did rate attributes that they believed likely to affect a resultant child as significantly more important than did women in the long-term mate group. That character was considered important in both long-term mate and donor selection suggested that women may have partly relied on the evolved psychology for long-term mate choice when they assessed attributes in a sperm donor, as consistent with the second hypothesized interpretation.

Insert Figure 1 about here

Although preferences for a donor were similar to those for a long-term mate, there were some differences in the two conditions that suggested that preferences for a sperm donor might reflect psychological adaptations to some other naturally-occurring context, such as that of an extra-pair copulation (EPC). Choice of sperm donor is different from long-term mate choice in that the male who

provides the gametes does not provide any of the paternal investment. Acquiring a donor's gametes is similar to the EPC context where a woman sometimes receives gametes and nothing more (Smith 1984). To test whether choice of sperm donor was more similar to choice of extra-pair partner than to choice of long-term mate, the second experiment was done (see Scheib 1994 for details). Using the same design as in the first experiment, a third group of women rated the importance of attributes in an extra-pair partner; these preference scores were compared to women's scores for a sperm donor and for a long-term mate. The additional EPC condition would provide a test for the existence of a possibly distinct set of preferences for traits of a sexual partner in the context of an EPC At present, few studies have been done to investigate the existence of a distinct EPC psychology. EPCs have undoubtedly been a persistent practice of women in evolutionary history (Smith 1984; Wilson and Daly 1992). EPCs entail a different set of costs and benefits from long-term mate choice, including the risk of desertion by a long-term mate, and it is plausible that distinct psychological processes were selected to assess the costs and benefits associated with this mating context for women.

The second experiment also provided a further test of the hypothesis that women's preferences for a sperm donor reflect the evolved psychology of mate choice preferences, as well as providing the opportunity to test the replicability of the first experiment. If subjects in the first experiment who assessed a donor were using some of the psychological assessment mechanisms of evolved preferences for long-term mate choice, then it is expected that the man's resources, which are valued in a mate (e.g., Borgeroff Mulder 1990; Buss and Barnes 1986; Townsend 1989), should be similarly valued when selecting a sperm donor. Thus a number of resource-related items (forming the construct "resource potential") were added to the questionnaire.

Subjects were women between the ages of 20 and 47 years from undergraduate psychology courses: 30 women rated attributes in a donor, 30 rated attributes in a long-term mate and 28 rated attributes in an extra-pair partner. The preference ratings for a donor and a long-term mate and the rank ordering of the "heritability" scores replicated the pattern of results found in the first experiment (see Figure 1b): health was the most important factor in a sperm donor and significantly more important than in a long-term mate; physical attributes were rated as least important for both a donor and a long-term mate, but were still considered significantly more important in a sperm donor. As in the first experiment, despite women's belief that character had little chance of being "transmitted from parent to child via one's genes," character was again considered very important in a sperm donor, almost as important as in a long-term mate. Women rated resource items considerably less important than health and character in a sperm donor which attested to subjects' understanding the task of donor selection where no resource benefits would be accrued. However in the mate choice condition, resources were also rated as less important than character and no difference emerged between the importance of resource potential in a donor and a long-term mate. So what is remarkable about the sperm donor condition is the very high ratings for the man's character, as in the long-term mate condition, even though character like resources was not considered very "heritable".

The preference scores for all of the factors were similar for the long-term mate and EPC conditions (see Figure 1b) and male character was the most important factor. Women's ratings for attributes in a sperm donor were similarly different from both the long-term mate and the EPC conditions: health and physical attributes were significantly more important in a sperm donor.

Conclusions from this second experiment included (1) there was little

evidence of an EPC psychology, distinct from a long-term mate psychology, (2) resources were valued less in a mate than character, and (3) preferences for a sperm donor were evidently reflective of a long-term mate choice psychology with respect to character. This also suggested that the closest model from which to predict women's preferences for a sperm donor would be that of the psychology for long-term mate choice.

In an international study of 37 societies, both women and men ranked character attributes, such as those used in these experiments (e.g., kindness and understanding), consistently highly (Buss 1989). Indeed, an evolutionary psychological perspective assumes that evolved adaptations are species typical (and sex- and life-stage typical), but exhibit variable contingent responsiveness depending on present cues and circumstances as well as life experiences. I was therefore interested in the possibility of assessing women's mate preference psychology in other cultural contexts than Canada.

Anne Kristiansen, Annelise Wara and I ran a third experiment in Norway to test the generalizability of the Canadian results to a somewhat different cultural context (see Scheib et al. 1996 for details). Norway has a population of approximately 4 million and has state-provided medical and child care (Barne og Familiedepartementet 1994). Norway is very similar to Canada in many respects, but such things as child-care support mean that it may be easier for women to have and successfully support children alone.

Norwegian women's preferences for a donor and a long-term mate were compared using the questionnaire items from the second experiment (see Scheib et al. 1996 for details). Subjects were women from the University of Trondheim between the ages of 20 and 29 years: 23 women rated attributes in a sperm donor and 21 rated attributes in a long-term mate. The overall patterns of results were

similar to those of Canadian women in the first two experiments (see Figure 1c). Most importantly, character was again very important in a sperm donor, as well as in a mate, despite Norwegian women's belief that character had little chance of being "transmitted from parent to child via one's genes." In agreement with the previous two experiments, these results suggest that Norwegian women's preferences for a sperm donor also reflected the operation of a psychology for long-term mate choice.

Figure 1 presents the consistent finding in all three replications involving 251 women, of which 207 were Canadians and 44 were Norwegians, that the character of a man is a very important consideration whether the context be long-term mate choice or sperm donor selection. It might be argued that the questionnaire items were not sensitive to the subtle differences between the contexts. However this conclusion is unlikely because there were significant differences between women's preferences for a sperm donor and a long-term mate and these preferences were consistent with previous findings in their respective areas, that is: (1) Women in the sperm donor condition rated health as the most important factor, consistent with clinical studies (e.g., Klock and Maier 1991), and significantly more important than did the women in the long-term mate condition in all three experiments. Physical attributes were also rated as more important in a sperm donor than in a long-term mate by both groups of Canadian women. These results were consistent with women's "heritability" ratings of health and physical attributes, that is women believed these attributes were quite likely to affect a resultant child. (2) Attributes indicative of good character (e.g., kindness and understanding) have been identified as highly desirable in potential long-term mates by women (e.g., Buss 1989), and character was considered the most important factor for a long-term mate in all three replications of my study.

The experimental results may not be directly generalizable to women who use DI as most subjects were in their twenties, and women who use DI typically have failed to conceive after several years in a sexual relationship and are in their thirties. Furthermore, the subjects in these experiments probably were not considering having children at the time. These subjects did however value attributes in a sperm donor that have been found to be of concern to recipients of DI and which they believed were likely to affect a resultant child. Analyses of women's preferences and choices of donors in a DI program would provide a validity check on my experimental findings and would provide further information about what women want in their donors. On an anecdotal note, when I asked a recipient at a sperm bank what she wanted in a donor, she replied, "You know, someone you'd like to date."

Concluding Remarks

The study of female mate choice provides a theoretically important, female-oriented perspective on animal behaviour. Evolutionary psychological analyses of mate choice focus on the relevant cues and associated mental processes that influence behaviour. This perspective assumes that women's evolved mate choice psychologies have resulted from a selective history of sexually-differentiated parental investment that influenced preferences for mates in both the long-term and extra-pair mating contexts. Women's choices of sperm donors provide an evolutionarily novel context in which to study the psychology of female mate choice. Choice of sperm donor and mate choice share important similarities as women's decisions in both contexts will affect offspring condition and future reproductive options. And indeed there were striking similarities in women's preferences for sperm donors and long-term mates.

In light of the popularity of DI techniques and the extensive discussion

surrounding reproductive technologies, it is surprising that there is so little information about women's preferences for sperm donors. Few studies have addressed what information DI recipients want or how they would choose donors if given the opportunity. Until recently, information and choice were not even issues as medical personnel typically chose the donor and provided recipients with minimal information because of a perceived need to protect the donor's anonymity. Recently a number of studies suggest that recipients do in fact want more information, such as about the donors' health and personalities. From an evolutionary perspective, it is assumed that women have been selected to have control and choice over their reproduction, so it is not surprising that recipients would want more information and control in the DI process. An increase in the number of DI programs where donor information is more routinely available suggests that there is a demand for more information and control by women in the DI process.

Findings from my three experiments indicate that women value information that describes the donor's character, information that is generally missing from the protocol used to choose a donor in DI programs. I feel that the DI process can be made much easier for women psychologically if they are given information and choice about their donors, and the well-being of women is likely to enhance maternal investment to the benefit of the offspring. The use of both an evolutionary theoretical framework and a feminist perspective, which question procedures that do not respect women's reproductive autonomy, can result in new insights and perhaps, ultimately, change.

Acknowledgments

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Table 1. Factors and their constituent attributes which women rated for a sperm donor, long-term mate or EPC partner.

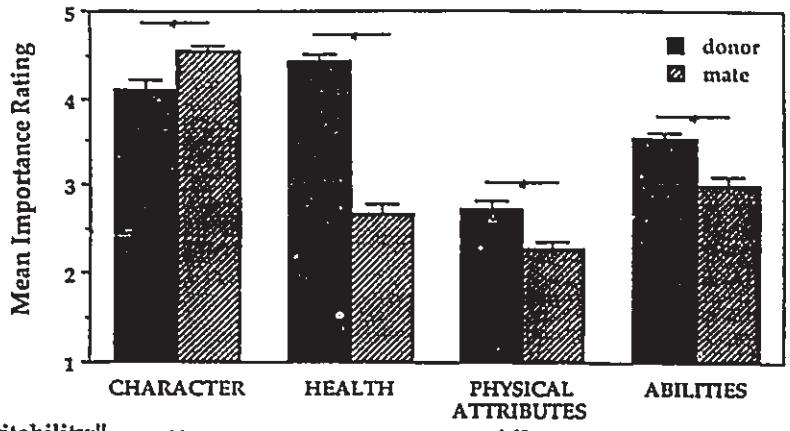
Figure 1. Comparison of mean importance ratings for factors in a sperm donor and long-term mate (a); for a sperm donor, long-term mate and EPC partner (b); and for a sperm donor and long-term mate in Norway (c) (where indicated: $p<.01$ for differences among groups), where 1 = not important at all; 3 = moderately important; 5 = very important. Error bars indicate SE. Mean "heritability" ratings listed below each factor where 1 = not heritable at all; 3 = moderately heritable; 5 = highly heritable.

FACTOR 1: Character	FACTOR 3: Physical
kind	hair color
understanding	handsome
dependable	eye color
considerate	height
affectionate	
honest	**FACTOR 4: Abilities**
self confident	creative
	musical talent
FACTOR 2: Health	intelligent
family health history	
family longevity record	
health background	

Note: Table 1 is adapted by permission of the publisher from Sperm Donor Selection and the Psychology of Female Mate Choice by J.E. Scheib, Ethology and Sociobiology, 15, 3, p. 120.

EXPERIMENT 1-CANADA

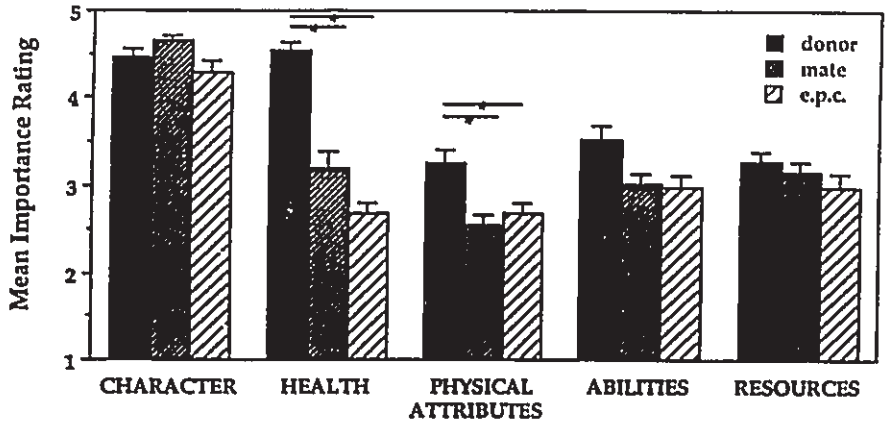
a



"Heritability:"	1.93	4.05	4.69	3.36

EXPERIMENT 2-CANADA

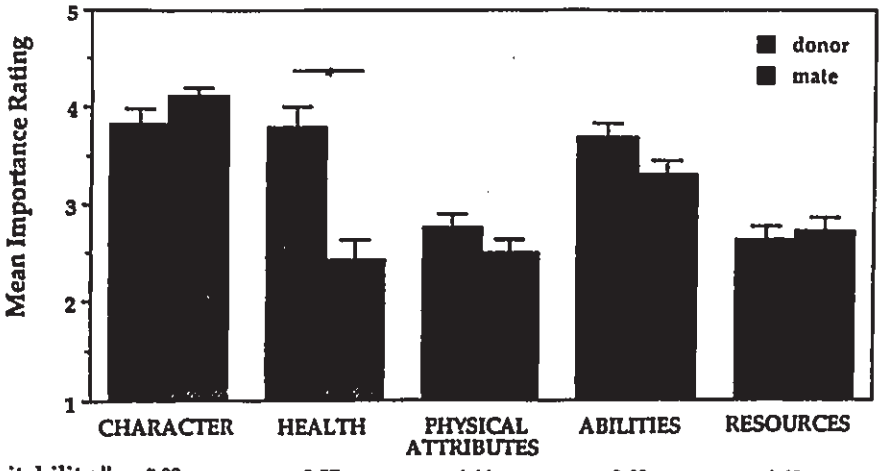
b



"Heritability:"	2.15	3.59	4.71	3.43	1.83

EXPERIMENT 3-NORWAY

c



"Heritability:"	2.02	3.57	4.44	3.63	1.69

Women's Choices of Donors at a Sperm Bank: Identifying Information that Determines Choices

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Abstract. Donor insemination is a type of reproductive technology through which healthy women achieve pregnancy with the sperm of an anonymous donor. To date, no clinical studies have examined how women select sperm donors. In study 1, we examined information that women used to choose sperm donors at a sperm bank. Our results suggest that recipients who were single used information about the donors' physical features and health. There was also some indication that information about the donors' characters was used, but the relationship to their choices of donors was weak. Donor attributes were not of any demonstrable consensual relevance to the donor selection by women who were not single, perhaps because women chose variably to match the traits of their partners. In study 2 we gave undergraduate subjects the same donor information that was provided to the recipients at the sperm bank. Undergraduate women's choices indicated that they used criteria similar, but not identical, to those used by single recipients when selecting sperm donors. Overall, these results suggest that to a certain extent, findings obtained in experimental studies of women's hypothetical choices of donors can be informative in a clinical setting.

Donor insemination is an evolutionarily novel context in which women can achieve pregnancy. It is a simple and effective technique used by women without male partners, such as single women and lesbian couples, and by women with infertile partners (reviews in Achilles, 1992; OTA, 1988). It also provides a context in which the contribution of genetic material by a male can be separated from his qualities as a partner and a potential parent. Little is currently known about how women select sperm donors, or whether their choices reflect those made in other potentially reproductive contexts such as mate choice (for a review see Scheib, 1996).

To date, no clinical studies have been conducted to examine how women select sperm donors. Moreover, very few clinical studies have examined whether recipients want information about the sperm donors and if so, what information they would like. This may be because recipients typically receive limited health-related information about the donors and little else (reviews in Scheib, 1996; Achilles, 1992). Nonetheless, there is some indication that recipients want information (e.g., Brewaeys et al., 1993; Mahlstedt & Probasco, 1991), and that they are interested in specific types of information about the donors that includes more than just health-related items (Klock & Maier, 1991; Purdie et al., 1992). In a sample of 35 heterosexual couples, Klock & Maier found that as well as being interested in information about a donor's medical and genetic background, recipients were also concerned about the future child's likely similarity in physical resemblance and in personality to the recipient's "marital" partner. Purdie and colleagues (1992) questioned 53 heterosexual couples about what they wanted to know about the donors. Aside from health information, recipients reported that they wanted information that would "describe [the donor] as a person" (p. 28), such as his interests, physical attributes and family background. Nonetheless, these other

types of information are often not available to the recipients.

In a series of experiments, Scheib and colleagues (Scheib, 1994; Scheib, Kristiansen & Wara, 1996) proposed that if women were given the task of identifying attributes that are important in a potential sperm donor, they might proceed in one of two ways: (1) Women would identify those attributes that they believed would affect a resultant child, such as attributes indicative of a donor's health; or (2) Women would identify attributes that are important in a long-term "marital" partner, such as traits indicative of a good companion and potential parent, as well as those that would affect a resultant child as noted above. Women's preferences for a donor might be similar to those for a mate because, throughout our evolutionary history, reproduction and mate choice were inseparable. That is, the attributes that a woman would find attractive in someone whose offspring she would carry would likely be related to her mate preferences. Additionally, as women's choices in either context would affect offspring condition and future reproductive options, it was likely that women would use some of the same criteria for a donor as they would for a long-term mate.

In an experiment where undergraduate women rated the importance of attributes in a sperm donor or a long-term mate, Scheib (1994) found that subjects in the donor condition valued health and physical attributes significantly more than did women in the long-term mate group, and all subjects rated these attributes as highly likely to affect a resultant child. These results supported her first proposition. Subjects in the long-term mate condition valued attributes indicative of a male's character (e.g., kindness, consideration, affectionateness) significantly more than did women in the donor condition, and these attributes were rated as unlikely to affect a resultant child. The remarkable result, however, was that women rated the importance of information about a sperm donor's character second

only to health, ahead of factors like physical attributes and abilities. The preference for information about a man's character, and especially for attributes indicative of his good character, can be beneficial in long-term interactions, such as mateships, and some evidence exists that women do have these preferences for mates (e.g., Buss & Schmitt, 1993; Kenrick et al., 1990). But it is less clear how a woman could benefit from good character in a sperm donor from whom she would get gametes and nothing else. However, these results are consistent with the second proposition. That is, Scheib suggested that the great importance of character in sperm donors was reflective of women using some of the decision-making processes that are normally associated with long-term mate choice. These results were further replicated in a second Canadian sample and in a sample from Norway (Scheib et al., 1996). Consistent with prior studies (e.g., Purdie et al., 1992), these results also suggest that women may be interested in more than just health-related information about the sperm donors.

In the present studies, we attempted to examine women's choice criteria for sperm donors in two clinical samples of donor insemination recipients and one sample of undergraduate women. Our goals were to identify information that predicted recipients' choices of sperm donors, and to assess whether similar information would predict choices made by undergraduate women, when asked to put themselves in the position of using donor insemination and selecting sperm donors.

We examined these questions in two studies. The first study was conducted at a sperm bank where clients are given non-identifying information about sperm donors that they can use to make their choices. Clients are encouraged to use the information and make their own choices, rather than having the donors chosen for them, as is done in more traditional clinics. Choices made by single women and

women with partners (i.e., women in marital or de facto unions) were separately compiled and analysed in order to determine what information predicted their choices of sperm donors. Recipients' choices were also compared to those made by women in previous experiments.

We conducted a second study in order to make more direct comparisons between experimental subjects' choices of sperm donors and recipients' choices. This second study was conducted at a university, where undergraduate women were asked to imagine that they were having children through donor insemination. They were then given the same donor information as the recipients at the clinic, and asked to choose three donors. This task was conceptually similar to the original sperm donor experiments (Scheib, 1994), except that the materials were now identical to those used by women at the sperm bank. This provided a more direct way of assessing whether the information obtained from undergraduates in experimental studies could be informative about the choice criteria that women use in the context of donor insemination.

STUDY 1

Methods

At this clinic, recipients choose up to four donors from a catalogue that lists each donor's race, blood type, eye colour, complexion, hair colour, height, weight, bone size, ethnic ancestry, education and interests (see Figure 1). We compiled the choices of women selecting sperm donors for the first time. By only using choices made by these women, we could ensure that the only information available about a donor (including the group of donors from which he was chosen) was that provided by the catalogue from which a woman chose. Information about the sperm

donors was taken from the catalogues and the only information we had about the recipients was their marital status.

In order to identify how women chose their sperm donors, we first analysed single women's choices. Approximately 20 per cent of women at this clinic were single. The rationale for focusing on single women was that their choices would not be influenced by attempts to phenotypically match the donors to "marital" partners. Phenotypic matching of a sperm donor is a common procedure done to maximize the resemblance between a resultant child and its social father. Women with partners also almost always made their choices with their partners' help. Thus, single women's choices more likely reflected their own criteria while "married" women's choices likely represented a compromise between their own criteria, their partners', and attempts to match phenotypes. In total, 43 choices were made by 20 single women from 4 catalogues, containing 54 to 85 potential donors, representing a total of 102 different men most of whom appeared in multiple catalogues.

Despite the limitations on interpretability of the choices made by women with partners, we analysed these too. These choices were in fact made by both the women and their partners, but it was possible that similar predictors of their choices might occur, albeit with noise. Moreover, the larger sample might enable detection of the more consensual criteria even if masked by idiosyncratic preferences. In total, 91 choices were made by 49 women with partners from 5 catalogues, containing 54 to 85 potential donors, that represented a total of 107 different men. These 5 catalogues included the same 4 used by the single women plus an additional one.

Figure 1 about here

The dependent variable

In each analysis, women's choices were used to establish donor popularity. A donor's popularity was calculated by dividing the number of times he was chosen by the total number of times he could have been chosen. This measure controlled for differences among the donors' opportunities to be chosen. Donors were then ranked on this measure, with a rank of one denoting the most popular donor. When scores were tied, donors who were women's preferred choices (e.g., first as opposed to second choice, etc.) were assigned better ranks; otherwise identical scores were assigned the mean of the ranks. Zeros were also ranked, from lowest to highest denominator. Ranking decreased the skew of the distribution and allowed us to discriminate among donors who were never chosen, but differed in their opportunities to be chosen. For instance, a score of zero did not differentiate between a donor who had only been available for 9 choices, but not chosen (a likely outcome), and a donor who had been available 91 times and not chosen (a less likely outcome), while a rank did. These rankings were then used as the dependent variable in the analyses.

The independent variables

Six variables were identified from the catalogues as information that might predict women's choices of donors. These potential predictor variables were page order, race, height, BMI (body mass index: weight divided by height^2), education (which sometimes included present occupation) and interests. Although not directly relevant to our questions, we included both page order and race and treated them as "nuisance" variables. In the case of page order, women had up to 35 donors to choose from on a page and it was likely that some of the variance in their choices might be accounted for by this. Additionally, samples from donors that appeared

later, on the second or third page, sometimes were not in stock which could delay the inseminations. Women therefore might have been inclined to choose donors that appeared earlier. Catalogues ranged from one to three pages in length. In cases where a donor changed page position, a weighted score was assigned according to the proportion of women who saw him on the different pages. The effect of race also had to be partialled out in case women were matching a donor's race to themselves. Race was coded as Caucasian (84.3% of donors in catalogues seen by single women, 84.1% of donors in catalogues seen by women with partners) or other (15.7% and 15.9% respectively).

Specific predictions were made about the relationships of height and BMI to women's preferences. We expected women to use information about donor height, and prefer taller donors, because women's preferences for donors may be influenced by their mate choice criteria (Scheib, 1994) and previous studies have shown that taller men are often desirable as potential mates (review in Ellis, 1992; Gregor, 1979). Women might also use greater height as a cue of better health, through improved nutrition during development, though this would not be an independent reason, as good health is also highly desirable in a potential mate. The range of height in catalogues seen by single women and women with partners was from 1.65 m to 1.93 m ($\bar{X}$ = 1.80 m, SD = .07).

We used BMI to represent information about the donors' overall sizes. This measure encompassed information about both weight in relation to height, and bone size, which categorized donors as small, medium or large. With regard to the measure of choice, we expected a non-linear relationship as mid-range BMI scores are defined as healthiest (i.e., small scores indicate being underweight for height and large ones indicate being overweight for height (FAS, 1987)). The range of BMI in catalogues seen by single women was from 18.56 to 29.27 kg/m^2 ($\bar{X}$ =

23.35, SD = 2.19), while the range in catalogues seen by women with partners was from 18.56 to 30.21 kg/m^2 ($\overline{X}$ = 23.42, SD = 2.25).

The last two variables concerned donor educational background and donor interests. Education was coded as 1 for technical or non-university level education (e.g., mechanic), 2 for presently enrolled in, or completed, university undergraduate education (e.g., BSc, Psychology), and 3 for any education beyond an undergraduate degree (e.g., grad school, medical school). All donors had some education beyond high school. The range of donor education in catalogues seen by single women and women with partners was from 1 to 3 ($\overline{X}$ = 2.0, SD = .6).

A donor's education and interests were the only information a woman could use to get some idea of the donor's personality and character, where information about donor interests was presented in one or two words (e.g., biking, reading). In Scheib's (1994) experiments, information about a donor's character was very important to undergraduate women and we wanted to test whether recipients used this type of information to choose their donors. The information presented in the catalogues was a poor description of a donor's character however, and if it did not predict donor popularity, it would not provide strong evidence against the idea that recipients were concerned about a donor's character. Alternatively, if this impoverished character information could predict donor popularity, then it would lend support to the idea that character is important in women's choices of donors. To derive a quantitative measure of donor character, an independent group of undergraduate women (n = 72; participated for course credit; ages 18-24 years; $\overline{X}$ = 20.2, SD = 1.4) rated the donors on the attributes that made up the character factor in Scheib's experiments (i.e., kind, understanding, dependable, considerate, affectionate, honest, self-confident), and on the words "good companion / romantic partner". Each donor's description was judged by 10 raters. These raters were

provided with the same information as was listed in the catalogues about donor education and interests (i.e., two words), and age, which was between 20 and 40 years, but the men were not identified as sperm donors. A seven-point rating scale was used, where a score of one indicated that the man in the description was not at all like the attribute, and a score of seven indicated that he was extremely like the attribute. The scores were then averaged for each donor and used as a measure of character in the present analyses (reliability of mean scores (with 10 raters) = .70; for the calculation see Streiner & Norman, 1991, pp. 83-85). The range of these derived mean character scores for the donors in catalogues seen by single women and women with partners at the clinic was from 3.7 to 5.6 ($\overline{X}$ = 4.7, SD = .5). It is noteworthy that while the mean scores were reliable, there was very little variability among them.

Multiple regression analyses were then used to establish the predictors of recipients' choices based on the attributes of the sperm donors, where recipients' choices were operationalized as the ranks of donor popularity. We used multiple regression because it was plausible that women would make their choices of donors based on multiple types of information. Multiple regression would allow us to analyze the effects of all of the potential predictor variables at once, rather than item by item, and would test the contribution of each variable with the effects of the other variables removed (Tabachnick & Fidell, 1989). We used the hierarchical form of multiple regression specifically, and this is explained in the main analysis section below.

Results

Single Women's Choices

Preliminary analysis

Prior to the multiple regression analysis, each of the six independent variables was examined in relation to donor popularity. Both page order and race were related to donor popularity, suggesting that it would be important to control for their effects in the multiple regression. Both height and BMI had an inverted U-shaped (i.e., quadratic) relationship to donor popularity (height & height^2: $r = .246$, $p = .045$; BMI & BMI^2: $r = .270$, $p = .024$) (see Figure 2 (a) and (b), respectively). These relationships suggested that donors with mid-range heights were chosen more often than shorter or very tall donors, and donors with mid-range BMIs were chosen more often than donors with smaller or large BMIs. The measure of donor character had a positive, but weak linear relationship to donor popularity ($r = .180$, $p = .071$), where donors with more positive character scores were chosen more often (see Figure 2 (c)). No relationship, linear or otherwise, was found between donor education and donor popularity.

Figure 2 about here

Main analysis

All of the above variables, except education, were then entered into a hierarchical multiple regression analysis. Hierarchical multiple regression was used in order to i) control for the effects of the nuisance variables, page order and race, and ii) test the predictive ability of each variable with the effects of the other variables removed. Page order and race were entered in the first step, while height, height^2, BMI, BMI^2, and character were entered in the second step. This approach provided a measure of what character and the quadratic forms of height and BMI

added to the prediction of donor popularity when the effects of page order and race were controlled. That is, this type of regression works by assigning any shared variance between two variables to the variable entered in the first step of the regression (Norman & Streiner, 1994). Consequently this reduces the predictive power of variables entered in later steps and becomes a conservative test of the effects of these variables (e.g., height, BMI, and character).

Four of the five variables remained significant independent predictors of women's choices of sperm donors (i.e., donor popularity) and the regression was significantly different from zero ($F_{7,94} = 4.443$, $p < .001$). Twenty-five percent of the variance in women's choices of sperm donors was accounted for by these five variables. That is, each variable accounted for some of the variance in women's choices of donors when the effects of other variables were removed (see Table 1). These results suggested that donors were more popular among women's choices if they appeared on one of the first pages women saw ($t = 2.735$, $p = .007$), and if they were Caucasian ($t = -2.375$, $p = .020$). The inverted U-shaped relation between height and donor popularity suggested that moderately tall donors (peaked around 1.80 m) were more likely to be chosen than taller or shorter donors (height: $t = -2.513$, $p = .014$; height^2: $t = 2.521$, $p = .013$). A similar relationship between donor BMI and popularity suggested that donors of moderate to larger BMIs (peaked around 24 kg/m^2) were more likely to be chosen over donors with small or large BMIs (BMI: $t = -2.279$, $p = .025$; BMI^2: $t = 2.278$, $p = .025$). The relationship between donor character and popularity was in the predicted direction, where donors rated as having better characters (e.g., kinder, more dependable, more self-confident, better companions and romantic partners) were more likely to be chosen by women, but it was not significantly so ($t = -1.528$, $p = .130$). However an interpretation of the analysis of character is made difficult because

there was very little variance among the donors' scores as judged by independent female raters (i.e., over two-thirds of the donors' mean character scores fell between 4.2 and 5.2 where the scale ranged from 1 to 7). This restriction of range has the effect of decreasing relationships between the measure and anything else (Ferguson & Takane, 1989; McNemar, 1949). A calculation to estimate the relationship if the range was not restricted indicated that if the variance of the mean character scores was half of what might be found in the population at large, then character would also be a significant predictor of women's choices of donors (for the calculation see McNemar, p. 126).

Table 1 about here

Choices By Women With Partners

Preliminary analysis

We examined the relationship between each of the six independent variables and donor popularity. (Donor popularity was calculated in exactly the same way as was done for the single women, but with choices made by women with partners.) Of these, donor race and height showed weak relationships to donor popularity (i.e., p's $\leq .10$). It was possible, however, that with multiple regression procedures some of these variables would significantly predict women's choices, once the effects of the other variables were removed (e.g., height might be a predictor once the effect of page order was removed).

Main analysis

The same six variables were entered into a hierarchical multiple regression analysis of donor popularity. This allowed us to compare donor information that

predicted single women's choices of donors to that which predicted choices made by women with partners. Variables were entered in the same order as before. In contrast to the previous analysis, however, no regression model could be produced that significantly accounted for any of the variance in choices of donors made by women with partners (i.e., that was significantly different from zero). No other combination of these variables produced a significant regression model.

Discussion

The results of study 1 suggest that four of the six variables we identified from the catalogues were significant predictors of single women's choices of sperm donors. Single women apparently used information about donor race, height and BMI, and the page on which a donor appeared. It was also possible that these recipients used information about donor character, as there was a trend in the predicted direction, but the evidence was weak. In contrast to the single women, there was no evidence that the women with partners used any of these variables in a consistent way to choose their sperm donors. This outcome was not unexpected because these women may have been matching the donors to their partners, and information was not available to allow us to detect individual matching effects. Moreover, this outcome suggests that single women's choices were a better reflection of their criteria (in comparison to women with partners) and were a better group for which to compare preferences reported in Scheib's prior experimental studies (1994; Scheib et al., 1996) and choices made by the women in study 2 as reported below.

The criteria used by single recipients were somewhat consistent with results from prior experiments (e.g., the importance of health found in Scheib (1994)). The weak relationship between donor character and women's choices, however,

contrasts with the importance attributed to character by Scheib's experimental subjects. This suggested that there might be differences between the recipients and the experimental subjects. However our measure of donor character was based on a two-word characterization of education level and one or two words about interests, and the final distribution of scores for the donors was very restricted. That is, there was very little variance among the donors on our character measure[1], and such a restriction in range could have reduced any relationship between character and women's choices. In this way, recipients in the current study might have had concerns similar to those observed in other studies, but we were not able to detect this with the current design. An observation that suggests that the recipients at this clinic were interested in character, was that they were often interested in and willing to pay for any additional information that might be available about the donors. For example, once the initial choices of donors were made, the women could sometimes obtain "profiles" that described the donors as people. Many of the recipients requested these profiles. Though only anecdotal, this behaviour is consistent with preferences reported by the recipients and experimental subjects in previous studies (e.g., Purdie et al., 1992; Scheib, 1994).

Although the importance of character was difficult to assess in the current study, the weak relationship between this measure and recipients' choices might also have been due to qualitative differences between the recipients and

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[1] It is plausible that a sample of donors would be restricted on numerous measures, (especially health), in comparison to a random sample of males in the population. However the character measure seemed excessively restricted in comparison to other donor attributes. For example, donor BMI, had a range of 18 to 30 kg/m^2, which spanned from being underweight for height (i.e., below about 21 kg/m^2), through the healthiest region, and into being overweight for height (i.e., greater than 25 kg/m^2). The standard deviation indicated that 68% of the donors had a BMI in the middle region, only a slightly more restricted sample than in comparison to the 60% of Canadian males that fall into this range (FAS 1987).

experimental subjects. In order to test this, we conducted a second study in which subjects (who were not in fact recipients) chose donors on the basis of the same information available to the donor insemination recipients.

STUDY 2

In order to make more direct comparisons between women's hypothetical choices of sperm donors and recipients' actual choices, a sample of undergraduate women were given the catalogues used by recipients at the sperm bank and asked to choose three donors that they would use if they wanted to have children through donor insemination. We then identified information that predicted their choices of donors and compared this to information that predicted single women's choices of donors at the sperm bank.

Methods

Subjects

Fifty-five female subjects participated in the study for an undergraduate psychology course credit. Their ages ranged from 18 to 38 years ($\overline{X}$ = 20.2, SD = 2.8). Ninety-one per cent of subjects were single and two per cent (i.e., one person) had children. No subjects reported that they had used donor insemination.

Design and procedure

Each subject received a questionnaire that consisted of an instruction page, a catalogue from which they were to choose three donors, and a last page on which they were to report their choices in order of preference and answer demographic questions. We emphasized the anonymity of the subjects' responses and did not ask

any questions that might identify individuals. The instructions were as follows:

> Imagine that you want to become pregnant and have a child. You are single, however, and have not found anyone with whom you would want to have and raise a child. You have decided that the best way of going about having a child is to use artificial insemination by anonymous sperm donor. You have found a fertility clinic where you are given the opportunity to select a sperm donor from a catalogue that lists non-identifying information about each male. All sperm donors are between the ages of 20 and 40 years. Donors are also healthy and have been screened for genetic disorders and for diseases including AIDS. This clinic emphasizes that the anonymity of each sperm donor is protected, in order to guarantee that he will not be contacted by the recipient and/or her potential offspring. You will never meet the donor in person.

These instructions were very similar to those given in Scheib (1994) with the additional information about donor age and health status. The actual procedural information for choice of donor (e.g., non-identifying information is available, there would be no contact with the donor) simulated the procedures followed at the sperm bank. We also gave additional information on the instruction page that would not be available from the catalogue, but that the recipients at the sperm bank would have received prior to studying the catalogue. This included definitions of terms and that the information listed under "education" might also include a donor's current occupation, if he was no longer a student. On the next pages, subjects received any one of five catalogues: the first four of these catalogues were used by both single women and women with partners at the sperm bank, while the fifth was used by women with partners only. Subjects were free to leave at any time during the experiment without penalty, should they not want to complete the questionnaire; in fact no subjects left. In total, 165 choices were made by subjects from 5 catalogues that represented a total of 107 different men.

The analyses

The data were examined in the same way as in study 1. The independent

variables were again page order, race, height, BMI, character and education. The distributions of these variables were the same as those for the recipients. The dependent variable was again donor popularity, but as calculated from the undergraduate women's choices of donors.

Results

Preliminary analysis

We examined the relationship between each of the six independent variables and donor popularity. Race was related to donor popularity, suggesting that it would be important to control for its effects in the multiple regression. Height ($r = .392$, $p < .001$), character ($r = .190$, $p = .050$), and education ($r = .179$, $p = .066$), all had significant or near significant linear relationships with donor popularity (see Figures 3 (a), (b), and (c), respectively). Page order and BMI showed no relation to donor popularity (i.e., $p > .10$), but were still included in the subsequent multiple regression analysis, as they might significantly predict women's choices, once the effects of the other variables were removed. This also allowed us to directly compare information that predicted undergraduate subjects' choices of donors to that which predicted choices made by single women at the sperm bank.

Figure 3 about here

Main analysis

Page order, race, height, character, education and the quadratic form of BMI (i.e., as used in the single women's analysis), were entered into a hierarchical multiple regression analysis of donor popularity as calculated from choices made by

undergraduate subjects.

As was found for the single recipients, page order, race and height were significant predictors of undergraduate subjects' hypothetical choices of sperm donors and the regression was significantly different from zero ($F_{7,99} = 5.832$, $p < .001$; see Table 2). Twenty-nine percent of the variance in subjects' choices of sperm donors was accounted for by these six variables. These results suggested that donors were more likely to be chosen if they appeared on earlier pages of the catalogue, ($t = 3.181$, $p = .002$), if they were Caucasian ($t = -2.350$, $p = .021$) and if they were taller ($t = -3.968$, $p < .001$). There was no evidence of a relationship between any of BMI, character or education and subjects' choices of donors.

Table 2 about here

Discussion

The results of study 2 suggest that three of the six variables we identified from the catalogues were significant predictors of undergraduate subjects' choices of sperm donors. Subjects apparently used information about donor race and height, and the page on which a donor appeared. Once the effects of page order and race were removed, there was no indication that subjects used information about donor BMI, character or education.

In comparison to the women at the sperm bank, undergraduate subjects appeared to be more similar to the single recipients than the women with partners, in that some of the information that predicted choices made by single recipients also predicted those of undergraduates, while none of the possible predictor variables affected choices made by women with partners.

Donor race and the page on which a donor appeared were related to choices made by both single women at the clinic and by undergraduate subjects in response to the hypothetical scenario. We initially controlled for any effects of page order on recipients' choices because of the large number of donors on each page and because of the possible "availability-problem" of later appearing donors. The fact that page order also had an effect on the undergraduate subjects, who did not know about availability problems, suggests that the order effect might be primarily due to the large number of donors on each page, who did not vary much with respect to the information that was listed about them. Women reading the donor descriptions in serial order may soon have come to an inference of decreasing and minimal information gains from further sampling effort.

Like the single recipients, donor height was a predictor of choices made by the undergraduate women, and both groups of women appeared to have had the criterion that taller donors were preferable over short ones. While taller donors tended to get chosen over short donors, donor popularity started to decrease beyond a height of 1.80 m for the single recipients, but not for undergraduate subjects. Such a difference may have been partly the result of height differences between the two groups of women. If women tended to choose donors that were a certain amount taller than them (as was found in the case of ideal height in mates [Beigel, 1954]), then average height differences between the groups would contribute to this difference. We did not have information about the recipients' heights, but the average height of the undergraduate women was 1.67m, slightly above the average for Canadian women. We also found that donor BMI affected single recipients' choices, but not undergraduate women's choices, although this difference was due to a null finding.

Choices made by both groups of women did not appear to be affected by

donor education or character. Donor character should have been important at least to undergraduate women, as this had been found in previous studies (Scheib, 1994, Scheib et al., 1996). However the character information that was provided to women in the donor catalogues was considerably less than the information provided to the undergraduate subjects in Scheib's experiments. This would suggest that the absence of an effect of donor character on women's choices is likely to be the product of insufficient information and a donor character measure that reflected this, rather than due to qualitative differences between single women at the sperm bank and undergraduate subjects.

GENERAL DISCUSSION

Our first goal was to identify information that predicted recipients' choices of sperm donors, if indeed women used any of the donor information in consensual ways. The results of study 1 suggest that single women did use donor information in specific ways. However, we found no evidence that women with partners did the same. In the case of single recipients, donor race, height and BMI, and the page on which a donor appeared predicted their choices. When the effects of race and page order were removed, single recipients tended to choose donors who were moderately tall and whose BMIs were in the mid to upper end of the healthiest region of the distribution. Aside from the fact that these men had to be healthy to qualify as donors, measures of their height and BMI (i.e., derived from information listed about weight and height) provided the recipients with additional "health" information, that they in turn used to select the donors. Single recipients' use of this information is consistent with what prior experimental subjects reported was important in selecting hypothetical sperm donors (Scheib, 1994; Scheib et al.,

1996) and with the major concern about health reported by recipients in Klock & Maier's (1991) clinical study. Additionally, the optimal donor's height according to these analyses (1.80 m) corresponded to the height of an ideal mate according to prior studies of North American women (Beigel, 1954; Gillis & Avis, 1980), lending preliminary support to the proposition that women's mate choice criteria influenced their choices of sperm donors.

We found little evidence that single recipients used information about character to choose their donors. One possibility was that the recipients did not have sufficient information about the character of the donors with which to make their choices. If women are given more of this type of information in the future, a more thorough analysis of this would be possible. Another related possibility was that the women in our clinical sample were somehow different from the women in prior studies of mate choice and sperm donor selection. A test of this was conducted in the second study by examining the hypothetical choices of undergraduate women in response to the same information as given to the women at the sperm bank. To a certain extent, there were similarities in the donor information that predicted choices made by both single recipients and the undergraduate women, and in the amount of variance that was accounted for in their choices. Additionally, there was little evidence that information about the donors' character affected undergraduate women's choices. These findings suggest that differences between results obtained from the recipients in the present study and from women in prior studies may be due to differences in availability of information. This also suggests that information obtained in experimental studies of mate and donor selection can provide insights into women's choices of sperm donors.

In conclusion, we were able to identify information that predicted choices made by single recipients and by undergraduate subjects. In agreement with

previous experimental findings, women chose donors with good health cues and cues that have been associated with ideal mates. Contrary to previous studies, we found little evidence that women were interested in information about the donors' character. However, this difference is likely due to the fact that the character information provided to the women was more limited than that available in the previous studies. Further studies are need to test hypotheses about the information that women use in donor selection and the effects that women's mate choice criteria have in this selection process. These studies will only be possible when more information is provided to women in the context of donor insemination.

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Table 1. Hierarchical multiple regression analysis of single recipients' choices of sperm donors.

Model Summary:

	Dependent variable:	rank of donor popularity
Step 1	Independent variables:	page order, race
Step 2[a]	Independent variables:	height[b], bmi[b], character

Step Entered	Variable	R	R^2	Adjusted R^2	S.E.
1	page order, race	.364	.133	.115	27.603
2	height, bmi, character	.499	.249[c]	.193	26.365

Analysis of Variance:

	df	Mean Square	F	p
Regression	7	3088.364	4.443	.000
Residual	94	695.106		
Total	101			

Variables:

	Beta[d]	t[e]	p
page order*	.280	2.735	.007
race*	-.224	-2.375	.020
height*	-10.176	-2.513	.014
$height^2$*	10.191	2.521	.013
bmi*	-3.247	-2.279	.025
bmi^2*	3.237	2.278	.025
character	-.139	-1.528	.130
(constant)		2.853	.005

[a] these variables were in addition to those entered in Step 1
[b] height and bmi were entered as quadratic functions
[c] proportion of variance accounted for by the independent variables
[d] standardized regression coefficients
[e] two-tailed tests
* significant predictors of donors' ranks according to single recipients' choices

Table 2. Hierarchical multiple regression analysis of undergraduate subjects' choices of sperm donors.

Model Summary:

	Dependent variable:	rank of donor popularity
Step 1	Independent variables:	page order, race
Step 2[a]	Independent variables:	height, bmi[b], character, education

Step Entered	Variable	R	R^2	Adjusted R^2	S.E.
1	page order, race	.367	.135	.118	29.129
2	height, bmi, character education	.540	.292[c]	.242	27.008

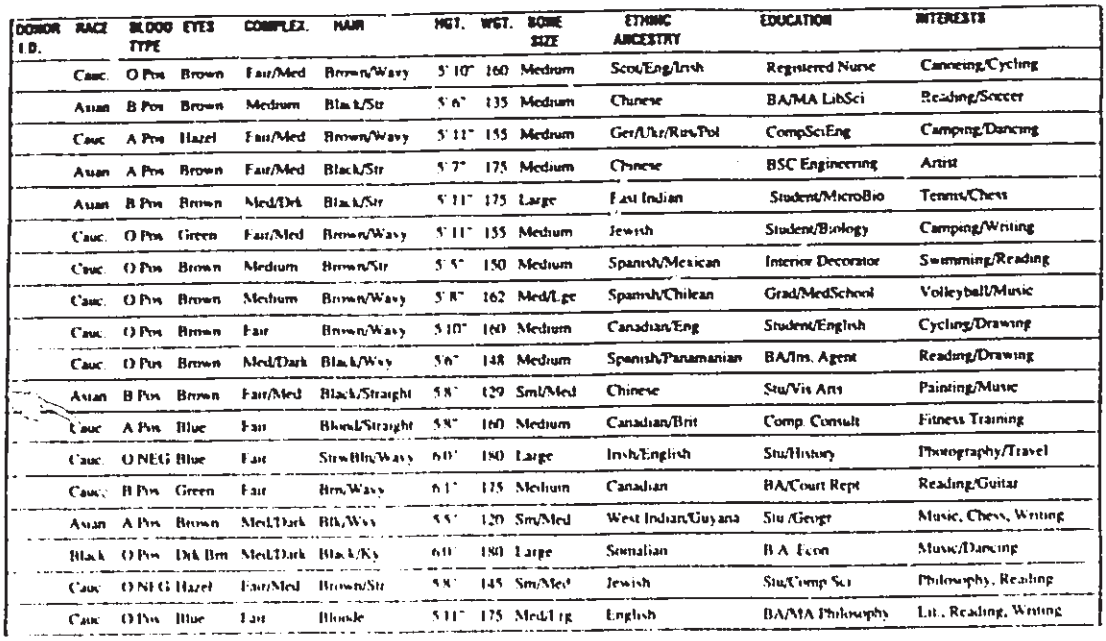
Analysis of Variance:

	df	Mean Square	F	p
Regression	7	4254.394	5.832	.000
Residual	99	729.457		
Total	106			

Variables:

	Beta[d]	t[e]	p
page order*	.303	3.181	.002
race*	-.225	-2.350	.021
height*	-.404	-3.968	.000
bmi	-.811	-.653	.515
bmi^2	.888	.716	.475
character	-.087	-.976	.331
education	-.084	-.948	.346
(constant)		2.617	.010

[a] these variables were in addition to those entered in Step 1
[b] bmi was entered as a quadratic function
[c] proportion of variance accounted for by the independent variables
[d] standardized regression coefficients
[e] two-tailed tests
* significant predictors of donors' ranks according to undergraduate subjects' choices



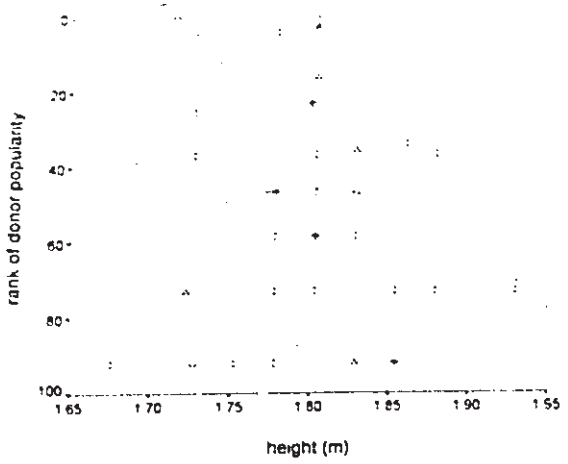
DONOR I.D.	RACE	BLOOD TYPE	EYES	COMPLEX.	HAIR	HGT.	WGT.	BONE SIZE	ETHNIC ANCESTRY	EDUCATION	INTERESTS
	Cauc.	O Pos	Brown	Fair/Med	Brown/Wavy	5'10"	160	Medium	Scot/Eng/Irish	Registered Nurse	Canoeing/Cycling
	Asian	B Pos	Brown	Medium	Blk/Str	5'6"	135	Medium	Chinese	BA/MA LibSci	Reading/Soccer
	Cauc	A Pos	Hazel	Fair/Med	Brown/Wavy	5'11"	155	Medium	Ger/Ukr/Rus/Pol	CompSci/Eng	Camping/Dancing
	Asian	A Pos	Brown	Fair/Med	Black/Str	5'7"	175	Medium	Chinese	BSC Engineering	Artist
	Asian	B Pos	Brown	Med/Dk	Black/Str	5'11"	175	Large	East Indian	Student/MicroBio	Tennis/Chess
	Cauc.	O Pos	Green	Fair/Med	Brown/Wavy	5'11"	155	Medium	Jewish	Student/Biology	Camping/Writing
	Cauc	O Pos	Brown	Medium	Brown/Str	5'5"	150	Medium	Spanish/Mexican	Interior Decorator	Swimming/Reading
	Cauc.	O Pos	Brown	Medium	Brown/Wavy	5'8"	162	Med/Lge	Spanish/Chilean	Grad/MedSchool	Volleyball/Music
	Cauc.	O Pos	Brown	Fair	Brown/Wavy	5'10"	160	Medium	Canadian/Eng	Student/English	Cycling/Drawing
	Cauc	O Pos	Brown	Med/Dark	Black/Wvy	5'6"	148	Medium	Spanish/Panamanian	BA/Ins. Agent	Reading/Drawing
	Asian	B Pos	Brown	Fair/Med	Black/Straight	5'8"	129	Sml/Med	Chinese	Stu/Vis Arts	Painting/Music
	Cauc	A Pos	Blue	Fair	Blond/Straight	5'8"	160	Medium	Canadian/Brit	Comp. Consult	Fitness Training
	Cauc.	O NEG	Blue	Fair	Strw Bln/Wavy	6'0"	180	Large	Irish/English	Stu/History	Photography/Travel
	Cauc.	B Pos	Green	Fair	Brn/Wavy	6'1"	175	Medium	Canadian	BA/Court Rept	Reading/Guitar
	Asian	A Pos	Brown	Med/Dark	Blk/Wvy	5'5"	120	Sm/Med	West Indian/Guyana	Stu /Geogr	Music, Chess, Writing
	Black	O Pos	Dk Brn	Med/Dark	Black/Ky	6'0"	180	Large	Somalian	B A Econ	Music/Dancing
	Cauc	O NEG	Hazel	Fair/Med	Brown/Str	5'8"	145	Sm/Med	Jewish	Stu/Comp Sci	Philosophy, Reading
	Cauc	O Pos	Blue	Fair	Blonde	5'11"	175	Med/Lg	English	BA/MA Philosophy	Lit., Reading, Writing

Figure 1. Part of a catalogue that women used to choose sperm donors. (Note: donor identification numbers have been removed)

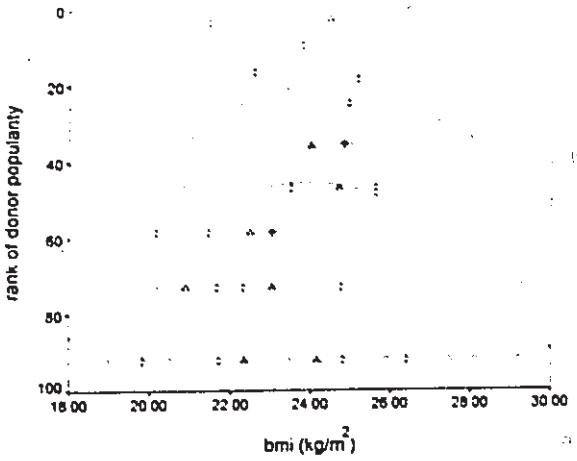
Figure 2. The relationships between donor popularity (as measured from single recipients' choices) and height (quadratic relationship: r = .246, p = .045) (a), BMI (quadratic relationship: r = .270, p = .024) (b), and mean character ratings* (r = .180, p = .07) (c). A "sunflower", ✿ , denotes overlapping points, where each short line or "petal" represents a point (e.g., ✿ indicates 4 data points).

*Donor character was a derived measure based on ratings given by undergraduate subjects (n = 72; not related to subjects who chose sperm donors in study 2) on the following attributes in response to information about each donor's education and "interests": kind, understanding, dependable, considerate, affectionate, honest, self-confident, and on the words "good companion / romantic partner". Ratings were made on a seven-point Likert scale where 1 = not at all [like the attribute], 4 = moderately [like the attribute], and 7 = extremely [like the attribute].

a


rank of donor popularity
0
20
40
60
80
100
1.65
1.70
1.75
1.80
1.85
1.90
1.95
height (m)

b


rank of donor popularity
0
20
40
60
80
100
18.00
20.00
22.00
24.00
26.00
28.00
30.00
bmi (kg/m2)

c

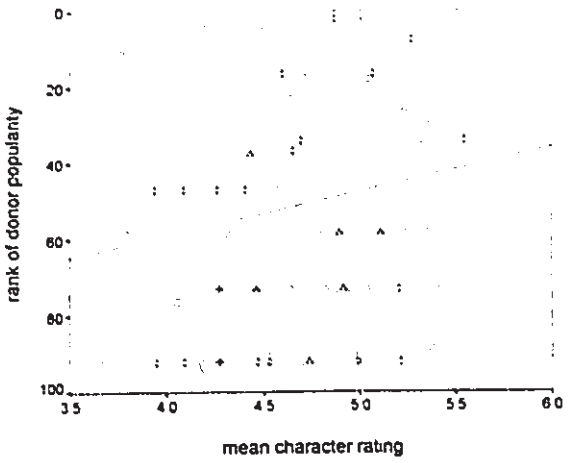
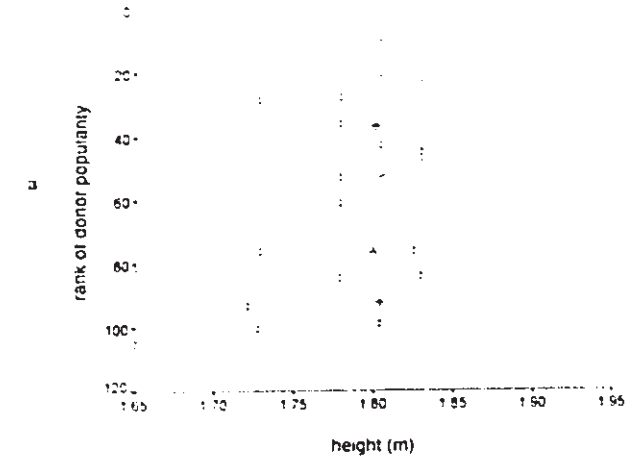
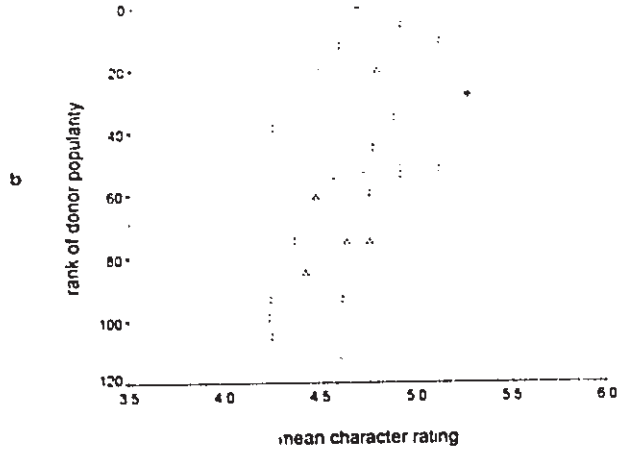

rank of donor popularity
0
20
40
60
80
100
35
40
45
50
55
60
mean character rating

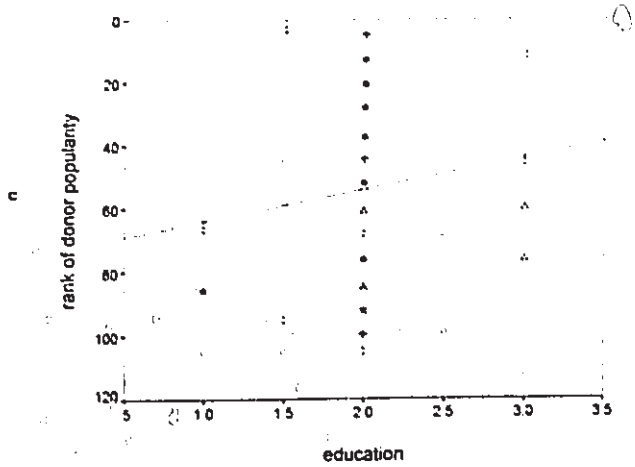
Figure 3. The relationships between donor popularity (as measured from undergraduate subjects' choices) and height ($r = .392$, $p < .001$) (a), mean character ratings* ($r = .190$, $p = .050$) (b), and education** ($r = .179$, $p = .066$) (c).

*See description of character ratings in Figure 2.

**Donor education was coded as 1 for technical or non-university level education, 2 for presently enrolled in, or completed, university undergraduate education, and 3 for any education beyond an undergraduate degree.


a
rank of donor popularity
height (m)


b
rank of donor popularity
mean character rating


c
rank of donor popularity
education

Concluding Comments & Directions for Future Research

The understanding of women's mate choice criteria, and the associated psychology, has provided a basis from which to examine women's preferences and choices in the context of donor insemination. Women's mate choice criteria are assumed to be part of psychological adaptations to decisions faced by women throughout our evolutionary history and to reflect a history of selection favouring control and choice in reproductive contexts. In comparison, reproduction through donor insemination is a new phenomenon, and no specific psychology is expected to have evolved for choice of sperm donors. However, the context of donor insemination does share similarities with mate choice in that women's choices in either context can affect offspring condition and future reproductive options. Thus women's choices of sperm donors might reflect use of criteria that are normally associated with choices of mates.

In the first set of experiments (reported in chapter 2), Scheib (1994) examined women's criteria for sperm donors and mates (i.e., both long-term and extra-pair) through the use of hypothetical scenarios. The results suggested that: 1) the undergraduate subjects understood the task of sperm donor selection because they valued attributes that they believed were likely to affect a resultant child, and these preferences were consistent with concerns reported by actual donor insemination clients; and 2) preferences for a sperm donor were likely reflective of a long-term mate choice psychology with respect to the importance of character found for both a long-term mate and a sperm donor.

In order to test the generality of the Canadian women's preferences for sperm donors and long-term mates obtained by Scheib (1994), Scheib, Kristiansen

and Wara (1996a) conducted a similar experiment with a group of Norwegian women (reported in chapter 3). The pattern of results replicated those of the Canadian women and provided additional support for the idea that women's mate choice psychology influenced their criteria for sperm donors.

The relationship between women's mate choice criteria and their criteria for donors can also be investigated through analyses of women's choices of donors in a donor insemination program. In the last set of studies (reported in chapter 5), Scheib, Norman and Del Valle (1996b) examined information that predicted donor choices made by single women and women with partners at a sperm bank (in fact, no such information could be identified for women with partners). Consistent with concerns reported by both donor insemination recipients and undergraduate subjects in earlier studies (e.g., Klock and Maier, 1991; Scheib, 1994), single women used information about donor health and physical attributes, but there was only preliminary evidence that they used information related to desirable attributes in a mate (e.g., height, character information). When undergraduate subjects made hypothetical choices of donors from the same catalogues as used by the recipients at the sperm bank, there were similarities in information that predicted their choices, but little evidence was obtained that donor character affected their choices. However, the failure to find effects of character was likely due to the limited amount of donor information that was available to recipients at the sperm bank.

These analyses allowed us to examine whether women had any consensual criteria for donor selection - single recipients appeared to, women with partners appeared not to - and to identify some of these criteria. However, these analyses were not strong tests of the idea that women's mate choice criteria influenced their choices of donors, especially because the character information about the donors was so impoverished. There were a number of attributes listed in the donor

catalogues that have been found to be important in mate choice, including height and related health information, that was also important in donor selection, and that in turn could benefit offspring. However, stronger support for our idea would be derived from evidence that women used information in their choices of donors that they did not necessarily believe would affect a resultant child, like character attributes, but that was important in mate choice. The little character information available in the donor catalogues was not conducive to this test.

Altogether, the results from these studies suggest that women can exhibit specific consensual preferences for sperm donors, despite the fact that they are not often offered much choice in the context of donor insemination. Women's mate choice criteria also appear to influence their donor choices in hypothetical scenarios, and some preliminary evidence suggested that this may also occur with women's actual choices of donors at a sperm bank. Although these findings are important, further work is necessary and two areas are discussed briefly: specifically 1) women's mate choice and sperm donor choice criteria in very different cultures; and 2) women's criteria for donors in relation to the relative importance of different attributes.

The experiment conducted in Norway (i.e., Scheib et al., 1996a) served not only to test the generality of the Canadian results, but also to test the ideas in a somewhat different culture. If women's preferences for sperm donors are influenced by their mate choice criteria, and these mate choice criteria are thought to be part of psychological adaptations to decisions faced by women throughout evolutionary history, then women in other cultures should also show this overlap between their mate preferences and sperm donor preferences. If any variation existed among cultures in women's mate choice criteria, then one might expect to see concurrent variation in their criteria for donor selection. Among the Norwegian

women, their pattern of results replicated those of the Canadian women, and in fact, little variation was seen. Although cultural differences do exist between Canada and Norway, a better test of these ideas would be to examine women's criteria for sperm donors in a very different culture and geographic area. For example, Gangestad and Buss (1993) found that the relative weighting women assigned to physical attractiveness in potential mates varied dependent upon the local pathogen load, where physical attractiveness was assumed to be a cue of health and disease resistance (see also Low (1988) for local pathogen load and the incidence of polygynous marriages). If women's mate choice criteria influence their choices of sperm donors, then in pathogen prevalent environments one might expect to see a concurrent shift in women's criteria for sperm donors. At present, this idea has yet to be tested.

In addition to identifying information that women use in their choices of donors and mates, it is likely that women assign relatively more importance, or weight, to some types of information over others when they make their actual choices. For example, in Scheib's (1994) analysis of women's criteria for extra-pair partners (e.p.p.), little evidence was found for an e.p.p. psychology, distinct from that for long-term mate choice. However, when information was presented in a somewhat different format where women had to weigh the relative importance of different attributes in potential mates, and, for example, trade-off more physically attractive aspects in a man for cues that he would make a good companion, differences between women's criteria for extra-pair partners and long-term mates started to emerge (Scheib, in preparation). Although the basic attributes that are important in both choices of long-term mates and extra-pair partners remain very similar, the relative weightings assigned to these attributes vary according to the type of mate. Such a methodology could also be used in the context of donor

insemination, where the relative importance of attributes could be examined by having women trade-off some attributes for others. In this way, the most important or critical factors in donor selection could be identified, in addition to simply identifying information that is used when women make their choices. This methodology could only work however, after the basic criteria for donor selection had been examined. Thus the studies reported here represent a starting point from which to examine and understand how women select their sperm donors.

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