

Running head: THE ADAPTED FLEXIBILITY OF JEALOUSY

The Adapted Flexibility of Jealousy: The Moderating Influences of Sex, Children,  
Relationship Satisfaction, Relationship Length, and Age-related Changes in Fertility on  
Reactions to Sexual and Emotional Infidelities.

Edouard S. St-Pierre

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Department of Psychology

Lakehead University

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Abstract

Evolutionary studies of jealousy have found clear differences between men and women in the factors that evoke jealous discomfort. When asked to select which form of infidelity would be most distressing, men usually select the sexual infidelity of their partner while women typically indicate that emotional infidelity would be most distressing. Research has most commonly reported the reactions of younger adults, but research findings based on young adults may not generalize to older adults. There are theoretical grounds for believing that older adults with same-age mates face different adaptive challenges than younger adults, and that the nature and triggers of jealous reactions may change across adulthood. The nature and triggers of jealous discomfort were therefore investigated among 1163 adults, whose ages ranged between 18 and 78 years. Participants indicated their anticipated degrees of discomfort and the likelihood that they would end their relationship in response to separate scenarios depicting emotional and sexual infidelities. Both men and women expressed significantly more jealousy in response to sexual infidelity than emotional infidelity, and, surprisingly, women were more jealous than were men. Male ratings of jealousy and of their likelihood of leaving their relationships in response to sexual infidelity decreased in a fashion that corresponded with age-related changes in female fertility. The complementary finding for women was that their jealousy remained relatively high across the age range, presumably because male fertility does not markedly diminish with age. The implications of these findings are discussed.

## Table of Contents

Abstract.....	2
Introduction .....	6
The Nature of Jealousy .....	7
The Function of Jealousy.....	9
Organization of the Literature Review .....	11
Defining Jealousy .....	11
Envy and jealousy.....	14
Societal perspectives of jealousy.....	15
Jealousy and violence .....	17
Explaining Jealousy.....	19
Evolutionary Psychology.....	27
Evolved psychological mechanisms.....	28
Jealousy and Evolutionary Psychology .....	32
Adaptively Patterned Differences in Jealousy.....	34
Sex Differences in Jealousy.....	38
The origin of sex differences in jealousy .....	38
Empirical support for the existence of sex differences in jealousy .....	41
Enduring Situational Moderation of Jealousy .....	48
Age-related changes in fertility .....	51
Relationship length.....	54
Relationship satisfaction.....	55
Shared children.....	55

The Present Study .....	56
Predictions .....	60
Method.....	61
Participant Recruitment .....	61
Participants .....	62
Procedure and Measures.....	64
Results .....	66
Data screening .....	66
Order effects .....	67
Sex differences in jealous distress and the likelihood of ending the relationship .....	67
Age-related changes in fertility .....	75
Predictors of the jealous response .....	77
Discussion.....	80
Sex differences in jealousy and the likelihood of ending the relationship .....	81
Age-related changes in fertility .....	85
Predictors of the jealous response and the likelihood of ending the relationship .....	87
Limitations of this study and future directions.....	89
Conclusion .....	90
References .....	92
Appendix .....	105
Table 1 .....	112
Table 2 .....	113
Table 3 .....	114

Figure 1.....	115
Figure 2.....	116

The Adapted Flexibility of Jealousy: The Moderating Influences of Sex, Children, Relationship Satisfaction, Relationship Length, and Age-related Changes in Fertility on Reactions to Sexual and Emotional Infidelities.

Jealousy is universal. Think of your current romantic partner, or of one with whom you were involved in the past. Imagine that person forming a deep emotional attachment to another person. Imagine them spending time with that other person, talking about personal issues with that person and even telling the other person that they love them. Imagine also that they partake in frequent passionate sexual intercourse and that they enjoy sex in a number of different positions. For almost all of us, this scenario arouses at least some emotional response. For many of us, the response is familiar because we have experienced the discovery of something similar in a past or even in our present relationship. Written in any language, and presented to the people of any culture, of both sexes, young and old, a scenario suggesting the infidelity of a partner is likely to evoke at least some discomfort. Romantic jealousy, the response that is likely to be evoked by our romantic partner's relationship with another person, is universal.

The normal and reasonable expression of jealousy evoked by cues of potential infidelity often enhances commitment to a relationship (Buss, 2000). However, the jealousy experienced in response to actual infidelity can erode the well-being of any relationship. In fact, jealousy is a leading reason for divorce (Betzig, 1989). In extreme cases, the expression of jealousy has dire consequences. For example, jealousy is a leading motive for murder (Daly & Wilson, 1988), and battered women often report that their aggressive husbands are frequently enraged with jealousy. The battered women interviewed for one study invariably reported that their jealous husbands limited their contact with family and friends, insisted on

knowing their whereabouts at all times, and belittled them constantly eroding their self-esteem (Wilson & Daly, 1996). Excessive jealousy is destructive and frequently pathological, but the value of a normal expression of jealousy should not be ignored. Jealousy is functional.

### The Nature of Jealousy

Buss (2000) wrote that, early into his investigations of jealousy, he informally surveyed his academic colleges for why they thought jealousy had been ignored by the scientific community. Some of his colleagues stated that jealousy was not a “primary” emotion but was rather a blend of the expression of other “basic” emotions such as anger, fear, and sadness. Those colleagues reasoned therefore, that jealousy did not deserve the attention granted more basic emotions. Others, Buss wrote, stated that jealousy was simply a symptom of other problems, like immaturity or neurosis. Those colleagues argued that mere symptoms did not deserve the depth of attention commonly provided to the study of fundamental problems.

Through his research, Buss (2000) found that jealousy was not simply a character defect. Jealousy was expressed by normal people who were not afflicted by neurosis or immaturity. In one survey, Buss found that nearly all men and women have experienced at least one episode of intense jealousy. Thirty-one percent of people admitted that their jealousy had at times been difficult to control, and among people who admitted to being jealous, 38 percent said that their jealousy had led them to want to hurt someone. Buss found that jealousy was “no less basic than fear or rage, and that its expression was no less important than flight or fight” (p. 27). Jealousy, according to Buss, is a basic human emotion with its origins in evolutionary processes. In the language of Buss and other evolutionary psychologists, jealousy is an *evolved adaptation* (Buss, 1989; 2000; Buss et al., 1992; Daly,

Wilson, & Weghorst, 1982; Symons, 1979). Specifically, jealousy is a *psychological adaptation* and evolutionary psychologists reason that it evolved and persisted because its expression solved a recurring problem of survival or reproduction. Jealousy, like other adaptations, is triggered by particular environmental stimuli and is shared by all people. The view that jealousy is an evolved psychological adaptation is the perspective assumed in the present research.

Evolution by natural selection imposes relative uniformity in complex adapted designs. Each adapted design is maintained because it provided a beneficial function in human evolutionary history (Tooby & Cosmides, 1992). The result is that all people inherit a universal genetic architecture comprised of the same psychological adaptations. In other words, we all possess a common human nature. The expression of jealousy is a part of that human nature. Arguments that jealousy takes many forms across many cultures and is therefore not universal or is not genetically encoded miss the mark. Those arguments ignore the most fundamental point that, while the expression of jealousy might vary cross-culturally or between individuals, jealousy is nonetheless universally expressed.

The variation of any component of human nature across cultures informs us only about the particular natures of each of those cultures. Cultures represent varied environments and environmental input is expected to create manifest differences in every evolved component of human nature. Similarly, individual variation in the experience and expression of jealousy is not surprising, since environmental input into that universal adaptation is expected to result in manifest individual differences. The tendency to experience romantic jealousy is universal, but each individual can be expected to experience and express romantic jealousy in a fashion consistent with the particular modulating influences of his or her experience.

*Summary*

The position taken in this paper is that jealousy is an evolved adaptation. It is a basic human emotion and it has a purpose and is common to all people. However, the expression of jealousy is expected to vary between individuals because of varied environmental input. The result is that each individual expresses jealousy in a fashion consistent with the realities of their particular situations.

The Function of Jealousy

Evolutionary accounts of romantic jealousy were inspired by the “parental investment” research of Trivers (1972). Trivers pointed out that in a species with internal fertilization, males cannot confidently identify their offspring. The resultant paternity uncertainty is a selection pressure that operated against the evolution of post-zygotic paternal investment. In other words, men needed to strike a balance between the degree to which they invested in the offspring of their mate with their degree of confidence that the offspring was in fact theirs. Modern estimates suggest that 9 to 13% of children have putative fathers that are not their genetic fathers (Baker & Bellis, 1995). While a modern estimate might not accurately present the dilemma faced by men throughout evolutionary history, such an estimate is important. It is important because it provides evidence that paternity certainty was more than merely a theoretical problem for men and that it was, in fact, a practical problem (Buss, 2000). Men who were indifferent towards their partners’ sexual contacts with rival males experienced lower paternity certainty, greater investment in competitor’s gametes, and lower reproductive success than did men who noticed and acted on cues of infidelity. Therefore, jealous men had an advantage.

Unlike men, women were always certain of maternity. Barash (1977) speculated that because her husband's adultery did not diminish his capacity to inseminate her, a wife risked little if her husband engaged in extramarital sex. Symons (1979) wrote, "a wife's experience of sexual jealousy varies with the degree of threat to herself that she perceives in her husband's adultery, whereas a husband's experience of sexual jealousy is relatively invariant, his wife's adultery almost always being perceived as threatening" (p. 232).

For an ancestral woman, the infidelity of a mate was most damaging if it resulted in the withdrawal of resources (Buss, 1988; Buss et al., 1992; Trivers 1972). Therefore, women should have been most sensitive to infidelity that signaled the removal of paternal investment. Buss et al. (1992) speculated that women risked losing a man's investment in at least two situations. First, in monogamous marriages, women faced the possibility that their mate would partially divert his resources to a woman with whom he was having an affair or that he would depart and totally divert his resources. Second, in polygynous marriages, women faced the possibility that their mate would invest more heavily in the offspring of other wives at the expense of his investment in her offspring. The emotional attachment to another woman has been presumed to be the best indicator of potential resource removal (Buss et al., 1992). In other words, women should be most disturbed by the knowledge that their partner has fallen in love with another woman.

### *Summary*

The function of jealousy for men was to increase their confidence that the offspring into which they invested were in fact their own. Women, on the other hand, were always certain of their maternity. For women, the function of jealousy was to reduce the probability that her mate would divert resources from her offspring to the offspring of another woman.

### Organization of the Literature Review

The evolutionary description of jealousy is preferred because it can best account for the existing data and provide an explanation for both the existence and function of jealousy. The evolutionary account can accommodate both the universal nature of jealousy and the significant individual variation that characterizes jealousy. In the sections that follow, evolutionary psychology will be briefly outlined and the nature of evolved adaptations will be explained. The function of jealousy will be described, and it will be shown how jealousy can be both universally expressed by all people yet evidence significant individual variability. The variation that characterizes the jealous experience is argued not to be arbitrary, but, rather, to be adaptively patterned. The thesis of this study is that individuals should be expected to express jealousy in a fashion consistent with the fertility of their mates, their sex, experiences, and circumstances. The present study is an investigation into the moderating influence of these factors on jealousy. Jealousy will first be defined and differentiated from other human emotions, and then societal perspectives of jealousy will be detailed. Various academic accounts of jealousy will then be presented, and their various failings pointed out.

### Defining Jealousy

Buss (2000) in his book, *The Dangerous Passion* briefly described how the word jealousy came into the English language via the French words jaloux and jalousie, both of which had their origin in the Latin word zelus. The Latin word was borrowed from the Greek word zelos, which meant fervor, warmth, ardor, or intense desire. Buss pointed out that the French word jalousie has a dual meaning. In one sense, jalousie is similar in meaning to the English word jealous, but it also refers to a Venetian blind, the kind with numerous horizontal slats. The psychiatrist Nils Retterstol (1967; cited in Buss, 2000) offered a theory

for how *jalousie* came to be a term for a Venetian blind. Retterstol speculated that the association might have arisen from the circumstance in which a husband suspicious of his wife could secretly observe her from behind the *jalousie*, presumably to catch her involved with another man.

Jealousy was defined by Clanton and Smith (1977) as a feeling of displeasure expressing itself either as a fear of loss of the partner or as discomfort over a real or imagined experience the partner has had with a third party. Buss (2000) commended Clanton and Smith for capturing two central components of jealousy: the threat of losing a partner and the presence of a third party. However, Buss pointed out that the Clanton and Smith definition does not account for precisely what sort of *real or imagined experience* the partner has had with someone else. In addition, Buss noted that the definition fails to mention the complex emotions and varied behaviours that characterize the jealous response. From an evolutionary psychology perspective, the conditions that evoke jealousy and the subsequent emotions and behaviours are not arbitrary. Rather, the conditions that evoke jealousy do so because, over the course of human evolution, those conditions had detrimental biological consequences. Therefore, adaptive behaviour in the midst of those conditions was selected for because it reduced the negative consequences. The anger, rage, humiliation, fear, anxiety, sadness, and depression that are frequently associated with jealousy and the behaviours, as varied as aggression and avoidance, are directed at reducing those potentially harmful biological consequences (Buss, 2000; Buss & Shackelford, 1997a).

Daly et al. (1982) defined jealousy as “a state that is aroused by a perceived threat to a valued relationship or position and motivates behaviour aimed at countering the threat” (p. 12). Buss (2000) pointed out that the definition of Daly et al. highlights three additional facets

of jealousy. First, jealousy is a state. Jealousy is a temporary or episodic experience and not a stable condition. Second, jealousy is evoked in response to a threat toward a valued relationship. Jealousy is not usually evoked in the context of relationships that are brief and casual. Third, jealousy motivates actions that are designed to deal with the threat. In other words, jealousy results in particular behaviours that reduce the threat to the valued relationship.

According to Buss (2000), the definition of jealousy provided by Daly et al. (1982) is lacking in that it does not stipulate the nature of the perceived threats that are likely to evoke jealousy. Buss pointed out that relationship threats can take many forms, including threats that are sexual, emotional, economic or intellectual. From an evolutionary psychology perspective, the threats that evoke jealousy are not arbitrary. Instead, they are quite particular, for example, the fear of losing a valued relationship because of death is argued not to typically evoke the experience of jealousy.

Jealousy is not a uniform phenomenon. Jealousy can occur as easily between friends, lovers, and siblings. Romantic jealousy refers to the jealousy that is evoked within the context of romantic relationships and is the focus of this study. Romantic jealousy is typically evoked by the real or potential infidelity of the partner and results in responses that range from almost non-existent in some people to morbidly violent or delusional in other people. Wilson and Daly (1992) wrote that romantic jealousy “has been conceived as a personality characteristic, a particular emotion, a particular set of actions, or anything one feels or does in a particular sort of situation” (p. 302). Wilson and Daly advocated for a view of romantic jealousy as,

A complex psychological system whose functioning is inferred from observable combinations of circumstances and responses – a system that is

activated by a perceived threat that a third party might usurp one's place in a sexual relationship and that generates a diversity of circumstantially contingent responses aimed at countering the threat (p. 303).

The point Wilson and Daly were making is that romantic jealousy is evoked by a particular threat and results in situation appropriate behaviours that are directed at defeating the particular threat. In summary, their point is that the jealous experience is not arbitrary but is instead organized and functional.

### *Envy and jealousy*

Envy and jealousy are frequently confounded (Bers & Rodin, 1984; Salovey & Rodin, 1984). In fact, American English speakers were found often to use the word "jealous" to describe both situations of envy and jealousy (Stepanova & Coley, 2002). One reason for the conflation of jealousy and envy is the frequency of their co-occurrence. For example, when a person's romantic partner pays attention to an attractive rival, the person might be jealous about their partners contact with the rival and envious of the rival for being so attractive (Schmitt, 1988).

The term envy is derived from *invidere*, a Latin word meaning to look upon with malice. Envy occurs when a person lacks another's superior quality, achievement, or possession and either desires it or wishes that the other lacked it (Parrot & Smith, 1993). The experience of envy is characterized by feelings of inferiority, longing, resentment of the circumstances, and ill will toward the envied person, sometimes accompanied by guilt, denial, or awareness of the inappropriateness of the ill will (Parrot, 1991; Parrot & Smith, 1993). Jealousy, by contrast, necessarily occurs in the context of a relationship; a person becoming

jealous when they perceive a rival as posing a threat to their valued relationship. The jealous experience is characterized by anxiety, distrust, and a fear of rejection or loss (Parrott, 2001; Parrott & Smith, 1993)

Parrot and Smith (1993) pointed out that envy and jealousy do appear to have some overlap. Both can involve hostility and resentment. Both also can involve some form of lowered self-esteem and sadness; envy because of inferiority and longing, and jealousy because of rejection and loss. However, as Parrot and Smith also wrote, even those shared aspects can lead to distinguishable experiences. For example, envious hostility is rarely socially sanctioned, whereas jealous hostility has usually been afforded greater legitimacy. Therefore, envious hostility is less likely to entail righteous anger and more likely to be accompanied by a sense of disapproval by others.

In simple terms, envy occurs when another has what one lacks, whereas jealousy is concerned with the loss of a relationship that one already possesses. Envy involves two elements, oneself and a person to whom one compares poorly, whereas jealousy requires three, oneself, a partner with whom one has a relationship, and a rival to whom one fears that this relationship will be lost. Finally, envy is evoked when we compare poorly with others on characteristics deemed important, whereas jealousy involves the fear that a valued partner will abandon us in favour of a rival who may actually be inferior to us in all other respects (Neu, 1980).

#### *Societal perspectives of jealousy*

As early as 1906, jealousy was recognized as an important aspect of human psychology. Gesell (1906) wrote,

Animal jealousy, a fundamental instinct, appearing in the lowest and higher vertebrates was connected chiefly with feeding, mating and breeding. Jealousy appears very early in the human and continues into old age...the common constituents of it were anger, grief and self-pity and most painful of all emotions. The pathology of jealousy revealed the tremendous practical importance of the instinct and its helpfulness in the cultivation of a healthy personality among children and youth. Jealousy is at the basis of many attitudes which an individual takes toward his fellows; it colors social custom and situations and motivates group action (p. 437).

Like the modern perspective of the evolutionary psychologists, Gesell recognized jealousy as being normal, instinctual, motivating, and as having specific functions.

Lay perspectives have not typically been to view jealousy as a normal aspect of human experience. Sommers (1984) wrote that Americans characterize jealousy as an emotion to avoid, conceal from others, uncomfortable to experience, dangerous, destructive, and of no usefulness. Mullen (1991, 1993) argued that the concept of jealousy, as it is encoded in language, law, and social concepts, has been transformed in Western societies. In Mullen's view, jealousy has shifted from being a socially sanctioned response to infidelity into a form of personal pathology characterized by immaturity, possessiveness, and insecurity. The result, because the social, ethical, and interpersonal meanings of jealousy have been stripped away and the boundary between normal jealousy and pathological jealousy blurred, is that the jealous response has ceased to be the responsibility of the individual (Mullen, 1991; 1993).

*Jealousy and violence*

The aggressive competition for females and the sequestering of mates from rivals are male preoccupations in many species, including mammals. Cross-cultural and historical reviews of codified law reveal a consistent limitation on the sexual rights of women (Daly et al., 1982). The sexual intercourse between a married woman and a man other than her husband has consistently been an offence. The victim, who was always the husband, was commonly entitled to damages, violent revenge, or to divorce with a refund of bride price (Daly et al., 1982). In a review of European adultery law, Hadjiyannakis (1969; cited in Daly et al., 1982) found that male infidelity was not criminalized until 1810 when in French law it was written that a man could not keep a concubine in his conjugal home against his wife's wishes. Then Austria in 1852 was the first country to institute legal equality between spouses, but even that law considered the husband to be an offended party if the paternity of an infant was questioned.

Legal traditions have commonly acknowledged that when female adultery is discovered, a jealous rage on the part of the victimized husband is expected. Infidelity has frequently been viewed to justify or at least mitigate responsibility for violence. In America Vance and Wynne (1934; cited in Daly et al., 1982) described the "unwritten law" which, according to their analyses of law references, was "a popular expression to designate a supposed rule of law that a man who takes the life of a wife's paramour or a daughter's seducer is not guilty of a criminal offence". Vance and Wynne found examples of juries acquitting husbands based on the "unwritten law" despite explicit instructions by the presiding judges to ignore the "unwritten law" and convict the offender.

Modern opinions of jealousy-motivated violence are somewhat consistent with historical analyses. Puente and Cohen (2003) found that while people generally perceived violence to signal a lack of love, they did not make the same attribution about jealousy-related violence. When a man hit his wife over a jealousy-related incident, people believed that he loved her at least as much as when he did not hit her. Puente and Cohen found that jealousy-related abuse was viewed as more justified and as less indicative of relationship problems than disputes in non-jealousy situations. However, an indication of societal change was the finding that despite a lingering acceptance of jealousy motivated violence the violent male was nevertheless perceived to deserve harsh punishment (Puente & Cohen, 2003).

Daly et al. (1982), and later, Daly and Wilson (1988) in their book *Homicide*, built a case for jealousy as one of the leading motivations for murder in all societies. They cited research into the motives of hundreds of murders including samples from Philadelphia, (Wolfgang, 1958), Manhattan (West, 1968), England and Wales (Gibson & Klein, 1961), Scotland (Gillies, 1976), Baltimore, and the Navajo people in Arizona (Daly et al. 1982). In each of the studies jealousy ranked as one of the top three motives for murder. In the words of Daly and Wilson (1983), “if a marriage contract provided a man with a magical guarantee of paternity, the world would be a more peaceful place” (p. 285).

Daly et al. (1982) also noted the link between jealousy and wife assault. They cited a study by Miller (1980) who found that over half of a sample of battered women reported jealousy as a reason for their husband assaulting them. Whitehurst (1971; cited by Daly & Wilson, 1988) attended 100 court cases involving a husband’s assault on his wife. He found that in almost every instance, the husband reported being motivated by the frustration of not being able to control his wife and in many cases, the charged husband accused his wife of

being a “whore” or of having an affair. Whitehurst also reported that 12% of men in an adult middle-class sample believed that a wife should be beaten if she were to indulge in extramarital sex.

### *Summary*

Lay perspectives of jealousy have ranged from contempt for that emotion to regard for that emotion as a justifiable response to the infidelity of a partner. From an evolutionary psychology perspective, the circumstances that evoke jealousy and the subsequent behaviours associated with jealousy are not arbitrary. Rather, the conditions that evoke jealousy do so because they signal a threat to a valued relationship. The consequent jealous response is adaptive because it serves to reduce the relationship threat. The sum of the jealous experience for any individual is adaptive in that it is tailored to their personal and environmental circumstances.

### Explaining Jealousy

Various theories have been offered for the origin of the jealous response. Jealousy has been described as a cultural construction, stemming from societies expectations about the behaviour of men and women. Jealousy has also been ascribed to the influence of capitalism, specifically the capitalist emphasis on personal possessions. Others have attributed the expression of jealousy to a defect in the character of the jealous person, for instance immaturity or low self-esteem. Jealousy, especially the extreme manifestations of jealousy, has even been described as a form of pathology and therefore not a “normal” component of human behaviour.

It is argued that each of the aforementioned descriptions fail to provide an adequate account of jealousy. They fail because they provide proximate and therefore inadequate

explanations for jealousy. They all provide explanations that are tied to the behaviours of individuals, or to the jealous behaviour of only one culture or in one era. In summary, they fail to provide a distal and causal explanation for jealousy, an explanation that accounts for the origin and function of jealousy for all people.

Evolutionary psychologists have offered an explanation that describes the function of jealousy and why we should expect that all people would experience jealousy (Buss et al., 1992; Daly et al., 1982; Symons, 1979). From the evolutionary psychological perspective, jealousy is an adaptation. Jealousy like other adaptations is a mechanism or system of properties crafted by natural selection to solve a specific problem encountered by ancestral populations during the course of evolution (Tooby & Cosmides, 1992). From the perspective of the evolutionary psychologists, the induction of jealousy is not arbitrary; it is evoked by particular stimuli and results in organized and adaptive behaviour focused on managing the particular evoking threat. Proximate explanations invoking cultural, societal, and economic or personality defects as causes of jealousy are only offering moderators of the jealous experience and are thus not explaining the origin or function of jealousy.

The expression of jealousy has frequently been viewed as the result of personality defect. Jealousy, by such accounts is related to and caused by personality inadequacies ranging from low self-esteem, anxiety, neurosis, dissatisfaction with life, external locus of control, and dogmatism (e.g., Bringle, 1991; Mathes & Severa, 1981; Mathes, Roter, & Joerger, 1982; Salovey & Rodin, 1984; White, 1981; White & Mullen, 1989). The assumption is that some people, because of personality defect are predisposed to more frequent and intense jealous episodes. For example, having low self-esteem has been associated with the expression of extreme jealousy (Mathes, Adams, & Davies, 1985; White, 1981), and threats to

self-esteem have been postulated as a cause of jealousy (DeSteno & Salovey, 1996; Salovey & Rodin, 1991; Salovey & Rothman, 1991). Buss (2000) wrote that attributing jealousy to poor self-esteem fails to answer the question of why self-esteem exists and why we should be motivated to maintain it. Therefore, rather than answer any question about the origin or cause of jealousy the self-esteem research only shifts the questions to another basic process.

Wilson and Daly (1992) criticized proposals that jealousy is the product of personality defect on the basis that such proposals fail to account for the function of jealousy. For example, to equate jealousy with a character defect ignores and tacitly rejects an examination of the social consequences of jealousy and the effectiveness of jealousy in promoting sexual exclusivity. In addition, they pointed out that the studies linking jealousy and self-esteem have failed to consider that having poor self-esteem might reflect the accurate assessment of one's own value and the value of one's mate. Some people might have a legitimate concern to be jealous if they are, for some reason, undesirable or simply just less desirable than their mate is (Wilson & Daly, 1992).

Attributing the expression of jealousy to a defect in personality makes the implicit assumption that to correct the defect in the individual would result in the disappearance of jealousy (Buss, 2000). The reality is that the jealous response is universal. Arguably, all people express jealousy to some degree regardless of the existence or severity of any personality defect. Instead, the absence of a jealous response in the face of a real relationship threat could be indicative of pathology or at the least an indication of serious problems in the relationship. For example, individuals with schizoid personality traits are noted for their emotional coldness, detachment from social relationships, and flattened affect, and individuals experiencing depression are often noted to be indifferent to the circumstances of their

environment (American Psychological Association, 2000). Finally, much of what is described as morbid or extreme jealousy can actually be understood as normal, but as falling on the high end of a continuum of possible jealous expressions. As Buss pointed out sometimes people labeled as suffering from “pathological jealousy” turn out to have mates who have been chronically unfaithful for years.

The expression of jealousy has frequently been described as simply the manifestation of a cultural construction. For example, socio-cultural theorists (e.g., Eagly & Wood, 1999) account for social phenomena (e.g., jealousy) by attributing their existence to processes of socialization into particular cultural systems of shared beliefs, values, and roles. From their view a person’s self-concept and the behaviours they express are consistent with the cultural systems to which they have been exposed. Frumkin (1957) argued that the “rugged individualistic” ideology of Americans results in “authoritarian” sexual jealousy (p. 1). Similarly, Bhugra (1993) argued that jealousy is the result of “capitalist society”. He maintained that capitalist ideals of placing a premium on personal possessions and property have extended to the possession of other people. In Bhugra’s words, the capitalist society encourages “treating the love object in a literal object manner, taking the partner to be the individual’s personal possession or property” (p. 272).

A socio-cultural standpoint is also inherent in Hupka’s (1991) well-known explanation for jealousy. Hupka agreed that people do have an innate capacity to experience the jealousy related emotions. However, he insisted that before individuals are capable of attributing their emotions to jealousy they must first *learn* to value romantic relationships. In addition, they must *learn* the motives for being jealous, the appropriate target of the jealousy, the events that trigger the jealousy, who expresses jealousy, the manner of expressing it, who is to blame for

the predicament, and so forth. Hupka argued that it is unlikely that the human mind is hardwired to respond in any emotional fashion that is not required by immediate survival. In his opinion, the jealous response reflects a desire to control the sexual behaviour of mates and that it has its origin in socially constructed gender systems.

The social constructivist explanations for human behaviour like those of Hupka (1991) and of Bhugra (1993) assume that societal structures are arbitrary and therefore that the roles ascribed to the members of a society are also arbitrary and must be learned. They maintain, for example, that if men and women differ in their desires for beauty, honour, masculinity, femininity, recreation, career choice, etc., that those differences are learned. Societies are therefore expected to vary widely in the behaviour that is considered normal for its members. Presumably, if societies in fact do vary substantially and if norms are arbitrary then all aspects of human behaviour including the expression of jealousy should be significantly varied between societies. For example, societies should exist in which men are more jealous than women and others that have the opposite pattern. Presumably, there would also be cultures whose members are consistently and extremely jealous and others that completely lack the expression of jealousy. If Bhugra was correct and jealousy is the product of a “capitalist society”, then people living in socialist, anarchist, or dictatorship societies should demonstrate jealous responses that vary not only from those of capitalists but also from each other. However, cultures with markedly varied expressions of jealousy have not been shown to exist and as Buss (2000) wrote, “cultures in tropical paradises that are entirely free of jealousy exist only in the romantic minds of optimistic anthropologists, and in fact have never been found” (p. 32).

The behaviours that evoke jealousy are consistent and not arbitrary. What has been found to vary cross-culturally was the average intensity of jealousy in response to various forms of extradyadic behaviour. Buunk and Hupka (1987) investigated the intensity of jealousy in response to various behaviours in seven nations. Explicit erotic behaviour of the partner (e.g., flirting and sexual involvement) evoked a negative emotional reaction in all nations and behaviour that was more ambiguous (e.g., dancing and hugging) evoked reactions that were more neutral. While the intensity of jealousy varies cross-culturally both the experience of jealousy and the circumstances that evoke jealousy are consistent. Constructionist theories of jealousy fail to account for that cross-cultural consistency.

Any cross-cultural variability in the expression of jealousy is not necessarily evidence that jealousy is culturally learned. The human species is characterized by significant social complexity. Moral systems, alliances based on kinship and reciprocity, personal reputations, and ecological diversity all contribute to the tremendous cultural variability (Dickermann, 1979; 1981). However, as Wilson and Daly (1992) pointed out, there is a “ubiquity of a core mindset, whose operation can be discerned from numerous phenomena which are culturally diverse in their details but monotonously alike in the abstract” (p. 291). In other words, cultural variability is superficial, representing only surface variability based on an underlying constant. For example, marriage ceremonies vary extensively between cultures. However, the fact that marriage occurs in every known culture (Brown, 1991) and marks the unity of a man and woman in a relationship within which reproduction is both encouraged and expected signals a universal construct that is unlikely to be the arbitrary fabrication of any culture. At the “core”, a partner’s sexual or emotional infidelity evokes jealousy regardless of the cultural context (Buss et al., 1992; Buss, Shackelford, Kirkpatrick, Choe, Lim, Hasegawa et al. 1999;

Buunk & Hupka, 1987; Buunk, Angleitner, Oubaid, & Buss, 1996; Dijkstra, Groothof, Poel, Laverman, Schrier, & Buunk, 2001; Geary, Rumsey, Bow-Thomas, & Hoard, 1995; Voracek, 2001; Weiderman & Kendall, 1999). The experience of jealousy by all people regardless of their cultural upbringing, like marriage, signals its place as part of a universal human nature. Cultural variation is therefore merely one form of input that might influence the manifestation of the adapted jealous response.

Social constructionist perspectives also do not explain variation in the expression of jealousy between individuals within the same culture. For example, if the experience of jealousy is the product of capitalism, then we should expect that all people living in a capitalist society would express jealousy in the same fashion. Each individual would be expected to express jealousy in response to the same stimuli and at the same intensity as each other individual from the same society. However, there is significant variation in the manifestation of jealousy between individuals within the same culture. Varied environmental input between individuals is argued to be the cause of that variation. In many cases, environmental input might have the effect of modulating the expression of an adapted mechanism. For example, and in the case of jealousy, a person whose partner cheated in the past, while on a business trip, might be more likely to indicate a desire to accompany their partner on such trips in the future. Experiences (e.g., past infidelity) or circumstances that endure in a person's environment (e.g., the presence of many rivals) could have an effect on the experience of jealousy. Therefore, while the natures of the stimuli that evoke jealousy are argued to be consistent, the readiness and intensity of the jealous response can be expected to vary as a function of environmental input and experience. Individual variation in the jealous response is adaptive because it permits a response that is consistent with the particular

requirements of the individual's environment. A number of environmental circumstances might have the effect of moderating the manifestation of jealousy. For example, shared children in the relationship, relationship length, relationship satisfaction, one's age, and their partner's age might all moderate the experience of jealousy.

Neither the individual differences that characterize the manifestation of jealousy nor the cross-cultural variation in jealousy are a problem for the evolutionary psychology model. Cross-cultural and individual differences in the expressions of universal mechanisms are expected because of different environmental input. What at the behavioural level appears variable fractionates into variable environmental inputs and a universal design, interacting to produce manifest patterns of variation. In the next section, the evolutionary psychological approach will be reviewed. Adaptations will be described and it will be shown how jealousy fits a class of adaptations known as evolved psychological mechanisms. Evolutionary psychologists attribute the origin of all behaviour to the interaction between evolved psychological mechanisms and environmental input. All psychological mechanisms, including jealousy, evolved and persisted because they solved recurring problems of survival and reproduction.

### *Summary*

Theories attributing the experience of jealousy to that of a cultural construction or as a symptom of personality deficiency provide only superficial and proximate accounts for the role of jealousy. From the evolutionary psychological perspective, jealousy is an adaptation crafted by natural selection. The induction of jealousy is not arbitrary; it is evoked by particular stimuli and results in organized and adaptive behaviour focused on managing the particular evoking threat. Jealousy is argued to be universal expressed in response to similar

evoking stimuli in all cultures. Proximal explanations, invoking cultural, societal, and economic or personality defects as causes of jealousy are only offering moderators of the jealous experience and therefore are not explaining the origin or function of jealousy.

### Evolutionary Psychology

Evolutionary psychology is a synthesis of modern evolutionary theory, studies of behaviour inspired by evolutionary theory, and cognitive psychology (Kennair, 2002). The evolutionary psychology approach accounts for all human behaviour by invoking the action of evolved psychological mechanisms maintained in the inherited architecture of the human mind. All manifest behaviour depends on environmental input acting upon those inherited psychological mechanisms. Buss (1995a) pointed out that the environment can have no influence on a blank slate; a mind that lacks the structures and programs designed to respond to particular stimuli will fail to respond. The reason a human responds in particular ways to particular environmental input is because they possess, unlike a blank slate, inherited psychological mechanisms that are designed to respond to that particular stimuli. No behaviour can be produced without those mechanisms (Buss, 1995a). Those environmentally sensitive mechanisms owe their existence to evolution by natural selection (Tooby & Cosmides, 1990b). If a process other than evolution by natural selection exists that is capable of producing complex psychological mechanisms it remains currently unknown (Symons, 1987).

All psychological theories imply the existence of psychological mechanisms (Symons, 1987). In other words, all theories of behaviour appeal to mechanisms inherent to the organism, which permit a particular response to particular stimuli. Buss (1995a) provided the following examples: Skinner's theory of operant learning suggested the existence of

general mechanisms that cause organisms to alter their behavioural responses in accordance with their history of reinforcement. Festinger's theory of cognitive dissonance implied the existence of psychological mechanisms designed to reduce our tendency to maintain thoughts or behaviours that were not commensurate with each other. Finally, Latane's theory of social loafing implicitly posited the existence of a psychological mechanism causing people to diminish effort in a task as a function of the presence of others.

While all psychological theories imply the existence of psychological mechanisms, they frequently cannot fully explain behaviour because they fail to account for the precise origin and nature of the mechanisms (Buss, 1995a). It is the ability to account for the nature of and origin of these varied psychological mechanisms that puts evolutionary psychology in a position to provide an integrative perspective that could potentially prove to be a meta-theory connecting the seemingly disparate empirical findings and theories of psychology (Barkow, Cosmides, & Tooby, 1992; Buss, 1995a, 1995b; Kennair, 2002). What is the nature of the psychological mechanisms that evolution by natural selection has fashioned? What are their functions; what problems did they solve?

#### *Evolved psychological mechanisms*

Successful navigation over the long course of our species evolutionary history has required that humans solve a multitude of problems. Many problems had an effect, directly or indirectly, on the ability of individuals to have children and thereby to pass on their genes. Individuals who possessed the means to solve such problems invariably had more children than individuals who failed to solve such problems. Those problems that repeatedly affected the ability of individuals to reproduce, however indirectly, are called adaptive problems.

Avoiding predation, obtaining food, shelter, finding a mate, and communicating with others are examples of adaptive problems repeatedly faced by our ancestors (Cosmides, Tooby, & Barkow, 1992). Individuals who were predisposed to have the ability, through whatever means, to reduce the impact of, or solve adaptive problems, enjoyed greater “fitness” or in other words, they sired more offspring. The offspring of successful individuals often shared the advantage and were rewarded with an increase in their fitness, and so on.

Amongst a variety of strategies to solve a particular adaptive problem, the strategy that resulted in the greatest net benefit to the individuals’ fitness tended to persist while the others disappeared. The psychological mechanisms responsible for the performance of those fitness-enhancing strategies were therefore preserved, replicated, and became the most common throughout the population. For example, a psychological mechanism to display aggression in particular contexts might have increased the fitness of those who possessed it because it enhanced their ability to secure resources or defend offspring (Buss & Shackelford, 1997b). Evolved psychological mechanisms, designed to solve specific adaptive problems and genetically shared by all members of the species, fit into a class of evolved structures called “adaptations” (Williams, 1966). Therefore, an adaptation is a psychological mechanism or organic structure that evolved precisely because it recurrently enabled its bearers to solve a specific adaptive problem (Tooby & Cosmides, 1992).

The period of evolution during which the bulk of our psychological adaptations formed is generally considered the Pleistocene and is called the environment of evolutionary adaptation (EEA) (Bouchard & Loehlin, 2001; Buss, 1995a; Symons, 1992; Tooby & Cosmides, 1992). It is important to distinguish between the present-day environment and the EEA because psychological mechanisms shaped by the EEA need not be adaptive in the

contemporary environment (Tooby & Cosmides, 1992). Therefore, if particular behaviours fail to be fitness enhancing in the contemporary environment, it cannot be said that the behaviours are not adaptive or are not caused by psychological adaptations. In other words, humans are not “fitness-maximizers” they are instead “adaptation-executors”, (Symons, 1992; Tooby & Cosmides, 1992, p. 54) we simply respond with particular evolved patterns of behaviour when triggered by particular input. The response is insensitive to its own effectiveness at that time and in that environment. Therefore, behaviour that might have been adaptive when expressed in the EEA might seem harmful or insensitive today. As Cosmides and Tooby (1997) wrote, “our modern skulls house a stone age mind” (Principle 5 section, para. 5).

The adaptive problems that humans faced in the EEA were many, complex, and different from one another. Different adaptive problems selected for different adaptive solutions. For example, the solution of how to attract a mate would have done little for the problem of what foods to eat. As a result, our evolved adaptations are also many, complex, and different from one another; each designed to solve a particular adaptive problem (Tooby & Cosmides, 1990b). There are no general solutions because, as Symons (1992) wrote, there are no general problems. Therefore, an evolved psychological mechanism, or adaptation, is a set of processes possessed by an organism, existing in its particular form because it solved a specific adaptive problem. Adaptations are activated by information, internal or external, that specifies to the individual that they are facing a particular adaptive problem. The psychological mechanism then acts to regulate physiological activity, provide information to other psychological mechanisms, or produce a manifest action (Buss, 1995a). The result is that the particular adaptive problem is managed.

Adaptations are complex and require potentially hundreds of genes for their development. The process of sexual recombination, the genetic reshuffling that results from sexual reproduction, makes it unlikely that such complex genetic arrangements would be maintained if there was substantial variability between individuals (Buss, 1995a; Tooby & Cosmides, 1990b). Therefore, most, or all humans, share the same evolved adaptive mechanisms, they are in effect “human universals”, or simply, they are human nature.

Behaviour geneticists have frequently called into question the value of characterizing a shared human nature, given their estimation of the magnitude of genetic differences (Tooby & Cosmides, 1990b). As already mentioned, natural selection and sexual recombination, impose relative uniformity in complex adaptive designs. Buss (1995a) pointed out that the relative uniformity, or the existence of a human nature, is apparent in human physiology. Barring unusual genetic or environmental circumstances, all people have two eyes, a heart, and a liver. Of course, individuals can vary in the strength of their heart or the efficiency of their liver but they do not vary in the possession of those structures. Psychological adaptations are no different. All humans share the universal set of adaptations comprising human nature, but there will be individual differences in how they are expressed (Buss, 1995a; Tooby & Cosmides, 1992). Therefore, individual differences, including heritable individual differences, are unlikely to represent differences in the presence or absence of complex adapted mechanisms. Characteristics in which individuals differ because of genetic differences are considered an unrepresentative subset of human phenotypic characteristics. They are generally limited to quantitative variation in the components of complex, highly articulated, species typical psychological mechanisms. People do not differ in the presence or absence of adaptations but, rather, in how the adaptation is expressed (Buss, 1995a). Therefore,

genetically caused differences are variation constrained within the universal, adaptively organized human nature (Tooby & Cosmides, 1990b).

### *Summary*

The psychological mechanisms that are primary to human behaviour are adaptations shared by all people and are the product of natural selection. They evolved because they solved specific problems of individual survival or reproduction repeatedly over the course of human evolutionary history. Psychological mechanisms are encoded in complex genetic arrangements and they persist despite sexual recombination. Therefore, it is unlikely that adaptations and their constituent genes vary between individuals. Individual differences are obvious but those differences can be explained at least partly as due to the effect of varied environmental influences. The evolved jealousy mechanism is no different. Jealousy is functional and is expressed universally. Variation noted in the jealous response is adaptive variability patterned in response to particular relevant environmental input.

### Jealousy and Evolutionary Psychology

Evolutionary psychologists attribute the origin of all behaviour to the interaction between universal evolved psychological mechanisms and environmental input. Psychological mechanisms are domain and content specific information processing systems (Buss, 1995a; Tooby & Cosmides, 1992). Domain specificity means that evolved mechanisms are activated and employed only in those contexts or situations (domains) that signal the presence of the adaptive problem they evolved to manage. Content specificity refers to the fact that psychological mechanisms are sensitive to only the information that is relevant to the solution of the specific problem. Relevant information is processed rapidly, reliably, and efficiently. The domain of romantic jealousy is the romantic relationship and threats to one's investment

in a relationship. The induction of jealousy results in the content specific assessment of information relevant to the fidelity of the partner. Then relevant memories are recalled, thought is channeled into particular directions, and ultimately actions are initiated which are designed to reduce or eliminate the threat.

The complexity of the jealous experience and the variability in what evokes jealousy are not surprising considering the complexity of the threats that must be handled when a relationship is threatened. Once jealousy is invoked, the nature of the threat is assessed. Once the assessment is completed, any number of other emotional responses, each a psychological adaptation in its own right, might also be invoked to assist in the reduction of the threat. For example, jealousy is often evoked if one's partner is being persistently pursued by a rival. In that case, the jealous individual assesses the situation, determines that a rival is attempting to co-opt their mate, and might display anger or aggressiveness toward the rival in order to deter the intrusion. If the individual's mate expressed interest in the rival (e.g., flirting), then responses of hurt and fear might be expressed by the jealous individual as strategies to regain the affection of the mate. Finally, the jealous individual for a time might demonstrate increased vigilance until convinced that the threat has been managed.

The possession of an evolved jealousy mechanism is common to all people. The triggering events for that mechanism, and therefore the information that induces the experience of jealousy, are also universal. However, there is variation in the degree of jealousy people experience and in the readiness of individuals to experience jealousy. In addition, there is variation in the degree of jealousy evoked in response to different forms of infidelity. Some people report greater distress in response to the real or potential sexual infidelity of a partner while others are more concerned about the emotional infidelity of a

partner. The variability between individuals is explained at least partly by pointing out that the expression of a human nature composed of uniform psychological mechanisms will be effected by the interaction with relevant environmental circumstances.

### *Summary*

Romantic jealousy is a psychological adaptation. It is activated by potential threats to one's investment in a valued romantic relationship. Once activated jealousy motivates the individual to perform behaviours within a wide range that are focused on reducing the threat to the relationship. The experience of jealousy is universal, as are the events that trigger it. What has been found to differ between individuals is the capacity for various stimuli to evoke the jealous response. Individual differences in the induction and expression of jealousy are expected at least partly because of varied individual experiences.

### Adaptively Patterned Differences in Jealousy

Individual variation in the experience and expression of jealousy is obvious. Some people seem very jealous, indeed some are pathologically jealous, thrown into a violent rage at even the slightest suggestion of infidelity. Worse yet, some are deluded, jealous even when there is no evidence of infidelity. The outcome of extreme jealousy is often mortal (Daly & Wilson, 1988). On the other hand, some people express very little jealousy, not caring much about their partner's extradyadic involvement.

Most of us experience a degree of jealousy that falls within the two extremes described above. Most people, at least those people who have been involved in romantic relationships, have likely experienced jealousy. Many people may even have noted that their tendency to experience jealousy was not uniform from one relationship to another. With one

or more partners, we may recall experiencing little jealousy but with a particular other, we experienced a great deal of jealousy when they flirted or someone flirted with them.

We might even be able to account for the difference. We might recall not having been very attracted to some of our partners, or that we did not highly value the relationship. Some people might report not feeling jealous until they were married and were raising children with their partner. Others might report having been subject to a partner's infidelity and were henceforth very jealous. Our life experiences and our present circumstances seem to have the effect of modulating our jealous experience. Buss et al. (1992) found that men who reported never having experienced a committed sexual relationship were more likely to choose emotional infidelity as most distressing. On the other hand, men who had experienced a committed sexual relationship indicated that sexual infidelity was more distressing. The point is that the jealous experience rather than being uniform is responsive to our circumstances.

Evolutionary biology provides a conceptual framework that permits reconciliation between the existence of a shared human nature and individual differences. From an evolutionary perspective both human nature and the widespread individual variation are the product of the evolutionary process. Our experience and expression of jealousy is proposed to be the resultant manifestation of our adapted jealousy mechanism interacting with relevant environmental input.

Since natural selection and sexual recombination impose genetic uniformity, it is unlikely that substantial genetic differences exist between individuals. Therefore, psychological adaptations are not likely to vary in quality between individuals. According to Tooby and Cosmides (1992), the fact that people reliably develop a clearly recognizable species-typical psychological architecture should not be taken to imply that our development

is absolute or impervious to modification. Tooby and Cosmides pointed out that ontogenetic intervention can have the effect of evoking or attenuating the activity of psychological adaptations. Therefore, the task of our “adaptations is not to assemble a machine of fixed design, but rather to assemble and modify the set of expressed adaptations according to a moving target of age, sex, and circumstance-dependent design specifications” (Tooby & Cosmides, 1992, p. 81). Put simply, evolved adaptations are evoked and manifested in a fashion consistent with the circumstances faced by each individual.

Not all features of evolved human design are likely to be present at any one time in any one individual. The genetically universal may be developmentally expressed as different maturational designs across the life span, in females and males, or in accordance with the different circumstances faced by individuals. Adaptations are not necessarily expressed in every individual. They only had to be expressed often enough in our evolutionary history to have been the targets of selection, and therefore to have been organized by selection so that they reliably develop under appropriate circumstances (Tooby & Cosmides, 1992). Our jealousy mechanism is no different. Jealousy, like other adaptations, is likely to be characterized by significant individual variability; representing adaptive flexibility in concert with our sex, maturity, and experiences.

In summary, individual differences are not separate from human nature; they are simply differences in how individuals come to express the common human nature (Buss, 1995a; Buss & Greiling, 1999; Tooby & Cosmides, 1990b; 1992). While individual differences are unlikely to be adaptations, or represent the expression of alternative human natures, Buss (1995a) reasoned that they are adaptively patterned. In other words, individual

differences are not arbitrary but exist because they enhanced our ability to behave adaptively at particular stages of life or under particular circumstances.

Our psychological adaptations are many and therefore we are able to respond to a wide variety of potential inputs. Each evolved mechanism is sensitive to particular input. Hence, the environmental, maturational, or biological input recognized by an adapted mechanism will have the effect of customizing our adapted expression. Many adaptations respond to immediate input and can reverse if the input alters, as opposed to being “locked in” (Tooby & Cosmides, 1992, p.81). Input in the form of what Buss and Greiling (1999) call “enduring situational” could have the effect of modulating the jealous response. In addition, a person’s sex (i.e., biological input) has also been found to be a particularly potent modulator of the jealous response. The result is human behaviour that is contextually adaptive and therefore varied between individuals (Tooby & Cosmides, 1992). The individual’s unique expression of human nature is, according to Buss (1995a), “strategically patterned” because it is caused by the individual, with their unique characteristics confronting different “environmentally or heritably induced” adaptive problems. In summary, we express our universal human nature in the way that best enables us to solve the adaptive problems of our unique circumstances.

### *Summary*

Like all adaptations, the experience of jealousy and the concomitant jealous response, have distal causes but are influenced, triggered, and moderated by proximal internal and external stimuli. The variation in the expression of our human nature, the same variation evident in expressions and experiences of jealousy are adaptive, not arbitrary. The variation is adaptive because it enhances the ability of individuals to behave adaptively in response to

their particular maturational, biological (e.g., sex), and enduring situational circumstances (Buss, 1996; Buss & Greiling, 1999; Tooby & Cosmides, 1992).

#### Sex Differences in Jealousy

Over the course of human evolutionary history, both sexes faced threats to valued relationships. Therefore, both sexes faced an adaptive problem to which jealousy evolved as a solution. There is no reason to predict that one sex has evolved to be more jealous than the other (Buss, 1995a). In fact, most studies have found that the sexes are equally jealous (Buss, 1995a; White & Mullen, 1989) a finding that holds up cross culturally (Buunk & Hupka, 1987). Jealousy is argued to be a species-typical adaptation and is therefore expected to be evident in all cultures (Daly & Wilson, 1988).

The sex of an individual has been put forward as a particularly potent modulator of the jealous experience. Evolutionary psychologists have predicted that the sexes should differentially weigh the importance of different forms of infidelity (Buss et al, 1992; Daly et al., 1982; Symons, 1979). Buss et al. (1992) were the first to demonstrate a sex difference in the infidelity perceived as inducing the greatest jealousy when respondents were required to make a choice. Since then sexually dimorphic jealousy induction has been replicated numerous times (Bailey, Gaulin, Agyei, & Gladue, 1994; Buss et al., 1992; Buss et al., 1999; DeSteno & Salovey, 1996; Harris & Christenfeld, 1996a; Pietrzak, Laird, Stevens, & Thompson, 2002; Wiederman & Allgeier, 1993).

#### *The origin of sex differences in jealousy*

Mammalian females enter estrus periodically and sexual activity typically occurs within that brief fertile period. The challenge for primate males has been to mate with their

partners during that fertile time while preventing her pairing with a rival male; if effective, he may be relatively confident in his paternity of subsequent offspring. When his partner is not fertile, a male can relax and not worry that her contact with other males will result in her becoming impregnated. Human females are unique among primates in that they possess the adaptation of concealed ovulation. In other words, the current reproductive status of any woman is partially obscured.

Concealed ovulation created a new adaptive problem for men; it decreased their certainty of paternity. Human males were never certain when their partner was ovulating and therefore could only be certain of paternity if they were able constantly to restrict their mate's access to rival males. For most men, constant guarding was impractical because survival required much more than reproduction. Males were obviously frequently busy away from their mate and therefore had lower certainty in their paternity.

Marriage provided one potential solution. Married men gained more frequent and consistent sexual access to their mate throughout her reproductive cycle. In addition, marriage provided an opportunity to learn intimately about a mate's personality therefore making it more difficult to conceal infidelity (Buss, 2000). This access benefited married men reproductively relative to other men because it increased their paternity certainty (Alexander & Noonan, 1979; Buss, 2000). Socially sanctioned marriage also had the benefit of reducing conflict within male coalitions by providing clear signals of who was mated with whom (Buss, 2000).

The risk of raising a rival's offspring was a serious adaptive problem for men because of the great investment they often devoted to their children. Failure to detect and prevent infidelity reduced paternity certainty and increased the risk that a man might unwittingly

invest in the offspring shared between his wife and another man. In that case, the man lost not only his own investment but also the investment of his wife who was from that point on investing her efforts into the offspring of another man. Buss (2000) stated succinctly, “men who were indifferent to the potential sexual contact between their wives and other men are not our ancestors” (p. 149). It is not surprising then that most men when they are asked to report the qualities that they desire in a mate indicate a desire for a partner who expresses her intention to be faithful during the course of the marriage (Buss & Schmitt, 1993).

A mate’s infidelity also posed an adaptive problem for women. However, “Papa’s maybe” was always “Mama’s baby” (Buss, 2000, p. 52) and therefore women were not faced with the threat of parental certainty. Instead, a woman had to be concerned about maintaining a mate’s investment in her offspring. Therefore, a woman’s jealousy should be most easily evoked by cues of her mate’s potential resource reallocation. A man’s emotional connection to another woman has been proposed as just such a cue (Buss et al., 1992). Presumably, a woman will be vigilant about the attention her partner affords other women. Any attention paid to a rival means less investment in his relationship with his mate and her offspring. However, men are also only likely to invest in the offspring of women with whom they have had sex. Therefore, a man’s potential or actual sexual contact with another woman might signal his imminent reallocation of resources. In that case, a man’s sexual infidelity is only a risk to a woman if once he has slept with another woman he decides to invest in her subsequent offspring. The result is that jealousy can be expected to be a more flexible response in women, with any form of infidelity being significantly distressing. However, because a man’s emotional attachment is thought to be the best predictor of his intent to

reallocate resources, it is expected that women will be most wary of their mate's emotional infidelity.

*Empirical support for the existence of sex differences in jealousy*

Several evolutionary psychologists have argued for the existence of sexually dimorphic jealousy triggers (Buss et al., 1992; Daly & Wilson, 1992; Symons, 1979). Male jealousy is typically found to be most readily evoked by sexual infidelity while the jealousy of women is typically more easily induced by cues of emotional infidelity. A theory proposing a sex difference in the circumstances that most readily evoke jealousy does not preclude women from feeling jealousy in response to sexual infidelity, men from feeling jealousy in response to emotional infidelity, or either sex from feeling jealousy in response to other relationship threats. The theory simply predicts that sexual infidelity poses risks for men (i.e., paternity certainty) not faced by women, whereas emotional infidelity raises risks for women (i.e., paternal investment) not faced by men. The result is a sex difference in how different forms of infidelity are weighted by men and women.

The view of jealousy as a sexually dimorphic adaptation has received a great deal of attention in research and in popular publications. Robert Wright (1994), in his book *The Moral Animal*, proclaimed the jealousy theory to be the most rigorously tested hypothesis to emerge from evolutionary psychology. Wright cited the research on jealousy to be the finest example of evolutionary psychology. In his influential book, *How the Mind Works*, Pinker (1997) wrote that the established gender differences in jealousy are an especially well worked out and rigorously documented contribution to Darwinian psychology.

Empirical evidence dates back nearly 70 years. Gottschalk (1936; summarized in English by Bohm, 1960) found that among men, jealousy manifested itself mainly as a shock of feeling sexually inadequate or sexually repulsive, resulting in a simultaneous and sudden release of rivalry feelings. Women in that study did not respond with feelings of sexual rivalry or injury pertaining to sexual possession. Instead, women focused more on the emotional intimacy with the rival. Francis (1977), in interviews with 15 couples and using a free-association task, found that sexual involvement with a third person was the most often mentioned situation evoking jealousy for men. Women in that study reported that their partner spending time talking with a third person was of central importance. Similarly, Teisman and Mosher (1978) found that males experienced their jealousy primarily in terms of sexual issues, while women reported greater distress in response to their partner diverting their attention to a rival and spending time with a rival. In the Teisman and Mosher study, men, when asked to role-play a jealous situation picked a sexual topic more often than women did. A recent study by Schutzwahl and Koch (2004) had men and women read a story in which were embedded cues to sexual and emotional infidelity. In a surprise recall test, men preferentially recalled cues to sexual infidelity, whereas women preferentially recalled cues to emotional infidelity.

The findings of a series of studies by Buunk have also found a sex divergence in jealous focus. Buunk (1981) found that female expressions of jealousy were more typically characterized by a fear that they were no longer the only one for their partner. Buunk and Hupka (1987) found, across seven nations, that men responded with more jealousy than women did to the prospect of their partner engaging in a sexual fantasy about another person. Buunk (1984) studied a sample of Dutch people whose mates had engaged in infidelity. In

that study Buunk found that for men, but not for women, jealousy ratings increased when the cause of the affair was attributed to a need for sexual variety. Furthermore, unlike women, men were not able to adapt to the fact that their partner had been sexually unfaithful.

Sex differences in which form of infidelity is considered most distressing have been reported in samples from the United States (Buss et al., 1992; Buunk et al., 1996; DeSteno & Salovey, 1996; Harris & Christenfeld, 1996a), the Netherlands, Germany, Korea, Japan (Buunk et al., 1996), and Sweden (Wiederman & Kendall, 1999). According to Buss (1994), sex differences in the eliciting factors of human jealousy are probably a human universal.

The best evidence for the existence of a sex difference in the conditions that evoke the greatest jealousy comes from two kinds of studies: (1) forced-choice studies in which men and women are asked to indicate the type of infidelity, sexual or emotional, they would find most upsetting; and (2) physiological response studies, in which the physiological responses of male and female subjects are tracked as they imagine infidelity scenarios.

*Forced-choice studies.* The most direct evidence for a sex difference comes from studies using a forced-choice design first applied to jealousy by Buss et al. (1992). That design typically has male and female participants think of a committed sexual relationship that they have had or would like to have. The participants then choose which form of infidelity would be most upsetting: their mate (a) falling in love with someone else or (b) having sexual intercourse with someone else. A significant sex difference in which form of infidelity is chosen as most upsetting has been found in most studies employing the forced-choice design (e.g., Bailey et al. 1994; Buss et al., 1992; Buss, et al., 1999; Pietrzak et al., 2002; Wiederman & Allgeier, 1993; DeSteno & Salovey, 1996; Harris & Christenfeld, 1996a). A clear majority of women indicate that they would be more upset about emotional

infidelity, a majority that has ranged consistently between 62% (DeSteno & Salovey, 1996) and 86% (Buss et al., 1992). However, at most, only a slight majority of men say they would be more bothered by sexual infidelity, ranging from 47% (Harris & Christenfeld, 1996a) to 73% (Buss et al., 1992). Pietrzak et al. (2002) illustrated the predicted sex difference, but with majorities that were much higher than the typical reported ranges. Pietrzak et al. reported that 96% of females in their study were more distressed by emotional infidelity, while 73% of men choose sexual infidelity as more disturbing. The small sample of that study, 25 women and 22 men, has been called “deviant” by Harris (2005) who noted that the size of the sex effect reported by Pietrzak et al. was an “extreme outlier” relative to similar samples in previous forced-choice studies (p. 82).

Some researchers argued that the gender differences found in forced-choice studies should not be attributed to innate differences. Instead, they reasoned that men are more bothered by sexual infidelity, not because they have an innate propensity for such, but because they have learned to assume that if a woman has had sex with another man, she must also be in love with that man. On the other hand, a woman presuming that a man can have sex without love will be less upset over his sexual infidelity since it does not necessarily imply that he has fallen in love. In other words, when required to select one or the other form of infidelity, people have learned to choose as worse the form of infidelity that is likely to imply the co-occurrence of the other form. This has been labeled the “double-shot” (DeSteno & Salovey, 1996) or “two-for-one” (Harris & Christenfeld, 1996a, 1996b) hypothesis.

It is true that in the early studies (e.g., Buss et al., 1992), the sexual and emotional infidelity scenarios were not entirely independent, which left open the possibility that individuals were choosing a particular type of infidelity because it implied the co-occurrence

of the other type. In a cross cultural study that pitted the evolutionary hypothesis against the double-shot or two-for-one hypothesis, Buss et al. (1999) modified the original dilemmas and made the two types of infidelity, sexual and emotional, mutually exclusive. The new scenarios explicitly indicated that a partner had been sexually unfaithful, but not emotionally, and vice versa. Buss et al. found that the usual sex differences persisted. Men still reported greater distress in response to sexual infidelity while women were more disturbed by emotional infidelity, a finding consistent in American, Korean, and Japanese cultures. These findings were, of course, in contrast to the prediction of the double-shot or two-for-one hypothesis that controlling for the differing conditional probabilities would eliminate or attenuate sex differences in jealousy.

Further evidence that the forced-choice format does not induce a method-specific decision process are the findings of a study by Schutzwahl (2005). Using a forced-choice response format and recording the time required to make a choice, Schutzwahl found that men and women selecting the adaptively primary infidelity type (i.e., women selecting emotional infidelity and men selecting sexual infidelity) engaged in less elaborate decision strategies.

Harris (2003), a critic of the standard evolutionary psychology model of jealousy, after presenting her meta-analyses of forced-choice data, admitted that a sex difference does exist. However, Harris noted that the magnitude of the sex difference varied depending on the studied sample and the research design used. For instance, the sex difference diminished as the sample deviated further from the college aged and unmarried samples typically studied. In addition, when a continuous measure of jealous distress is utilized, which requires a rating of distress as opposed to the selection of one or the other form of infidelity as most distressing, the sex difference often disappears (DeSteno & Salovey, 1996; DeSteno, Bartlett, Braverman,

& Salovey, 2002). Some studies utilizing continuous measures have found women to report even greater distress than men in response to sexual infidelity (DeSteno et al., 2002; de Weerth & Kalma, 1993; Harris, 2003). The failure to find sex differences in those studies has been put forward as evidence that sex differences are an artifact of the forced-choice design (DeSteno et al., 2002; Harris, 2003). However, other studies using continuous measures have replicated the standard sex difference (Geary, DeSoto, Hoard, Sheldon & Cooper, 2001; Geary, Rumsey, Bow-Thomas, & Hoard, 1995; Sagarin, Becker, Guadagno, Nicastle, & Millevoi, 2003; Shackelford, LeBlanc, & Drass, 2000).

The use of the forced-choice design has been defended as providing the clearest indication of the form of infidelity an individual would least want to experience (Buss, 2000; Shackelford et al., 2000). Both forms of infidelity are expected to be upsetting to both sexes. Buss (2000) admitted that when the task of a study is for participants to indicate their degree of distress in response to both sexual and emotional infidelity both sexes rate each type as highly distressing. The forced-choice design affords the opportunity to evaluate whether participants are differentially upset about one or the other type of infidelity. Therefore, the use of a forced-choice design is in some ways limited to the detection of straightforward sex differences in which form of infidelity is perceived to be the most distressing. Harris (2003) argued that a forced-choice design does not fully elucidate the jealous experience. For example, an increase in the proportion of people choosing sexual jealousy could represent increased sexual jealousy, decreased emotional jealousy, or other combinations of changes. Therefore, a forced-choice design might not be adequate for a study of the moderating influences on the jealous experience.

*Physiological response studies.* While heart rate (HR), electrodermal activity (EDA), and electromyographic activity of the brow (EMG) were being measured Buss et al. (1992) had college students imagine separately their mate engaging in sexual intercourse with someone else and a mate falling in love with another person. Men showed greater reactivity to the imagined sexual infidelity, whereas women showed greater reactivity to the imagined emotional infidelity. These relatively objective findings were influential because they did not rely on subjective self-report data. Consequently, the data from physiological response studies have been hailed as providing undeniable support for the position that jealousy is a specific innate mental module characterized by sex differences (Buss, 1995a; Pinker, 1997).

The findings of the initial Buss et al. (1992) study have been challenged. Harris (2000) in a similar study of physiological markers reported that men did indeed show greater signs of autonomic arousal when imagining sexual infidelity relative to emotional infidelity. However, Harris pointed out that men also demonstrated comparably greater reactivity to sexual than to emotional imagery that was devoid of infidelity. Therefore, Harris' finding raised the possibility that the heightened physiological response of men was simply a response to sexual imagery in general, and not indicative of sensitivity to sexual infidelity. In the same paper, Harris found no indication that women in general showed greater autonomic arousal to imagery of emotional infidelity than to sexual infidelity. Further, and contrary to the predictions of Buss et al. (1992), female participants who had experience with a committed sexual relationship showed greater reactivity not to emotional infidelity but rather to sexual infidelity, a pattern of arousal that resembled that of male participants.

Other studies have replicated the Buss et al. (1992) original findings. Grice and Seely (2000) partially replicated Buss et al. finding that heart rate measures supported the existence

of sex differences; men showed greater heart rate increases in response to sexual relative to emotional infidelity imagery, and women showed greater heart rate increases in response to emotional relative to sexual infidelity imagery. Pietrzak et al. (2002) replicated the Buss et al. findings. They found substantial sexual differentiation on all measures attempted by them — HR, EDA, EMG — and on an assessment of temperature which was novel to their study. In summary, physiological results seem to confirm the pattern of sexual differentiation so often found in forced-choice studies (e.g., Bailey et al., 1994; Buss et al., 1992; DeSteno & Salovey, 1996; Harris & Christenfeld, 1996a; Wiederman & Allgeier, 1993).

### *Summary*

Sex is an especially potent modulator of the jealous experience. A sex difference in the nature of the infidelity that evokes the greatest jealousy has been repeatedly demonstrated. The difference is accounted for by men and women having repeatedly faced different threats to their reproductive success. For a man, his partner's sexual infidelity was particularly damaging because it decreased the probability that he was investing in his own offspring. Women, on the other hand, were always certain of maternity. For a woman her partner's emotional attachment to a rival female was particularly distressing presumably because it signaled his potential diversion of resources from her offspring to the offspring of another woman.

### Enduring Situational Moderation of Jealousy

From an evolutionary perspective, both our human nature and the widespread individual variation are the product of the evolutionary process. It is argued that the induction and expression of jealousy is influenced by reproductively relevant environmental input. Relevant input could act to trigger evolved adaptive variability in the jealous experience.

Relevant input has the triggering effect that it does because the same input existed in the EEA and provided sufficient adaptive advantage to individuals who were sensitive to that particular input. Many adaptations respond to immediate environmental input and can reverse if the input alters, as opposed to being “locked in”. To address adaptive problems functionally a psychological mechanism should remain activated only as long as the cues for its activation are present. For example, a spouse aware that their partner is having an affair should remain jealous as long as the affair lasts. Responsiveness to particular inputs was selected for because the resultant modulation of the jealous response permitted a “tailored” or more adaptive reaction to real or potential infidelity (Tooby & Cosmides, 1990b).

Buunk, Angleitner, Oubaid, and Buss (1996) suggested an example of this kind of modification. To account for the fact that only 30% or less of the German and Dutch men in their study chose sexual infidelity as worse than emotional infidelity, they suggested that the strength of male sexual jealousy might be related positively to the degree to which a man invests in a mate. If a man will invest little in a mate, sexual jealousy may be attenuated: "In sexually more liberal cultures where men may distribute their mating effort over a number of women, and hence devote less investment toward any one woman, men are less sexually jealous of any particular woman" (p. 363). An account of the variation in jealousy that invokes environmental input as a cause does not require conscious means-ends thinking on the part of the person ("I need to make sure I'm not investing heavily in an offspring not my own"), but rather an automatic unconscious modulation of the jealousy response. Further, the triggering sensitivities would have had to exist in ancestral environments. Thus, Buss (1995a) wrote, "the domain-specific psychologist...would predict that cues to sexual infidelity would still trigger a man's rage and sexual jealousy, even if his wife is taking reliable birth control"

(p. 82). In summary, the individual differences in the jealous experience are not arbitrary. Some of the individual variation could have been shaped in response to enduring environmental influences. Tooby and Cosmides (1992) predict that such “adaptive flexibility” would exist in many evolved mechanisms.

Buss and Greiling (1999) pointed out that from an adaptationist perspective a mechanism for adjusting one’s threshold for jealousy in response to environmental stimuli could have resulted from thousands of selective events in the evolutionary past. For example, a mechanism to adjust the expression of jealousy in response to relationship satisfaction could have been selected for if indications of a partner’s relationship satisfaction were statistically associated with their tendency to be unfaithful. An individual who detected their partner’s dissatisfaction and was consequently more vigilant about their partner’s contact with rivals could have been more successful. In that example, the increased vigilance represents an individual difference in jealousy that is an adaptively patterned response to an enduring situation. Therefore, the difference is due to a psychological mechanism common to all individuals but only expressed by those who encounter particular environmental input, in this case relationship dissatisfaction. If the enduring environment were to change, for example, if the couple were to separate, then the behaviour would also change (Tooby & Cosmides, 1990; Buss & Greiling, 1999).

The suggestion that particular inputs have the effect of modulating the experience of jealousy is not new and a number of researchers have indicated that the search for and testing of potential moderators should be a focus of research on jealousy (Daly et al., 1982; Harris, 2003, Sagarin, 2005; Buss et al., 1992). Buss et al. (1992) suggested two such moderators: cultural differences in paternal investment and age of the female mate. The male to female

ratio in a population may represent another moderator of the jealous response, in that members of the more numerous sex may have benefited, historically, from reducing the intensity of their jealous response (Sagarin, 2005). As of yet, no one has provided a clear account of the adapted sensitivities that modulate jealousy. The present study was an examination of the moderating influences of a mate's fertility, the presence of children in a relationship, relationship satisfaction, and relationship length. Those potential moderators of jealous expression are described next.

#### *Age-related changes in fertility*

One's own age and the age of one's partner represent two potential moderators of the jealous experience. Hypotheses about the evolved psychology of older humans or about developmental changes in evolved psychological mechanisms over the lifespan are reasonable. Although the average lifespan of ancestral humans was likely shorter than that of modern humans, there is agreement among evolutionary scientists, that some ancestral humans lived into their seventies and eighties (for examples, see Euler & Weitzel 1996; Hill & Hurtado 1991). Voracek (2001) pointed out that a majority of the studies conducted to assess jealousy have relied on samples of young men and women. The implicit assumption of past research, according to Voracek, is that the jealousy findings for young adults, including the findings of sex differences, can be generalized to older adults.

Since the induction of jealousy is theorized to stem from threats to reproductive fitness, the experience of jealousy might be modulated in response to "infidelities" in which reproduction is unlikely. Our expression of jealousy is likely to take into account the real possibilities of conception, and the real probabilities of infidelity. Presumably, a man with an

infertile mate does not face the threat of misdirected resource allocation and as a result, his jealous expression might be mitigated. Continued vigilance in the absence of a real threat could potentially be costly. An investigation into the effect of age on jealousy might in fact be more accurately conceived of as an investigation into the effect of mate fertility on jealousy.

Research on jealousy has not directly addressed the question of how jealous feelings and actions might track the fertility of mates (Wilson & Daly, 1992). The age-associated decrease in the fertility of a woman and eventual menopause change the adaptive problems faced by the male partners of those women. The age of a man's female partner provides a reliable estimate of her fertility. Female fertility begins to decrease just noticeably after the age of 25 with large changes occurring from age 35 onward (Menken, Trussell, & Larsen, 1986). Measures of female infertility reveal that by the age of 24 years, women already have a 6% chance of remaining childless and by 44 years of age, that probability is as high as 64% (Menken et al., 1986). In addition, the probability of chromosomal abnormality in newborns increases with the age of the mother. By age 40 the risk of abnormality is 1 in 66 and at age 49 it is 1 in 8 (Creasy & Resnick, 1994). Spontaneous abortion rates also increase with age. Between the ages of 35 and 39 years, there is an 18% chance that a fetus will miscarry and after 45 years of age, that probability has been found to be as high as 54% (Gindhoff & Jewelewicz, 1986). In summary, the probability that a man will unwittingly begin to invest in a rival's offspring starts to decrease when his mate is in her late 20s with a more rapid decrease after she reaches the age of 35 years.

The sexual infidelity of a post reproductive woman does not decrease her male partner's paternity certainty. Therefore, older men relative to younger men, assuming they are partnered to a post reproductive woman, might indicate less distress in response to sexual

infidelity. Since male fertility changes very little across the lifespan, women should be expected to fluctuate little in their jealous response to sexual infidelity.

A recent study tested the assumption that the jealousy findings of young adults could be generalized to older adults (Shackelford, Voracek, Schmitt, Buss, Weekes-Shackelford, & Michalski, 2004). In that study, 202 older adults (mean age = 67 years) and 234 younger people (mean age = 20 years) were asked to select which form of infidelity, emotional or sexual, they found most distressing. Shackelford et al. speculated that the sex difference commonly found in young adults would generalize to older adults. They predicted however that the magnitude of the sex difference might be smaller because of the decreased threat of being cuckolded for older men. Further, they predicted that older women, relative to younger women, might be less distressed by a partner's emotional infidelity. They reasoned that because older women are less likely than younger women to have dependent children any resource diversion that accompanies a partner's emotional infidelity may be less consequential for an older woman than it is for a younger woman. Both factors lead to the expectation that sex differences would be attenuated in older adults.

The results of the Shackelford et al. (2004) study confirmed that the usual sex difference in what evoked the greatest jealousy replicated in the older sample. Therefore, older men, like young men selected sexual jealousy as the most distressing and older women, like younger women, indicated that emotional infidelity was the most distressing. However, there was no within-sex age difference for men. The proportion of men selecting sexual infidelity as the most distressing did not vary between older and younger men as predicted. Therefore, older men were as concerned as younger men were about their partner's sexual infidelity despite the decreased or even-nonexistent threat of unwittingly investing in a rival's

offspring. There was a within-sex age difference for women. As predicted a smaller proportion of older women, relative to younger women selected emotional infidelity as the most distressing leading Shackelford et al. (2004) to speculate that for older women the loss of resources and investment accompanying the emotional infidelity of a partner might be less consequential.

Shackelford et al. (2004) speculated that the failure to find a decrease in male sexual jealousy might have been due to a failure to test that prediction accurately. They did not ask participants to report the age of their partners and therefore their analyses assumed that the older men were partnered to older and infertile women. They suggested that future studies should request the age of the partner in order to provide an accurate test of the speculation that older men (who are partnered to older women) will be less likely than younger men (who are partnered to younger women) to select as more distressing a partner's sexual infidelity. Shackelford et al. (2004) also suggested that future studies should collect data from participants of all ages. Thus, age could then be treated as a continuous variable to assess the impact of participant age on reported jealousy. Therefore, a better assessment of whether jealousy fluctuates with fertility could be made.

#### *Relationship length*

Longer relationships have presumably been afforded greater investment by each partner. Greater investment in the relationship might evoke greater jealousy since the relationship might be more valued. Couples in relationships of a shorter duration might report high jealousy but may be more willing to leave the relationship because they have invested less into it.

Aune Strzyzewski and Comstock (1997) found a significant positive correlation between ratings of jealousy and relationship length. They attributed their finding to the increased interdependence, sense of investment, and commitment that relationship partners experience over time. Mathes (1986) found that couples with higher initial ratings of jealousy were more likely to stay together. Mathes interpreted his results to suggest that jealousy preserves and promotes love.

#### *Relationship satisfaction*

High relationship satisfaction has been found to be related to higher jealousy ratings (Hansen, 1983). Individuals who are satisfied with their relationships might experience greater jealousy in response to threats to that relationship and be less likely to leave the relationship.

#### *Shared children*

The presence of children in a relationship could modulate the jealousy experience. Children signal required and past investment and people might be more devoted to a relationship into which they have already invested. The result might be an increase in vigilance to prevent the disruption of the relationship. Even in the face of infidelity, a person might experience the same magnitude of jealousy but be less likely to leave the relationship, because leaving would reduce the investment into the children and therefore potentially reduce overall fitness.

#### *Summary*

What at the behavioural level appears variable fractionates into variable environmental inputs and a universal design, interacting to produce manifest patterns of variation. Individual

differences in the expression of jealousy are expected because of different environmental input. The environmental inputs that modulate the jealous experience are not arbitrary but instead have the modulating effect that they do because they are consequential in some way to the fitness of the individual. The fertility of one's mate, the time invested in a relationship, satisfaction with the present relationship, and the presence of children in a relationship, might all modulate an individual's experience and expression of jealousy.

#### The Present Study

The manifestation of jealousy, like that of all psychological adaptations, can be expected to vary between individuals. That variation is expected because adaptations are not designed for rigid or random expression, but rather for a manifestation that is circumstance-dependent. Therefore, the manifestation of universal jealousy might vary between individuals in accordance with the fertility of their mate, their sex, and relevant enduring environmental inputs. The environmental input that modulates jealousy is not expected to be arbitrary. Rather it is expected to be adaptively relevant. With the exception of sex, the nature of those adaptively relevant environmental inputs and their moderating effects has not been extensively explored. The present study assessed the degree to which several variables, specifically age-related changes in fertility, relationship satisfaction, relationship length, having children, and the individual's sex modulated the individual's expression of jealousy and the likelihood that they would end their relationship in response to sexual and emotional infidelity.

A sex difference in the conditions that most readily evoke jealousy has been well documented amongst younger adults in the age range of 18 to 25 years (Bailey et al., 1994; Buss et al., 1992; Buss et al., 1999; Buunk et al., 1996; DeSteno & Salovey, 1996; Pietrzak, et

al., 2002; Wiederman & Allgeier, 1993). Harris (2003) noted that the typical jealousy findings become less pronounced as a sample deviates from the typical college-aged groups. Therefore, an examination of sex differences in jealousy and the impact of potential modulators on the expression of jealousy in underrepresented populations would be of interest. For instance, a sample of adults ranging in age across the lifespan would permit an analysis of the moderating influence of age on the jealous response. Female fertility is reliably correlated with female age and therefore older adults with same age mates may face adaptive problems that differ from those faced by younger adults. Thus, patterns of jealousy might shift in a direction that solves those problems. Further, a large and age varied sample would also permit an examination of the moderating influence of various other variables that may be more restricted or homogenous amongst young samples. For example, relationship length is not likely to vary significantly between younger couples, and children are less likely to be a variable in the relationships of college-aged samples.

In the present study, we asked adults ranging in age across the lifespan to indicate their degree of distress, and the likelihood of ending their relationship, in response to a scenario depicting sexual infidelity and another depicting emotional infidelity. The scenarios were designed to capture those two types of infidelity without confounding them. A forced-choice design was not used because, as Harris (2003) pointed out, an increase in the proportion of people choosing sexual jealousy could represent increased sexual jealousy, decreased emotional jealousy, or other combinations of changes. A study of the factors that influence the experience of jealousy would be more sensitive if separate measures of each type of jealousy were used.

Asking people to report the likelihood that they would end their relationship in response to their partner's infidelity was relatively novel. Only one previous study had asked that question and had sampled only young adults ranging in age from 15 to 25 years (Shackelford, Buss, & Bennett, 2002). In that study, which used a forced-choice design, a significant sex difference was found for which form of infidelity would most likely lead to a break-up. Men, relative to women, were more likely to end a relationship in response to sexual infidelity as opposed to emotional infidelity. Conversely, women, relative to men were more likely to end a relationship if their partner committed an emotional infidelity. These findings were consistent with the predictions of evolutionary psychology. Presumably, because men are concerned about paternity certainty, they should be more inclined to "cut their losses" by leaving a relationship when their partner has been sexually unfaithful. Women, on the other hand, are presumably more concerned about the investment made in their offspring and should be more likely to end a relationship in response to emotional infidelity.

Asking people about both their expected degree of jealousy and the likelihood that they would leave their relationship allowed a comparison of those two outcomes. The likelihood of ending the relationship was expected to be related to jealous distress, but perhaps be differentially moderated by age-related changes in fertility, relationship length, relationship satisfaction, and having children. Analyses of the moderating effects of those variables were enhanced by the more age-varied sample of the present study. Older adults, people with children, or people who are satisfied in their relationship might indicate a high degree of jealousy in response to infidelity but report less of an intention to leave the relationship.

An examination of the relationship between peoples' jealousy and their partner's age was novel. Decreases in fertility for females, but not males, are reliability associated with age. Male jealousy in response to sexual infidelity was expected to decrease and evidence a profile that corresponded with age-related changes in female fertility. Since a man of any age is potentially fertile, a woman's vigilance about her male partner's sexual infidelity should remain high. It was expected that female jealousy would decrease less overall and more gradually than the jealousy of men.

The length of a relationship and the number of children shared in the relationship were examined because it was presumed that they might be analogues to the degree of investment made in a relationship. It was hypothesized that the investment into a relationship might have a modulating effect on jealousy ratings. However, there was no specific reason to predict that for either men or women the relationship would be in any particular direction or that it would differ between responses to either sexual or emotional infidelity. On one hand, it could be argued that sharing children in a relationship, or being in a relationship for a long period, could result in greater jealousy because the individual is vigilant about protecting that investment. On the other hand, the presence of children in a relationship, or a relationship of long duration, might signal the fact that the relationship has already been fully exploited. In that case, less jealousy might be reported.

Relationship satisfaction seemed like a likely candidate as a moderator of jealousy. However, no specific predictions were made. It was suspected however that people in satisfying relationships might be more jealous about a partner's infidelity because they perceive a greater potential loss. High satisfaction with a relationship might also be related to lower expressed intentions to end the relationship in response to infidelity.

*Predictions*

The following specific predictions were made:

1. A sex difference in the form of infidelity evoking the greatest degree of jealousy was expected. Men were expected to provide the highest jealousy ratings in response to sexual infidelity, while women were expected to report greater distress in response to emotional infidelity.
2. It was predicted that men would be more likely to leave a relationship in response to sexual infidelity, while for women, emotional infidelity was thought to most predict a desire to end the relationship.
3. It was predicted that male ratings of jealousy and intentions to leave the relationship in response to sexual infidelity would decrease in a fashion that corresponded with age-related changes in female fertility. Therefore, it was expected that the greatest decrease in male ratings would occur when female partners were between 30 and 40 years of age. Because male fertility is not reliably associated with age, female ratings of jealousy were expected to remain relatively uniform.

In summary, the present study was an examination of jealousy as an evolved and universal, but modifiable response. The experience of jealousy was expected to fluctuate as a function of sex, the fertility of one's mate, and because of input from relevant enduring situational circumstances resulting in a contextually adaptive manifestation.

## Method

### *Participant Recruitment*

Prior to the collection of data, the proposal for the present study was reviewed and approved by the Lakehead University research ethics committee. Then participants were contacted and surveyed on the internet. An electronic message containing contact information and a web address for the online questionnaire was sent to potential respondents in Canada and the United States using a popular freeware chat program. The electronic message indicated that the questionnaire and study concerned relationships. Recipients of the message were invited to click the provided web link in order to be directed to the online survey. Interested individuals, in other words those people who clicked the link, arrived at an introduction page for the online survey. The introduction page provided full researcher contact information and detailed the various facets of informed consent. For example, readers were forewarned that the survey contained content of a sexual nature. Readers were instructed that they could discontinue participation at anytime. They were also instructed that their responses were confidential and would be aggregated with the responses of other participants. At the conclusion of the introductory page the reader, if still interested in participating, was asked to type "I agree" into a blank web-form and then to click a "continue" button at which point they were transferred to the online questionnaire. The entire online questionnaire, including the online introduction page, is available for review as an Appendix.

Respondents were neither offered nor provided any incentive for participation. If a respondent was interested in directly receiving the survey results, he or she was invited to provide an e-mail address. Respondents were also informed that the findings would be

available at the same Internet address several weeks later. That approach insured that visiting the online questionnaire and completing the survey were left to the discretion of the individual.

There is sometimes a concern about the validity of web-based research. Studies comparing data obtained online to data obtained via paper and pencil have shown the two sets of data to be psychometrically equivalent. Myerson and Tryon (2003) used structural equation modeling to evaluate the psychometric consistency between web-collected data and paper-and-pencil data. They found that the internal consistency and internal validity of Internet data were equivalent to that of data obtained by means that are more traditional. Pettit (2002) investigated whether the manifestation of response sets in web-based questionnaires differed from that in paper-and-pencil questionnaires. Pettit compared tendencies for random responses, item non-responses, extreme responses, acquiescent responses, and response errors. Only a tendency for response errors, a situation in which a response is provided but cannot be used (e.g., illegible handwriting), was found to differ significantly between the two methods. Response errors were almost nonexistent in web-collected data.

### *Participants*

Of the 1595 online submissions, 1163 were included in the study. Of the 432 excluded submissions, 261 were immediately removed because they were either blank or duplicate submissions. Duplicate submissions were the result of an individual clicking the "submit" button more than once and were obvious because they arrived sequentially, usually within a minute of each other, and contained identical data. Another 107 (97 men and 10 women) submissions were excluded because the respondent indicated that they were gay or lesbian

and 8 responses were removed because the respondent's reported age was below 18 years. The removal of gay and lesbian responses was for theoretical reasons. There is evidence that the typical sex difference in jealousy is reversed in the jealous expression of gay men and lesbian women (Dijkstra et al., 2001) so the decision was made to remove the data but save it for future consideration. A final 56 respondents were removed from the sample following pre-analyses data screening (see results section).

There was 1163 remaining, 667 men and 496 women from Canada and the United States. The mean age of the sample was 38.2 years ( $SD = 12.1$ ); 254 (22%) were single, and 909 (78%) were currently involved in relationships. Of the participants in a relationship, 478 (53%) were formally married. A total of 710 (61%) respondents reported having children and of those with children, 367 (52%) of them had children with their current partner. With their current partners, respondents had an average of .72 ( $SD = 1.13$ ) children and an average of 1.51 ( $SD = 1.58$ ) children in total. Most respondents 1053 (91%) were thinking of an actual current or past relationship while 110 (9%) were imagining a relationship. The average length of existing relationships was 9 years and 4 months. Respondents had various levels of education: 11 (< 1%) completed grammar school, 448 (39%) completed at least high school, 700 (60%) completed secondary education, and 4 (< 1%) respondents did not respond. Respondents indicated their financial situation by choosing one of three response options: 111 (10%) indicated that they were "In financial hardship", 502 (43%) reported that they "Can just make ends meet", 521 (45%) reported being "Financially comfortable" and 29 (2%) did not select an option.

*Procedure and Measures*

*Scenarios.* Participants were presented with a dilemma and scenarios similar to those used by Buss et al. (1992). The dilemma read as follows:

“Please think of the person to whom you are currently married or dating. If not currently in a relationship, please think of your most recent relationship or one that you would like to have. Imagine that you discover that this person has become interested in someone else.”

After a reading of the dilemma, respondents were asked to indicate how “disturbed or distressed” they would feel in response to each of three possible infidelity scenarios that could accompany the dilemma. They were also asked to indicate how probable it was that they would end their relationship in response to each form of infidelity. The scenarios, labeled A through C, were designed so that they did not confound sexual and emotional infidelity and appeared as follows:

Scenario A:

Imagine your partner forming a deep emotional attachment to the other person. They spend time together and talk about very personal issues. They have even said that they are in love with each other. Despite this attachment, you know as fact that your partner has not had sexual relations with the other person.

Scenario B:

Imagine your partner enjoying passionate sexual intercourse with the other person. They enjoy frequent sex in a number of different positions. Despite this sexual relationship, you know as fact that your partner does not love the other person.

## Scenario C:

Imagine your partner both forming a deep emotional attachment and enjoying passionate sexual intercourse with that other person. They enjoy sex in a number of different positions, spend time together, and say that they love each other.

*Jealousy measures.* Respondents indicated the degree of disturbance evoked by each scenario on a scale ranging from 1 (Not disturbed at all) to 100 (Completely disturbed). In addition, respondents indicated the likelihood that they would leave the relationship in response to each scenario on a scale from 1 (Not likely at all) to 100 (I would end the relationship).

It is noteworthy that in the present study we asked people to report their degree of disturbance or distress in response to each scenario instead of asking directly about jealousy. Jealousy is widely perceived by lay-people to be dangerous, destructive, or useless (Sommers 1984), and as a form of personal pathology (Mullen, 1991; 1993). In addition, it is common for people to deny feeling jealous (Bringle, 1991; Bringle & Buunk 1986; Clanton & Kosins 1991). Socially desirable responding therefore is a potential problem for research on jealousy and the use of alternate descriptive terms such as disturbed, upset, or distressed is common (Wiederman & Allgeier, 1993).

Wiederman and Allgeier (1993) using a design similar to that of the present study found order effects. Specifically, participants who responded to a version of their survey that presented the sexual infidelity first subsequently rated the love scenario as less upsetting than did those participants who responded first to the love scenario. In order to account for such

effects in the present study, the order of the sexual and emotional infidelity scenarios were counterbalanced. The combined infidelity scenario always appeared last.

*Relationship measures.* Respondents provided information about their current and past relationships. They were asked to rate their satisfaction with their present relationship on a scale that ranged from 1 (“Not satisfied at all”) to 100 (“Completely satisfied”). They were also asked to report the number of children they shared with their present partner and to indicate how long they had been in that relationship.

## Results

### *Data screening*

Prior to analyses, all cases were inspected for accuracy of data entry, missing values, and fit between the distributions of individual variables and the assumptions of multivariate analysis. Forty-Seven cases with missing datum on at least one of the three jealousy measures (i.e., criterion measures) were dropped from the sample. It was noted that in most of those cases the respondent had not completed any of the jealousy measures and had left a majority of the remaining fields blank. Therefore, dropping those cases was appropriate since they contributed little or nothing to the data.

Univariate outliers were identified using Mahalanobis distance. Data points with a  $z$  score of greater than  $\pm 3.29$  (Tabachnick & Fidell, 2001) were removed, but the case was usually retained. Seven cases were identified as having several or more univariate outliers and those cases were completely removed. Two other cases were identified using Mahalanobis distance as multivariate outliers and were removed.

The variables were checked for normality. The measure of distress in response to sexual infidelity and the likelihood of ending the relationship in response to sexual infidelity were slightly negatively skewed. Those two variables were transformed and planned analyses were conducted to compare the results with transformed data to the results of the same analyses using raw data. The difference was insignificant. To maintain ease of interpretation, all analyses were conducted on data that were not transformed.

#### *Order effects*

There were two versions of the online questionnaire that differed only in the order of the sexual and emotional infidelity scenarios. Participants were randomly sent a link to either of the two versions. The presence of any order effects on jealousy ratings and the reported likelihood of ending the relationship were investigated by comparing the mean ratings for one order of presentation to the opposite order of presentation for both men and women. Neither the jealousy ratings nor the reported likelihood of ending the relationship differed as a function of the order of presentation. The sample sizes, means, standard deviations, *t* values, and significance levels for all order effects comparisons are presented in Table 1.

#### *Sex differences in jealous distress and the likelihood of ending the relationship*

Respondents were asked to report their degrees of discomfort to each of the three infidelity scenarios separately. They were also asked to estimate the likelihood that they would end a relationship in response to the behaviour depicted in each scenario. The existence of sex differences in ratings of distress or likelihood of ending the relationship was of interest. The within-sex ratings are reported below, followed by between sex comparisons. Significant paired and independent *t*-test comparisons were converted into effect size measures. An effect

size index ( $d$ ) was computed to provide a measure of the magnitude of the mean differences. Effect size ( $d$ ) values of .2, .5, and .8 were interpreted according to convention as small, medium, and large effect sizes respectively (Cohen, 1988).

*Manipulation checks.* The inclusion of a combined scenario was intended to serve as a check of participant task comprehension and attention. In other words did participants understand the task, the scenarios, and were they making an effort to respond in a logical fashion instead of randomly. As mentioned above, some cases were removed because they were obvious outliers, having responded in an obviously illogical or random fashion. This second check was conducted to confirm that participants as a group perceived a difference in the content of the scenarios. It was hypothesized that the scenario combining both sexual and emotional infidelity would, for both men and women, evoke the greatest degree of jealous discomfort and result in the greatest desire to end the relationship. Paired samples  $t$ -tests were conducted to determine whether the combined scenario evoked the greatest degrees of jealousy and the highest estimated probabilities of ending the relationship.

The jealousy evoked in response to combined infidelity ( $M = 87.99$ ,  $SD = 25.89$ ) was significantly greater than the jealousy evoked by sexual infidelity ( $M = 77.24$ ,  $SD = 32.39$ ),  $t(1162) = -19.07$ ,  $p < .001$ , and emotional infidelity ( $M = 62.24$ ,  $SD = 33.64$ ),  $t(1162) = -32.71$ ,  $p < .001$ . The difference between the combined scenario and the sexual scenario was moderate,  $d = .56$  and the 95% confidence interval for the mean difference between the two ratings was -11.85 to -9.64. The difference between the combined scenario and the emotional scenario was large,  $d = .96$  and the 95% confidence interval for the mean difference between the ratings was -27.29 to -24.20.

The combined scenario evoked higher expressed intentions to end the relationship ( $M = 87.45$ ,  $SD = 26.92$ ) than both sexual infidelity ( $M = 73.08$ ,  $SD = 35.42$ ),  $t(1152) = -21.63$ ,  $p < .001$  and emotional infidelity ( $M = 47.08$ ,  $SD = 36.61$ ),  $t(1152) = -40.97$ ,  $p < .001$ . The size of the difference in likelihood to end the relationship in response to combined infidelity as compared to sexual infidelity was moderate,  $d = .64$  and the 95% confidence interval for the mean difference between the two ratings was -15.68 to -13.07. The difference in likelihood to end the relationship in response to combined infidelity as compared to emotional infidelity was large,  $d = 1.21$  and the 95% confidence interval for the mean difference between the ratings was -42.31 to -38.44. As expected the combined infidelity scenario evoked the most jealousy and was perceived to most likely result in the dissolution of the relationship.

*Jealousy ratings.* Paired samples  $t$ -tests revealed that men,  $t(666) = 12.74$ ,  $p < .001$  and women,  $t(495) = 11.53$ ,  $p < .001$ , reported significantly greater distress in response to sexual infidelity than to emotional infidelity. For men, the difference was small,  $d = .46$  and the 95% confidence interval for the mean difference between the two ratings was 13.19 to 17.99. The difference for women was moderate in magnitude,  $d = .52$ , and the 95% confidence interval for the mean difference between the two ratings was 11.79 to 16.63.

Independent samples  $t$ -tests were conducted in order to compare men's and women's jealousy ratings in response to each of the infidelity scenarios. The means ( $M$ ), standard deviations ( $SD$ ),  $t$  values,  $d$  values, and 95% confidence intervals for mean differences (95% CI) for the jealousy ratings in response to each scenario and broken down by sex are presented in Table 2. The results in Table 2 show that women reported significantly more distress in response to both the sexual and emotional infidelity scenarios than did men.

However, the sizes of the differences were small. Men and women did not significantly differ in the distress reported in response to the combined infidelity scenario.

Difference scores were calculated by subtracting the ratings of distress in response to emotional infidelity from sexual infidelity. A difference score calculated in that way represents how much more distressing sexual infidelity is perceived to be in contrast to emotional infidelity. The difference in the degree of distress reported in response to sexual infidelity relative to emotional infidelity was greater for men ( $M = 15.59$ ,  $SD = 31.62$ ) than it was for women ( $M = 14.21$ ,  $SD = 27.45$ ) but the difference was not significant,  $t(1161) = .78$ ,  $p = .44$ .

In summary, both men and women reported greater degrees of jealous distress in response to sexual infidelity over emotional infidelity. When the sexes were contrasted, women were found to have reported significantly more distress than men did in response to both sexual and emotional infidelity. However, the magnitude of that difference was small. Men and women did not significantly differ in the degree of jealousy they reported in response to sexual jealousy compared to emotional infidelity.

The continuous measures of jealous distress were reconsidered as a set of response options and three groups were generated. A respondent could have indicated the greatest distress in response to sexual infidelity (*sexual group*), the most distress in response to emotional infidelity (*emotional group*), or that the two forms of infidelity were equally distressing (*equal group*). Therefore, respondents were grouped based on which form of infidelity they perceived to be the most distressing. Continuous ratings considered in this way provided an analogue to a forced-choice design. The proportion of men and women falling into each of the jealousy categories was calculated. Omnibus chi-square ( $\chi^2$ ) tests were

conducted on the proportions for both men and women to determine if the proportion of individuals falling into each of the three jealousy categories significantly differed. For each chi-square test, Cohen's effect size index ( $d$ ) was calculated and again values of .2, .5, and .8, were interpreted according to convention as small, medium, and large effect sizes, respectively.

The omnibus one-sample chi-square test for men was significant,  $\chi^2(2, N = 667) = 256.21, p < .001, d = 1.23$ , as was the same test for women,  $\chi^2(2, N = 496) = 124.673, p < .001, d = 1.00$ . The proportion of men ( $P = 62\%$ ) and women ( $P = 54\%$ ) in the *sexual group* was greater than the proportions of men ( $P = 14\%$ ) and women ( $P = 13\%$ ) in the *emotional group* and the proportions of men ( $P = 24\%$ ) and women ( $P = 33\%$ ) in the *equal group*. Clear majorities of men and women indicated that for them sexual infidelity evoked the greatest jealousy.

A two-way contingency table analysis with a corresponding  $\chi^2$ -test was conducted to determine whether men and women could be differentiated by their membership in the three jealousy groups. The overall test was significant,  $\chi^2(2, N = 1163) = 12.46, p < .05$ . However, the degree of differentiation was small,  $d = .21$ . In order to determine the extent to which membership in each jealousy group (i.e., sexual, emotional, or equal) was dependent on sex, Yule's Q values were calculated. Yule's Q is based on the odds ratio and is a symmetric measure taking on values between -1 and +1. Values of -1 and +1 imply respectively, a perfect negative or perfect positive association. Yule's Q value of 0 implies that no association exists. Therefore, Yule's Q provided a measure of effect size indicating how well group membership could be differentiated by sex. Values of .1, .3, and .5 are typically regarded as small, medium, and large effect sizes respectively. The Yule's Q values indicated

that men and women could be meaningfully differentiated by their membership in the *sexual group* (Yule's  $Q = .16$ ) and the *equal group* (Yule's  $Q = .23$ ) but not the *emotional group* (Yule's  $Q = .05$ ). Therefore, while the ability to differentiate was small, the proportion of men ( $P = 62\%$ ) providing the highest jealousy ratings in response to sexual infidelity was greater than that of women ( $P = 52\%$ ), and the proportion of women ( $P = 33\%$ ) reporting that the two forms of infidelity were equal was higher than the proportion of men ( $P = 24\%$ ) in that group.

In summary, a significantly larger proportion of both men and women reported that of the two forms of infidelity, sexual infidelity was the most distressing. However, the proportion of men in that group was significantly greater than the proportion of women in that same group. A larger proportion of women, in contrast to men, reported that the two forms of infidelity, sexual and emotional, were equally disturbing.

*Likelihood of ending the relationship.* Paired samples  $t$ -tests revealed that men,  $t(662) = 19.43, p < .001$  and women,  $t(489) = 15.64, p < .001$ , reported a significantly greater likelihood of ending the relationship in response to sexual infidelity than to emotional infidelity. For men, the difference was moderate in magnitude,  $d = .75$ , and the 95% confidence interval for the mean difference between the two ratings was 24.37 to 30.73. The difference for women was also moderate,  $d = .70$ , and the 95% confidence interval for the mean difference between the two ratings was 20.85 to 26.84.

Independent samples  $t$ -tests were conducted in order to compare men's and women's reported likelihoods of ending the relationship in response to each of the infidelity scenarios. The means ( $M$ ), standard deviations ( $SD$ ),  $t$  values,  $d$  values, and 95% confidence intervals for mean differences (95% CI) for the jealousy ratings in response to each scenario and broken down by sex are presented in Table 2. The data in Table 2 show that women reported a

significantly greater likelihood of ending the relationship in response to each type of infidelity than did men. The magnitude of the difference was small in each comparison.

Difference scores were calculated by subtracting the likelihood of ending the relationship in response to emotional infidelity from the likelihood of ending the relationship in response to sexual infidelity. A difference score calculated in that way represented how much more likely sexual infidelity would be to lead to relationship dissolution than emotional infidelity. The difference in the reported likelihood in response to sexual infidelity relative to emotional infidelity was greater for men ( $M = 27.59$ ,  $SD = 36.56$ ) than it was for women ( $M = 23.84$ ,  $SD = 33.75$ ) but the difference was not significant,  $t(1151) = 1.80$ ,  $p = .07$ .

In summary, both men and women reported on average that they would be more likely to end a relationship in response to sexual infidelity than in response to emotional infidelity. When the sexes were contrasted, women were, to a small degree, found to have indicated a significantly greater likelihood of ending the relationship than men did, regardless of the infidelity type. Men and women did not significantly differ in the likelihood that they would end the relationship in response to sexual jealousy compared to emotional infidelity.

In the same way that continuous measures for jealous distress were considered in a categorical fashion, so were the measures for the likelihood of ending the relationship. Again, the result was that a respondent could be considered as falling into one of three categories. The person could have indicated the greatest likelihood of ending the relationship in response to sexual infidelity (*sexual group*), emotional infidelity (*emotional group*), or they could have indicated an equal likelihood in response to each form of infidelity (*equal group*). Continuous ratings considered in that way provided an analogue to a forced-choice design. Omnibus chi-square ( $\chi^2$ ) tests were conducted on the proportions for both men and women to determine if

the proportion of individuals falling into each of the three categories significantly differed. For each chi-square test, Cohen's effect size index ( $d$ ) was calculated and again values of .2, .5, and .8, were interpreted according to convention as small, medium, and large effect sizes, respectively.

The omnibus one-sample chi-square tests for men was significant,  $\chi^2(2, N = 663) = 385.41, p < .001, d = 1.52$ , as was the same test for women,  $\chi^2(2, N = 490) = 204.36, p < .001, d = 1.29$ . The percentage of men ( $P = 69\%$ ) and women ( $P = 62\%$ ) in the *sexual group* was greater than the proportions of men ( $P = 10\%$ ) and women ( $P = 10\%$ ) in the *emotional group* and the proportions of men ( $P = 21\%$ ) and women ( $P = 28\%$ ) in the *equal group*. Therefore, clear majorities of men and women indicated that they would be most likely to end a relationship in response to sexual infidelity.

A two-way contingency table analysis with a corresponding  $\chi^2$ -test was conducted to determine whether men and women could be differentiated by their membership in the three likelihood of ending the relationship groups. The overall test was significant,  $\chi^2(2, N = 1153) = 6.36, p < .05$ . However, the degree of differentiation was small,  $d = .15$ . In order to determine the extent to which membership in a likelihood of ending the relationship group (i.e. sexual, emotional, or equal) was dependent on sex, Yule's Q values were again calculated. Therefore, Yule's Q provided a measure of effect size indicating how well group membership could be differentiated by sex. Values of .1, .3, and .5 were regarded as small, medium, and large effect sizes respectively. The Yule's Q values indicated that men and women could be meaningfully differentiated by their membership in the *sexual group* (Yule's Q = .15) and the *equal group* (Yule's Q = .16), but not the *emotional group* (Yule's Q = .02). Therefore, while the ability to differentiate was small, the proportion of men ( $P = 69\%$ )

providing the highest jealousy ratings in response to sexual infidelity was greater than that of women ( $P = 62\%$ ), and the proportion of women ( $P = 28\%$ ) reporting that the two forms of infidelity were equal was higher than the proportion of men ( $P = 22\%$ ) in that group.

In summary, a significantly larger proportion of both men and women reported that sexual infidelity would be more likely to lead to their decision to end a relationship. However, the proportion of men in that group was significantly greater than the proportion of women in that same group. A larger proportion of women, in contrast to men, reported that they were equally likely to end their relationship in response to either sexual or emotional infidelity.

#### *Age-related changes in fertility*

It was hypothesized that a man's jealousy and likelihood of ending the relationship in response to sexual infidelity would decrease in a fashion consistent with the fertility of their female partner. Female fertility decreases with age, the greatest changes occurring between the late twenties and 40 years of age. Therefore, the age of a woman provides a reliable measure of her fertility. It was possible that any relationship between the ratings of men and their partner's age revealed by a linear regression procedure might be an artifact of a single level change in female reproductive capacity.

Average male ratings of jealousy and likelihood of ending the relationship in response to sexual infidelity were expected to decrease the most at the time that corresponded with the greatest decrease in the female partner's fertility. Therefore, the greatest decrease in mean ratings should occur between the late 20s and 40 years of age. A method sensitive to non-linear changes in a dependent variable was desired to assess that prediction.

Nonparametric smoothing is one class of methods for fitting lines to data without assuming normality of errors, linearity, or independence of observations (Wilkinson, 1999). A popular method is the LOESS, non-parametric, local area, polynomial regression procedure (Cleveland 1993; Simonoff, 1996). The LOESS procedure does not require specification of any function or model form for the data. The method involves a series of local regression analyses that permits the form of a curve to vary across the variable continua. For each specified neighborhood of data points, a weighted least-squares regression is performed that fits linear or quadratic functions of the predictors at the centers of the neighborhood. Different types of regression and weight functions may thus be used in the estimation. The procedure is a robust fitting method that is flexible and ideal for revealing potentially complex, unanticipated patterns of association between variables. The procedure produces a smoothed, nonlinear curve fit to the data. LOESS curves are much more accurate than are the lines (linear or quadratic) that are imposed on the data in familiar parametric analyses. The primary drawback is that overall curve functions and statistics cannot be produced. The LOESS procedure has wide applicability; for example, it was recently used by O'Connor (2005) to show that both linear and non-linear relationships existed between the domains and facets of the five-factor model and the personality disorders.

The LOESS curves for male and female ratings of jealous distress in response to sexual and emotional infidelity are presented as Figure 1. LOESS curves for the male and female reported likelihoods of ending the relationship in response to sexual and emotional infidelity are presented as Figure 2. The lines for male jealousy and the likelihood that men will leave the relationship in response to sexual infidelity indicated substantial decline across the range of female partner's age. The sharpest decline in the ratings of men in response to

sexual infidelity occurs when female partners are in their early 30's. Male ratings in response to emotional infidelity evidence a more gradual linear decline across the range of female ages.

For women, the total decline across the range of male age is less than that evidenced by men. Female jealousy in response to sexual and emotional infidelity evidences some decline when their male partner is in his 30s and early 40s but the decline levels off and remains relatively consistent across the remainder of the age range. The LOESS line representing the reported likelihood by women that they would leave the relationship in response to sexual infidelity shows a marked decrease corresponding to when the male partner is in his late 30s. The line representing the likelihood of ending the relationship in response to emotional infidelity shows a more gradual linear decline.

In summary, the LOESS lines for men show a greater total decline across the range of female partner's ages. The lines representing the responses to sexual infidelity showed the greatest decline when female partners were in their late 20s and 30s. Male responses to emotional infidelity declined across the range of female ages, but more linearly. LOESS lines for women showed that overall the amount of decline across the range of male partner's age was not large. Only the line depicting the likelihood of women ending the relationship in response to male sexual infidelity showed a sharp and large decline.

#### *Predictors of the jealous response*

Correlations between the dependent measures (i.e., jealousy and likelihood of ending the relationship) and the predictors were examined for multicollinearity and singularity. Singularity occurs when the correlation between two variables is  $r = .99$  or greater, indicating that the two variables are essentially identical. No singularities were found. Multicollinearity

occurs when a correlation between variables exceeds,  $r = .90$  (Tabachnick & Fidell, 2001). The correlation between the age of male participants and the age of their partners was high,  $r = .91, p < .001$ , as was the correlation between the age of females and their partners,  $r = .89, p < .001$ . While only the bivariate correlation of male age with their partner's age was a statistical problem, the same relationship for women was close to  $r = .90$ . To avoid problems with multicollinearity, the decision was made to base analyses on only the age of the partner since that variable was of greater theoretical interest.

Multiple regression analyses were conducted to evaluate how well the measures of partner's age, relationship length, relationship satisfaction, and shared children, predicted jealousy and the likelihood of ending the relationship in response to sexual and emotional infidelity. Separate multiple regressions were run for men and women. The correlations among the predictors for men ranged from .68 to .06. For women the correlations among the predictors ranged from .55 to .15. The indices to indicate the relative strength of the individual predictors for each of the criterion variables are presented in Table 3. The bivariate and partial correlations are presented and significant values are marked.

*Jealousy ratings.* The combination of predictors was significantly related to the jealousy reported in response to *sexual* infidelity for both men,  $F(4, 595) = 11.40, p < .001$  and women  $F(4, 437) = 9.67, p < .001$ . For men, the multiple correlation coefficient was .27, indicating that approximately 7% of the variance in sexual jealousy could be accounted for by the combination of predictors. For women, the multiple correlation coefficient was .29, indicating that approximately 8% of the variance in sexual jealousy was explained. The partial correlations revealed that, for both sexes, the age of the partner and relationship satisfaction were significant predictors. Partner's age was found to predict a decrease in jealousy, while

relationship satisfaction predicted an increase in the jealousy reported in response to sexual infidelity.

The combination of predictors was significantly related to the jealousy reported in response to *emotional* infidelity for both men,  $F(4, 595) = 11.37, p < .001$  and women  $F(4, 437) = 7.36, p < .001$ . For men, the multiple correlation coefficient was .27, indicating that approximately 7% of the variance in emotional jealousy could be accounted for by the combination of the predictors. For women, the multiple correlation coefficient was .25, indicating that approximately 6% of the variance in emotional jealousy was explained. The partial correlations indicated that, for both men and women, the age of the partner predicted decreased jealousy while relationship satisfaction significantly predicted an increase in the jealousy reported in response to the emotional infidelity of a partner. Neither relationship length nor the presence of shared children in the relationship predicted jealousy.

In summary, for both sexes, the age of the partner predicted decreases in the jealousy ratings reported in response to both sexual and emotional infidelity. Relationship satisfaction, for both sexes, predicted increases in the jealousy reported in response to sexual and emotional infidelity. The length of the relationship and the presence of shared children were not found to be significant predictors.

*Likelihood of ending the relationship.* The combination of predictors were significantly related to the likelihood of ending the relationship in response to *sexual* infidelity for both men,  $F(4, 591) = 11.46, p < .001$ , and women  $F(4, 431) = 4.89, p < .001$ . For men the multiple correlation coefficient was .27, indicating that approximately 7% of the variance in sexual jealousy could be accounted for by the combination of the predictors. For women the multiple correlation coefficient was .21, indicating that approximately 4% of the variance in

sexual jealousy was explained. The partial correlations indicated that, for both men and women, only the age of the partner was a significant predictor and in a negative direction. Therefore, the older one's partner the lower the probability that one would leave the relationship in response to sexual infidelity.

The combination of predictors was significantly related to the likelihood of ending the relationship in response to *emotional* infidelity for both men,  $F(4, 591) = 15.74, p < .001$ , and women  $F(4, 431) = 4.89, p < .001$ . For men, the multiple correlation coefficient was .31, indicating that approximately 10% of the variance in emotional jealousy could be accounted for by the combination of the predictors. For women, the multiple correlation coefficient was .24, indicating that approximately 6% of the variance in emotional jealousy was explained. The partial correlations indicated that, for both men and women, only the age of the partner was a significant predictor and in a negative direction. Therefore, the older one's partner the lower the probability that one would leave the relationship in response to emotional infidelity.

In summary, the partial correlations indicated that for both men and women only the age of the partner was a significant predictor of the likelihood that a person would leave the relationship in the event of their partner's extradyadic emotional or sexual involvement. The prediction was better for men than it was for women.

#### Discussion

From the perspective of evolutionary psychology, romantic jealousy is an adaptation crafted by natural selection to manage threats to one's investment in a romantic relationship. The induction of jealousy is not expected to be arbitrary; it should be evoked by information relevant to the actual or potential infidelity of a romantic partner and result in behaviour focused on managing that threat. Jealousy has a distal cause, but could be influenced,

triggered, and moderated by proximal internal and external stimuli (Buss et al., 1992; Sagarin 2005; Tooby & Cosmides, 1990). In other words, jealousy should be adaptively flexible and manifest in a way that is consistent with the modulating influences of sex, age related decreases in fertility, experience, and enduring circumstances. The finding in this study, that male responses to sexual infidelity decreased in a fashion corresponding with expected age-related decreases in female fertility, supports the assertion that jealousy is an adaptively flexible psychological mechanism.

*Sex differences in jealousy and the likelihood of ending the relationship*

The jealous response has been repeatedly found to vary between the sexes. When the continuous data of this study is examined in a straightforward fashion, sex differences are found but they are not in the hypothesized direction. Men, as expected, reported more jealousy and a greater likelihood of ending the relationship in response to sexual infidelity compared to emotional infidelity. Contrary to both our prediction and the typical findings of forced-choice studies, women reported higher ratings of jealousy and a greater likelihood of ending the relationship in response to sexual infidelity rather than emotional infidelity. More unexpected was the finding that female ratings in response to sexual infidelity were higher than the male ratings. These findings are seemingly in contrast to the predictions of evolutionary psychologists.

Harris (2003), in her review of jealousy research, pointed out that when continuous measures are used instead of the standard forced-choice design, expected sex differences are often not found. Harris argued that the frequent failure of continuous measures to show expected differences between the sexes in their jealousy ratings is evidence against a theory of

evolved sex differences. However, according to Buss and his colleagues, the forced-choice approach is the most appropriate design for the detection of sex differences (Buss et al., 1992; Buss et al., 1996; Buss, 2000). They reason that because a forced-choice design requires an individual to consider simultaneously each form of infidelity before selecting only one, their response will be in line with what is most adaptive to their sex. The use of continuous measures in this study is defended as appropriate since they were more likely to be sensitive to the potentially varied effects of modulating variables on responses to each form of infidelity.

Sex differences are not totally obscured by the method of this study. When the data are examined in a fashion analogous to that of a forced-choice study, the pattern of results is more consistent with typical sex differences. Men were more likely than were women to rate sexual infidelity as the most distressing and sexual infidelity as most likely to result in relationship dissolution. Women, more often than men, reported that the two forms of infidelity were equally distressing and equally likely to result in relationship dissolution.

There are some residual questions. The general question is why the evolved sex differences are often not obvious when continuous ratings are used. With regard to the findings of this study, that question can be phrased more specifically as two separate questions. First, why were the ratings of women in response to sexual infidelity higher than their ratings of emotional infidelity? Second, why were female ratings in response to sexual infidelity even higher than the ratings of men in response to sexual infidelity?

A simple answer pertaining to both questions might be that women actually are more distressed in response to sexual infidelity than emotional infidelity and further that women experience more intense jealousy overall than do men. For reasons detailed earlier in the

paper, men are expected to be more vigilant to cues of a partner's potential sexual infidelity while women are expected to have a propensity for vigilance about a partner's potential emotional infidelity. However, both sexes are predicted to be vigilant to cues of both forms of infidelity and the sex difference is expected only to be a bias in the form of infidelity that most readily induces a jealous response. When a study requires an estimate of how intensely jealousy or any other emotion will be experienced in response to each form of infidelity, it is possible that the response will be associated not simply with the induction of jealousy but also with the emotions that are associated with the entire jealous response to each form of infidelity. The unexpected finding of this study that women reported higher ratings in response to sexual infidelity might be because sexual infidelity evokes more intense cognitive and behavioural responses than emotional infidelity. Therefore, the proposal is that while women might be less predisposed than are men to display jealousy in response to sexual infidelity, once a jealous response to sexual infidelity is induced that response might be more intense than the response that is typically evoked by emotional infidelity.

The findings of a study indexing the various emotions experienced in response to each form of infidelity support that hypothesis. Shackelford et al. (2000) asked men and women to nominate emotions which they thought would be experienced in response to both emotional and sexual infidelity. The experience of sexual infidelity was found to be most associated with feelings of hostility, vengefulness, repulsion, nausea, and humiliation, as well as thoughts of suicide and homicide. Emotional infidelity was associated with feelings of insecurity, depression, helplessness, abandonment, fatigue, a need to forgive, and of being undesirable. It is argued that the emotions associated with sexual infidelity are more arousing and more likely to result in volatile behaviour than are the generally more depressive feelings associated

with emotional infidelity. Consequently, the feelings associated with sexual infidelity might result in higher ratings on continuous measures of jealousy.

The second question, which pertained to the unexpected finding that women reported higher ratings for sexual infidelity than did men was answered simply by stating that perhaps women experience more jealousy overall than do men. However, a tendency for women to experience jealousy more intensely than men, even in response to sexual infidelity, does not negate the existence of a sexually dimorphic jealousy trigger. Again, support for the existence of sex differences in jealousy is only contingent upon a finding that jealousy is differentially *induced* between the sexes not that it is differentially *expressed* or *experienced*. The expression and experience of jealousy are likely more modifiable and manifest in a fashion adaptive to the circumstances of that individual (e.g., age of the mate, relationship satisfaction).

Another reason the ratings of women in response to sexual infidelity might exceed those of men could have to do with the relationship between the expression of jealousy by men and violence (Buss & Shackelford, 1997a; Daly and Wilson, 1988; Wilson and Daly, 1996). Male jealousy is associated with murder and spousal assault, and thus men might be less inclined to report feeling high levels of jealousy because they worry about the negative connotation of such a claim.

In summary, when the continuous data of this study are examined in a straightforward fashion, women are unexpectedly found to experience greater jealousy and report a greater likelihood of ending the relationship than men. However, when the data are examined in a way analogous to that of a forced-choice study, support for predicted sex differences is found. It is proposed that continuous measures are not sensitive to evolved sex differences in

jealousy induction and that they capture only the jealous response as opposed to the jealous induction. Once jealousy is induced, there are reasons to believe that it might be reported as more intense in response to sexual infidelity and as more intense by women in contrast to men.

*Age-related changes in fertility*

Buss et al. (1992) suggested that male sexual jealousy might diminish as the age of the male's mate increases because her reproductive value decreases. That prediction was not directly tested until the present study. Shackelford et al. (2004) showed that the pattern of sex differences so often found in young adults generalized to a group of older adults. However, that study did not permit a direct examination of the relationship between average changes in fertility and patterns of jealousy.

For women, increasing age is associated with a decrease in fertility, the sharpest decline occurring on average when a woman is in her mid thirties. Male fertility does not significantly decline with age. As predicted, male ratings of jealousy and intentions to leave the relationship in response to sexual infidelity decreased in a fashion that corresponded with age-related decreases in female fertility. The complementary finding for women was the fact that their ratings of jealousy remained relatively high presumably because male fertility does not markedly diminish with age. Male and female jealousy ratings and the reported likelihood of leaving the relationship in response to emotional infidelity decreased across the age-span of partners. However, the decreases were closer to being linear and as expected did not correspond to age-related changes in fertility.

The findings that ratings of jealousy and the likelihood of ending the relationship corresponded with age-related changes in fertility are put forward as evidence that jealousy is adaptively flexible. Men with infertile mates do not face the threat of misdirected resource allocation and as a result, their jealous expression is mitigated. Continued vigilance in the absence of a real threat could potentially be costly. The discovery that female jealousy remained relatively high while male sexual jealousy corresponded with age-related changes in female fertility is difficult to interpret as arbitrary or simply the result of a “normal” age-related change in jealousy. First, there would be no reason to predict that a normal age-related change in jealousy would be more likely to result in a jealousy decrease instead of jealousy increase. In fact, common sense could, arguably, lead to the prediction that as people age and become more dependent or attached to their partner they should become increasingly jealous. Secondly, if an age-related decline in jealousy does occur, and it might, there is no reason to predict that the pattern of changes would correspond with changes in female fertility. Finally, if changes in jealousy are not adaptively patterned, and therefore are not changes designed to correspond to fertility of the mate, then there would be no reason to expect that the cause, whatever it is, would affect men and women differently.

Interestingly, female willingness to leave the relationship in response to their partner’s sexual infidelity decreased sharply when their partners were in their late 30s. This was not predicted but is interpreted as indicating an adaptive female response to their age-related decrease in fertility. Women in this study were, on average, a year and a half younger than were their partners. Therefore, a decrease in the female likelihood of leaving the relationship when their partners were in their late 30s corresponded with the mid 30s decrease in female fertility. Women, after that particular age, might be more inclined to stay with their partner

because a new relationship is not likely to result in offspring. Women who stayed with their partner and thus maintained their investment, and that of their partner, in the offspring of that relationship likely had a “fitness” advantage over women who decided to leave. A strategy of leaving a partner in search of another is more likely to be an adaptive strategy for young fertile women. Young women could still reproduce and therefore evoke investment from a new partner.

In summary, the finding that the pattern of male jealousy corresponded with age-related changes in female fertility is convincing evidence for the status of jealousy as an adaptively flexible response. The change in the willingness of women to leave a relationship at the age associated with their greatest decrease in fertility is also evidence that jealousy is adaptively flexible. It is argued that the changes in the jealous experience and response that correspond to age-related changes in fertility are not likely to be arbitrary but rather are adaptively patterned.

*Predictors of the jealous response and the likelihood of ending the relationship*

In addition to the respondents’ sex, their age, and their partner’s age, a few other variables were assessed for their potential to predict the jealous response, namely the reported degree of relationship satisfaction, the number of shared children in the relationship, and the length of the relationship. Relationship satisfaction, for both men and women, predicted jealousy ratings in response to both sexual and emotional infidelity. Sharing children in a relationship and the length of the relationship did not significantly predict jealousy or the likelihood of ending the relationship.

An individual's satisfaction with their relationship was an enduring circumstance that was found to predict ratings of jealousy in response to both emotional and sexual infidelity. Individuals were presumably more vigilant about protecting their investment in a relationship with which they were satisfied. Satisfaction with a relationship might be related to a number of reproductively relevant circumstances such as paternity certainty, a willingness to have children with that person and then to remain with that person in order to invest in the children. Future studies should examine exactly what the modulators of relationship satisfaction are since they may also prove to be fundamental to the prediction of jealousy.

It was somewhat surprising that shared children in a relationship did not predict jealousy. Children obviously represent reproductive success with which the function of jealousy is intimately linked. Children represent investment in a relationship and therefore it seemed logical that individuals would be vigilant about protecting that investment. The failure to find an association with jealousy ratings may have been because we did not ask people to report the ages of their children and therefore our test was not sensitive enough. As children get older, they typically become increasingly independent and as a result require less investment from their parents. It might be the case that mature children no longer represent an enduring relationship circumstance evoking increased vigilance. People with younger, dependent children, might demonstrate a greater tendency to experience jealousy, the jealousy in that case ensuring the ongoing investment of each partner. The present study attempted to correlate only the number of children to the experience of jealousy but future studies should also check for an association with the ages of the children.

The length of the relationship also did not predict either ratings of jealousy or the likelihood of leaving the relationship. Again, the investment into a relationship, in this case

the investment being time, was regarded an enduring situational environmental input that might modulate the jealous response. People might not have evolved a propensity to modulate jealousy in response to relationship length because relationship length unlike the variables already mentioned (fertility or age, presence of children, relationship satisfaction) is not directly related to anything that is consequential to the fitness of the individual.

*Limitations of this study and future directions*

Jealousy studies have typically used only either continuous measures or a forced-choice question. Future studies should request that participants choose which form of infidelity, sexual or emotional; they would least want to experience. Then, respondents should be asked to indicate in turn how jealous they would feel if they were the victim of sexual and emotional infidelity. The one existing study that combined a forced-choice with continuous measures had a small sample size ( $n = 47$ ) and was conducted with only young adults ranging in age from 18 to 23 (Pietrzak et al., 2002). The results of that study confirmed the standard evolutionary predictions on both forced-choice and continuous measures. A combined design conducted with a larger and more age-varied sample might help to differentiate how the induction of jealousy differs from the experience and response to jealousy.

This study requested and relied on people imagining their degree of jealousy or the likelihood that they would end the relationship. However, it was possible that some respondents were reporting from experience. Future studies should better tease apart responses based on actual experience from those that require conjecture about the future.

The use of a cross-sectional design was a weakness. Obviously, a longitudinal design would better track the impact of age-related fertility changes on jealousy ratings and rule out

cohort effects. However, as argued above, the correspondence between male ratings and age-related changes in female fertility are difficult to explain another way. Those findings seem to support convincingly the existence of an adaptive response by men to the fertility of a mate.

The prevailing finding of this study is the responsiveness of jealousy to age-related changes in fertility. A sample of older men mated with younger fertile women should be studied, and if changes in jealousy are adaptive to fertility, as opposed to being caused by simple age-related changes or cohort differences, then older men with fertile partners should demonstrate a pattern of jealousy similar to that of younger men with fertile partners. Similarly, a sample of young men with older infertile partners could also be queried and, if jealousy is adaptive to fertility, they should demonstrate a pattern of results consistent with those of older men who have infertile mates. Those analyses were attempted in this study but the sample of individuals meeting the age difference criteria was quite small. Young men with visibly pregnant partners could also be polled. It is possible, that sexual jealousy is attenuated in men with pregnant partners because for that period her extradyadic involvement with another man is of no threat.

### *Conclusion*

The manifestation of jealousy, like that of all psychological adaptations, should vary between individuals in a fashion consistent with that person's sex and relevant environmental input. That variation is expected because adaptations are not designed for rigid or random expression but rather for a manifestation that is circumstance-dependent. With the exception of sex, the nature of adaptively relevant environmental inputs and their moderating effects has not been extensively explored. This study represented the first attempt to capture changes in

the experience of jealousy across the full range of adult age. The correspondence found between age-related changes in fertility and reported levels of jealousy is argued to be a clear demonstration of the adapted flexibility of the jealousy mechanism.

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Appendix

**Lakehead University, Thunder Bay, Ontario, Canada.  
Survey**

This is a study to examine situations which make people uncomfortable. You will be asked questions which are personal and about relationships. Your participation in the study requires only completion of a short questionnaire. Typing "I agree" in the field provided following these instructions will indicate that you wish to participate in this study. It also indicates that you understand the following:

1. I am a volunteer who can withdraw at any time from the study for any reason.
2. There are no known risks of physical or psychological harm.
3. The data you provide will remain completely confidential.
4. Data obtained in this research will be stored at Lakehead University for seven years, as per standard university procedures.
5. You will have the option of returning to this web page in a few weeks time to review the results of the study or you may provide your email address and the results will be emailed to you.

If you would like to participate in this study type "I Agree" in this field -

There are no right or wrong answers to the following questions. Please just give the most accurate, truthful response for you. It is most helpful to us if you answer every question. If you feel that the questions are too personal, you do not have to answer them. Your responses will be kept completely confidential.

The questions are concerned with your perceptions of particular kinds of behavior by people with whom you are romantically involved.

Are you currently married or involved in a romantic relationship?

Yes  No

**Part 1:** You will now read scenarios and rate both your level of discomfort and the likelihood of ending the relationship on a scale from 1 to 100. Try to be as accurate as you can. Here are examples of the scales.

1 = not disturbed at all.

1 = not likely at all.

25 = slightly disturbed.

25 = slightly likely.

50 = moderately disturbed.

50 = moderately likely.

75 = quite disturbed.

75 = quite likely.

100 = completely disturbed.

100 = I would end the relationship.

Ok here we go....now read the following scenarios and respond to the scales.

Please think of the person to whom you are currently married or dating. If not currently in a relationship, please think of your most recent relationship or one that you would like to have. Imagine that you discover that this person has become interested in someone else. For each of the 3 situations indicate on the 1-100 scale how disturbed or distressed you would feel and how likely you would be to end the relationship.

**(Scenario A)**

Imagine your partner forming a deep emotional attachment to the other person. They spend time together and talk about very personal issues. They have even said that they are in love with each other. Despite this attachment you know as fact that your partner has not had sexual relations with the other person.

**1 = not disturbed at all.**

**1 = not likely at all.**



**100 = completely disturbed.**

**100 = I would end the relationship.**

**(Scenario B)**

Imagine your partner enjoying passionate sexual intercourse with the other person. They enjoy frequent sex in a number of different positions. Despite this sexual relationship you know as fact that your partner does not love the other person.

**1 = not disturbed at all.**

**1 = not likely at all.**



**100 = completely disturbed.**

**100 = I would end the relationship.**

**(Scenario C)**

Imagine your partner both forming a deep emotional attachment and enjoying passionate sexual intercourse with that other person. They enjoy sex in a number of different positions and spend time together and say that they love each other.

**1 = not disturbed at all.**

**1 = not likely at all.**



**100 = completely disturbed.**

**100 = I would end the relationship.**

**Part 2:** The next questions are simply requesting information about you.

Was the person you thought of in the above scenarios **Real** or **Imagined**? Real

Imagined

What is your current relationship to the person you imagined in the scenarios?

How old are you?  years.

What is your gender? Male  Female

How long have you been or how long were you romantically involved with the person you thought of in the above scenario?  years  months.

What gender is the person you thought of in the scenario? Male  Female

How old is / was the person you thought of in the above scenarios?  years.

How many children have you had with this person? (Do not include stepchildren)

How many children do you have in total? (Do not include stepchildren)

How many serious romantic relationships have you had in your entire lifetime?

How many times have you been married (including present)?

Did the person you thought of in the above scenarios ever cheat on you?  Yes, only sexually  Yes, only emotionally  Yes, both sexually and emotionally  Never

In how many of your romantic relationships did someone cheat on you in an emotional way?

In how many of your romantic relationships did someone cheat on you in a sexual way?

In how many of your romantic relationships did someone cheat on you in both an emotional and sexual way?

Have you ever cheated on the person you thought of in the above scenarios?  Yes, only sexually  Yes, only emotionally  Yes, both sexually and emotionally.  Never

In how many of your romantic relationships did you cheat in an emotional way?

In how many of your romantic relationships did you cheat in a sexual way?

In how many of your romantic relationships did you cheat in both an emotional and sexual way?

How satisfied are you or were you with the relationship you thought of?

**1 = Not satisfied at all.**

**100 = Completely satisfied**

What was the highest level of education that you completed?

How would you describe your present financial situation?

**Part 3:** The next questions are about you, and are in the form of statements with which you may agree or disagree. Please answer each question by selecting the appropriate response from the menu.

In most ways my life is close to my ideal.

The conditions of my life are excellent.

I am satisfied with my life.

So far I've gotten the important things I want in life.

If I could live my life over, I would change almost nothing.

On the whole, I am satisfied with myself.

I feel that I have a number of good qualities.

I am able to do things as well as most other people my age.

I feel that I'm a person of worth, at least on an equal plane with others.

I take a positive attitude toward myself.

**Part 4:** The next questions are about the person you thought of or imagined in the scenarios. The questions are in the form of statements with which you may agree or disagree. Please answer each question by selecting the appropriate response from the menu.

In most ways my partner's life is close to their ideal.

The conditions of my partner's life are excellent.

My partner is satisfied with their life.

So far, my partner has gotten the important things they want in life.

If my partner could live their life over, they would change almost nothing.

On the whole, my partner is satisfied with them self.

My partner feels that they have a number of good qualities.

My partner is able to do things as well as most other people their age.

My partner feels that they are a person of worth, at least on an equal plane with others.

My partner takes a positive attitude toward them self.

If you would like to directly receive the entire results of this study please enter your email address.

(You will receive the total findings of all participants together. You will not receive your own submissions therefore; your confidentiality will be further ensured. - your email will be given to no one and will not be used for any other purposes. You should receive the results in about 4 weeks).

Please provide any additional comments or suggestions for this questionnaire or share any of your own knowledge about this topic.

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Submit Questionnaire

**IMPORTANT** - After you have submitted the survey and you are directed to the thank you page...click the link that says return to previous page and you will be directed to a web page containing results and information.

Thank you for taking part in this survey. We appreciate all your help. Please forward this link to a friend so they can do it too. If you have any questions about this survey or psychology in general please feel free to contact me.

Contact Information: Edouard St-Pierre

epierre@tbaytel.net

Lakehead University

Ph.D Candidate Psychology

Table 1

*Order effects for the presentation of scenarios*

Question	Scenario	Sex	Order	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i> *
Jealousy	Sexual	Male	1	319	74.95	33.69	.05
			2	348	74.82	34.15	
		Female	1	224	80.18	31.01	-.16
			2	272	80.61	29.12	
	Emotional	Male	1	319	60.40	33.53	.82
			2	348	58.27	33.50	
		Female	1	224	67.22	32.51	.62
			2	272	65.36	34.21	
	Combined	Male	1	319	87.33	26.18	.45
			2	348	86.41	26.51	
		Female	1	224	88.54	26.91	-.78
			2	272	90.32	23.72	
End Relationship	Sexual	Male	1	318	70.36	36.55	-.34
			2	345	71.33	36.61	
		Female	1	221	76.79	33.41	.43
			2	269	75.48	33.84	
	Emotional	Male	1	318	45.51	36.06	1.53
			2	345	41.22	35.82	
		Female	1	221	52.48	36.26	.14
			2	269	52.01	37.44	
	Combined	Male	1	318	86.13	27.69	.42
			2	345	85.20	28.52	
		Female	1	221	90.48	24.51	.47
			2	269	89.42	25.47	

\* all *t* values were non-significant.

Table 2

*Mean Distress Ratings and the Likelihood of Ending the Relationship in Response to each Scenario.*

Question	Scenario	Sex	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>d</i>	95% <i>CI</i>
Jealousy	Sexual	Male	667	74.88	33.91	-2.94**	.18	-9.22 to -1.84
		Female	496	80.41	29.97			
	Emotional	Male	667	59.29	33.51	-3.48**	.20	-10.81 to -3.02
		Female	496	66.20	33.44			
	Combined	Male	667	86.85	26.34	-1.75		-5.65 to .33
		Female	496	89.52	25.21			
End Relationship	Sexual	Male	663	70.86	36.56	-2.50*	.15	-9.29 to -1.13
		Female	490	76.07	33.63			
	Emotional	Male	663	43.28	35.97	-4.13**	.24	-13.20 to -4.68
		Female	490	52.22	36.88			
	Combined	Male	663	85.65	28.11	-2.71**	.16	-7.34 to -1.17
		Female	490	89.90	25.03			

\*  $p < .05$ .

\*\*  $p < .01$ .

Table 3

*Bivariate and Partial Correlations of the Predictors for Jealousy and the Likelihood of Ending the Relationship in Response to Sexual and Emotional Infidelity*

Sex	Predictor	Jealousy				Likelihood of Ending the Relationship			
		Sexual Infidelity		Emotional Infidelity		Sexual Infidelity		Emotional Infidelity	
		<i>r</i>	Partial <i>r</i>	<i>r</i>	Partial <i>r</i>	<i>r</i>	Partial <i>r</i>	<i>r</i>	Partial <i>r</i>
Men	Partner's Age	-.20**	-.14**	-.24**	-.20**	-.25**	-.12**	-.28**	-.14**
	Relationship Length	-.16**	-.03	-.13**	.04	-.23**	-.08	-.27**	-.06
	Relationship Satisfaction	.16**	.17**	.11**	.13**	.03	.05	-.03	-.01
	Children	-.08*	.01	-.07	-.01	-.15**	.00	-.21**	-.07
Women	Partner's Age	-.18**	-.10*	-.18**	-.11*	-.19**	-.14**	-.19**	-.13**
	Relationship Length	-.14**	-.02	-.15**	-.00	-.14**	-.05	-.19**	-.04
	Relationship Satisfaction	.24**	.22**	.18**	.16**	.06	.03	-.02	-.05
	Children	-.11*	-.01	-.14**	-.07	-.07	.04	-.18**	-.07

*Note.* The partial correlations provided for each predictor were derived from regressions controlling for each of the other predictors listed in the table.

\*  $p < .05$ ; \*\*  $p < .01$ .

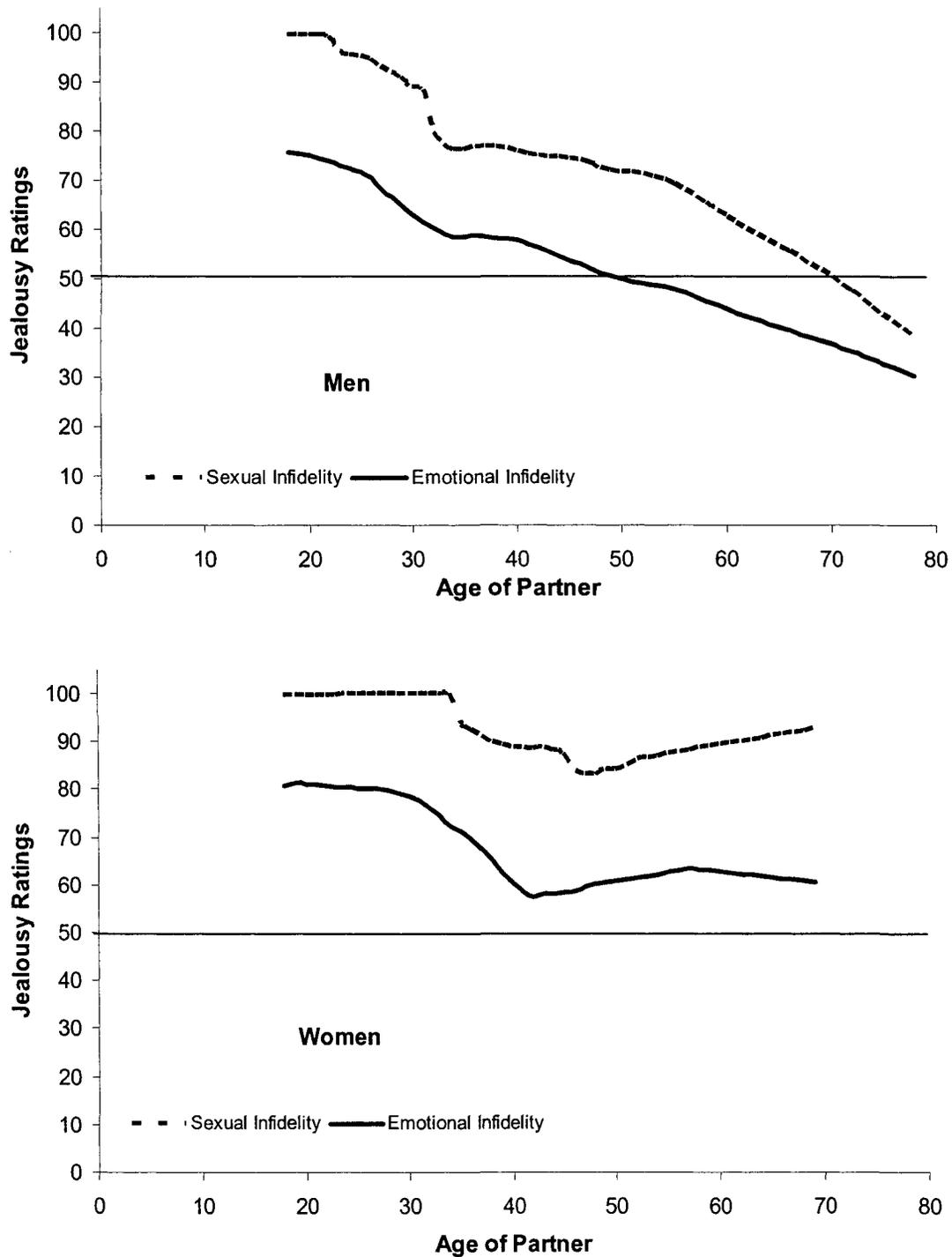


Figure 1. LOESS lines representing the association between age-related changes in fertility and ratings of jealousy in response to emotional and sexual infidelity for both men and women. The horizontal line at the rating of 50 was provided only as a visual aid to assist in the comparison of LOESS lines between sexes.

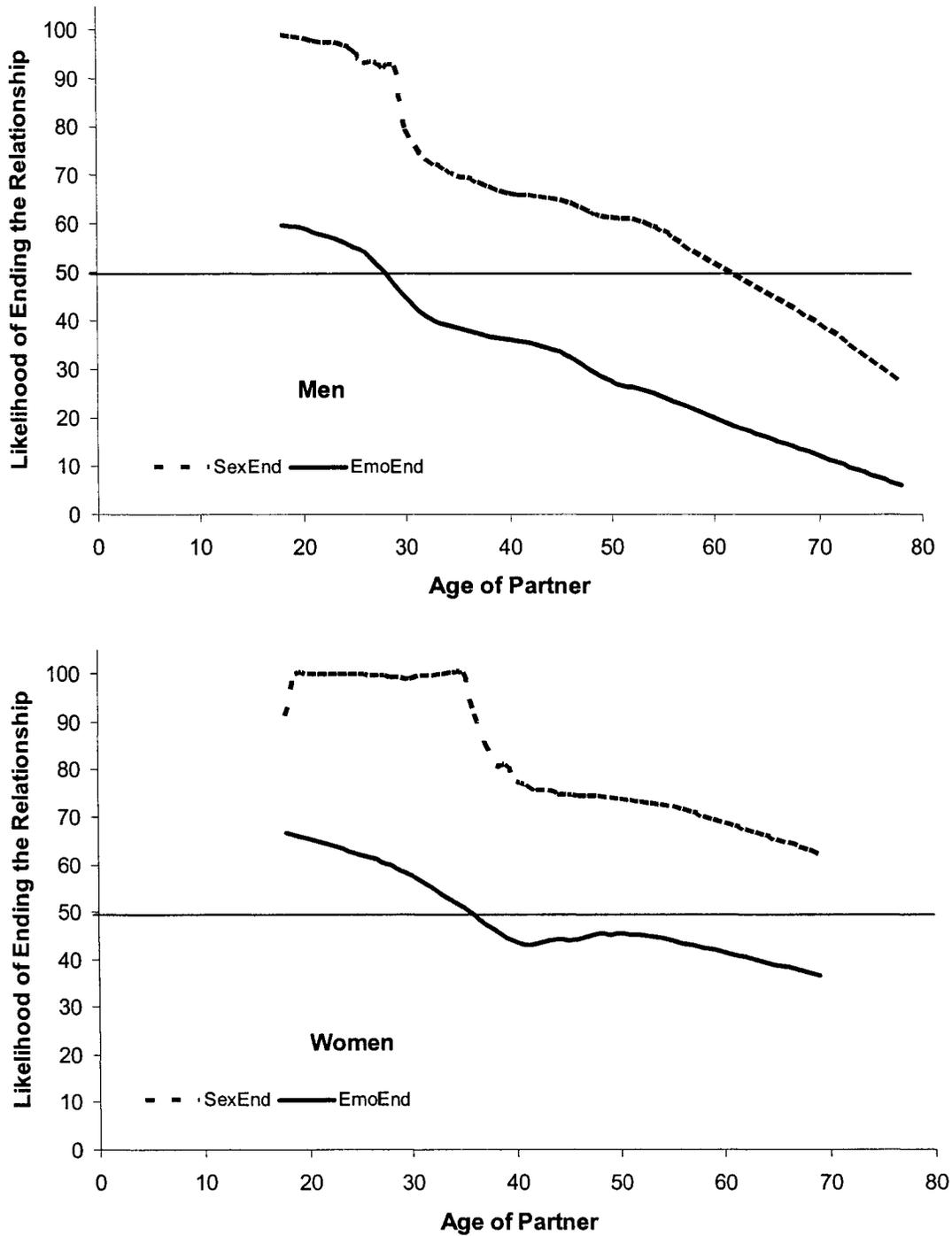


Figure 2. LOESS lines representing the association between age-related changes in fertility and the estimated likelihoods of ending the relationship in response to emotional and sexual infidelity for both men and women. The horizontal line at the likelihood of 50 was provided only as a visual aid to assist in the comparison of LOESS lines between sexes.