

FUNCTIONAL ASPECTS OF JEALOUSY ACROSS THE LIFESPAN

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ABSTRACT

The crux of this paper is to examine how jealousy has measurable fitness-related benefits that are evident across the lifespan. Evidence supports jealous responses being displayed by infants as young as six months, perhaps to redirect care to oneself. Children then begin to incorporate more range in their behavior to redirect attention and care back to themselves in relationships with parents, siblings, and peers. In adolescence, some jealousy occurs in peer relationships, due to the closed nature of peer groups, and peer jealousy appears to impact mating opportunities differently for each sex. Most of the research on jealousy in adulthood examines how partners use mate guarding and other signaling behavior to protect a relationship. Some key directions for jealousy research to test functional hypotheses are discussed for each stage of the lifespan. While it is true that data are lacking to confirm effectiveness, it is apparent that being aware of and responsive to recurring relationship threats serves to protect various social benefits across the lifespan.

Key words: *Jealousy, children, adolescents, evolution*

INTRODUCTION

Jealousy is often derided as an emotion that is harmful to relationships. Clinicians have designed therapeutic interventions aimed at ridding oneself of jealous feelings because of the purported detrimental impact jealousy has on relationships, usually one's romantic relationships (Bringle & Buunk, 1986; Buunk & Bringle, 1987; Mathes & Severa, 1981; Pines & Aronson, 1983). There is considerable research labeling jealousy as a pathological emotion and a hallmark of unjustified insecurity in the jealous person (Brehm, 1992). Neither sex enjoys being on the receiving end of jealous behavior; displays of jealous behavior such as being vigilant of a mate's interpersonal interactions or accusing a mate of being unfaithful are commonly cited reasons for relationship dissolution (Amato & Rogers, 1997), and sexual jealousy is a leading cause of violence in romantic pairings (Daly & Wilson, 1988). Still, jealousy is a universally occurring emotion found cross culturally (Bhugra, 1993) and has been thought to occur in other mammals as well (Morris, Doe, & Godsell, 2008, Panksepp, 2010).

Functional Themes of Jealousy in Development

From a functional perspective, the evident ramifications of expressing jealousy and the ubiquity of jealousy are confusing for a couple of reasons. If jealousy leads to conflict, separation, and even murder, how does expressing jealousy aid in the reproductive success of humans? To understand why a particular behavior occurs in humans, the behavior's evolutionary history, function, ontogeny, and physiological mechanisms must be accounted for (Tinbergen, 1963). This paper will center on how human fitness is enhanced because we are capable of experiencing the context-dependent emotion, jealousy. Moreover, jealousy has been documented in infancy and childhood, even in the absence of direct sexual motivational interest. This paper will discuss research showing that jealousy serves to protect social relationships that enhance fitness at each major point across the lifespan.

Defining Jealousy

Jealousy is a context-dependent emotion that results in an abhorrent feeling when one is aware of a threat to a relationship with a loved one. Jealousy results after observing someone enjoy attention or advantage that one wants for him- or herself. The threat is typically posed by a third party whom the jealous individual perceives to be a rival. This observation triggers a negative affect or affects, and individuals react with expressions of sadness, fear, or anger and with overt behaviors, to regain the love one's affection or allegiance (Hart, 2010). Overt behaviors include imitation of the rival, aggression against the rival, and attempts to gain attention and care from the loved one (Hart, 2010). Jealousy elicits visceral changes similar to those of other universal negative emotions (Hupka, Zaleski, Otto, Reidl, & Tabarina, 1996), fear and anger.

Sibling and Peer Jealousy

Human infants are highly dependent upon a caregiver, usually the mother, for feeding, warmth, transportation, hygiene, protection, and stimulation. Heavy investment in one infant can detract from investment in another child, resulting in discriminative parental solicitude: differential allocation of parental investment over time depending on child and parent characteristics and environmental pressures. Thus, behavior that calls attention to breaches in care is advantageous to the infant. Infants who are more reactive have a greater chance of reclaiming investment and attention if they detect when attention is being directed at another. The purpose of the jealous behavior is to gain or regain favorable treatment from the relationship target. Inequities in attention or care may elicit jealous behavior infants to redirect care from the interloper, who is likely to be a sibling, to themselves.

The presence of other siblings impacts the total resources and care available to the vulnerable infant, in addition to the demands of parent survival needs. Birth spacing allows for separate periods of similar parental investment, with close birth spacing a threat to infants. When births are spaced close together, more infants are given up for adoption (Rousseau, 1970). Infant mortality risk is doubled if the infant has an older sibling less than two years of age (CDC, 2000). The typical, potentially optimal, interbirth interval for our species is three or four years (Lancaster, 1984).

Increased infant mortality may be due to a disruption in breastfeeding, which could be impacted by the presence of other nursing siblings. Breastfed infants are four times more likely to die if breastfeeding stops at two or three months of age in comparison to infants without breastfeeding disruption (Lawrence & Lawrence, 2005; Leon-Cava, Lutter, Ross, & Martin, 2002). As time goes on, the cost to the mother is increased because breastfeeding impacts her ability to have other infants; thus, the mother's fitness is enhanced by early weaning in this way, but the child's fitness is enhanced by prolonged weaning (Trivers, 1974). Fouts, Hewlett, & Lamb (2005) conducted a comparison between child weaning behavior in farming and foraging communities neighboring each other in the Central African Republic. The children in farming communities showed significantly more weaning distress when the mother ended breastfeeding (between 18 and 27 months of age), whereas the forager children showed less distress and physical resistance, perhaps due to deciding for themselves when breastfeeding ceased. The foraging children were comparatively older than the farming children (between 36 and 53 months of age). This example underscores the inherent conflicting interests that are present for mothers and infants and suggests that a mechanism to solicit parental investment would be useful, starting early on in development.

Sometimes, environmental circumstances favor investing differentially in offspring. The Trivers-Willard effect (Trivers, 1973) states that the sex ratio of sons to daughters is influenced by parental investment considerations. When environmental circumstances are good, more sons are produced and the sex ratio reverses when conditions worsen. Healthy, well-fed sons can potentially produce more grandchildren for parents, and so parents may concentrate resources in sons when resources are accessible. In some countries where male labor is central to the family unit, sons are breastfed for longer periods, and vice versa in areas where female care is culturally required in the family, especially in low SES families (Quinlan, Quinlan, and Flinn, 2005; Bereczkei, 1993). Other conditions are likely to favor daughters over sons, such as a dowry competition (Dickemann, 1979) and better marriage prospects (Kronk, 1993). In line

with the Trivers-Willard hypothesis, father absence, which increases financial and general parental hardship, has been shown to increase infant male mortality more than female (Gibson, 2008). The following section examines the expression of jealousy in infancy and how it can redirect parental investment.

Prominent emotion researchers (Izard & Dougherty, 1982; Lewis 2000) have argued that infants only experience primary emotions, such as anger, fear, joy, surprise; secondary emotions like pride, shame, and jealousy arise around the second year of life. Because jealousy is contextual, some theorists hold that jealousy requires interpretation and thus may be beyond the developmental capacity of infants in the first two years of life (Bridges, 1962, Lewis, 1993). It is likely that jealousy in infancy is not the same as jealousy in other stages of the lifespan because of the apparent developmental differences, especially in brain maturation (Panksepp, 2010). However, the data cited below support the idea that infants can exhibit a jealous response consistently as early as six months.

In infancy, there are four categories of observable behavior patterns in the jealousy response. Protest behavior consists of crying and calling for a caretaker, or appearing sad. Motoric behavior includes aggression, such as hitting the relationship target or the rival, accompanied by staring, frowning, and stiffening of the body, and proximity seeking of the relationship target, such as positioning oneself between the rival and relationship target. Imitation of the rival has also been documented and this seems to increase as the infant ages, starting in the first year of life (Robin, le Maner-Idrissi, Corroyer, 1998; Hart, 2010). Jealous behavior in infancy is consistent with childhood and adult jealousy behavior, so the application of the notion of jealousy is reasonable to infancy, though the purpose may be to redirect care to themselves, which is distinct from later motives that center around reproduction.

Infants under one year have reacted to scenarios that elicit jealousy via a rival infant. Infants, around 8.5 months, were observed to shove a sibling away from the mother (Draghi-Lorenz, 1998). Hart & Carrington (2002) observed mother-infant dyads in two conditions where the infant lost exclusive maternal attention to a lifelike doll or a picture book. The six month old infants exhibited higher levels of anger and sadness when their mothers displayed positive attention to a lifelike doll than when their mothers displayed attention to a picture book. The infants demonstrated they were reactive to social exclusion, and the response is specific to a personified rival. The non-humanoid book condition did not elicit increased negative affect. Hart, Field, del Valle, and Letourneau (1998) showed that one-year-old infants protested more when the mother held a toy doll, exhibiting intense negative vocalizations, in comparison with when a stranger held the doll. There is evidence that infants differentiate among rivals as well. Upon seeing their mother attend to another infant, half of the five-month-old infants in a sample showed their upset by crying or screaming, whereas only a tenth exhibited the same signs of upset when the mother attended to an adult (Draghi-Lorenz, 1998). This suggests that infants react because there is a threat to the valued relationship, as opposed to an undifferentiated, general response to any person or object present, and infants monitor where caregiver attention is being directed. Additional research is needed to fully gauge the range of stimuli that would evoke jealousy.

To understand whether it is the attention that is directed to another versus the lack of expression directed from the mother to the infant, Hart, Carrington, Tronick, & Carrol, (2004) compared three paradigms: a play scenario, still face, and jealousy-evoking scenario with a lifelike doll. They found that 6-month-old infants in the jealousy-evoking scenario displayed more sadness than in the still-face paradigm. Infants in the jealousy condition, compared with the still-face condition, gazed more at the mother when she was playing with the doll, showed more interest in the doll, and approached the mother more. When mothers directed positive affect towards the doll, they elicited more negative reactions (sadness, distressing vocalizations) from the infant. Witnessing positive affect being directed to another appears to be more disturbing than receiving flat affect from a primary caregiver, and infants' negative affect may be proportional to their affection for the caregiver. In a separate study, the jealous affect of toddlers was highest, and accompanied by more physical interference, when an older sibling received special attention from the father (Volling et al., 2002). Infants demonstrate that they are sensitive to differential treatment.

The presence or absence of jealous behavior from infants is another index of relationship quality, in the way that attachment is, and this vein of research is largely untapped by researchers. Supporting evidence for this idea comes from data on infants of depressed mothers. Hart, Jones, & Field (2003) studied one-

year-old infants of depressed mothers who displayed the intrusive (rough, asynchronous, insensitive play or tickling; shaking; copious speech) or withdrawn (rare touching, flat affect, minimal speech) pattern of interaction with their infants. The infants were observed in four scenarios: an unfriendly stranger reading a book, their mother reading a book, an unfriendly stranger playing with a baby-like doll, and their mother playing with a baby-like doll. Infants of depressed mothers who were intrusive showed less gazing and less protest in response to the loss of attention, and they touched mothers less in comparison with both stranger conditions. Infants of depressed and withdrawn mothers attempted more interaction with the stranger who was ignoring them. The infants' responses indicated that the mother was not a source of comfort, and the mother's interactional pattern mattered in triggering response from the infant. Behaving this way to a stranger is potentially useful in eliciting care from another if loss is permanent (Bowlby, 1980) through death, unavailability, or asymmetry in caregiver responsiveness.

Additionally, indicators of health, such as activity level and physical attractiveness, can skew parental investment and are important to consider in jealousy research. Mothers of attractive newborn infants were rated as more affectionate and engaged in more play at three months (Langlois, Ritter, Casey, Sawin, 1995). Sickly children are subject to more neglect, abuse, and murder (Daly and Wilson, 1988; Harris, Hilton, Rice, and Eke, 2007; Catherine, Ko, and Barr, 2005). St. James-Roberts, Conroy, & Wilsher (1998) found that infants who cried more received more stimulation and maternal interaction. Infants' attractiveness, health, and reactivity are useful weapons in their burgeoning armory as they aim to have their needs met.

Sibling Jealousy

As infants develop and enter childhood, jealousy still arises between siblings over perceived disparities in parental affection and attention (Boer, 1990; Prochaska & Prochaska, 1985; Stocker, Dunn, and Plomin, 1989; Bryant & Crockenberg, 1980; Dunn & Kendrick, 1981), which warrants separate consideration from peer jealousy. Children are dependent on parents for continued care, although the amount of time spent with parents decreases in childhood. Thompson and Halberstadt (2008) discovered that fifth and sixth grade children reported at least one jealousy episode per month with a sibling in 98% of the sample. Children cited perceived parental favoritism and disproportionate parental attention as instigating factors. Violence between siblings is the most common type of family violence and is present in 70% of families with children (Hoffman & Edwards, 2004).

Various parental and infant characteristics, as well as family consanguinity, may potentially affect sibling jealousy. Temperament was a meaningful predictor of jealous affect when mothers were ignoring a toddler and playing with an older sibling (Volling, McElwain, & Miller, 2002). Older siblings who had higher emotional regulation expressed less jealousy (Volling et al., 2002). Older children can report their affects better than younger ones, inviting variance in emotional expression. On the other hand, the nonverbal expression of jealousy may be suppressed voluntarily as children develop.

Evolutionists would predict as well that sibling consanguinity would reduce the jealousy response. However, Fearon et al. (2006) demonstrated that maternal sensitivity varied between monozygotic twins, and therefore the attachment relationship for one twin could be different from the other's, resulting in different degrees of jealousy between the twins. In order to investigate if relatedness reduces jealousy, researchers would need to make comparisons between monozygotic and dizygotic twins, and siblings, while accounting for attachment security.

Various factors may influence sibling conflict. Sibling conflict is greatest when children are close in age (Cicirelli, 1995), suggesting that similarity in needs increases conflict. Older children receive more resources and protection and are afforded higher status in the family around the world (Rosenblatt & Skoogberg, 1974), and parents reduce their level of investment per child as family size increases (Borgerhoff-Mulder, 1998). Family size is known to delay menarche and reduced height, which carry reproductive consequences (Tanner, 1968). Sibling investment also results in delayed menarche, so extending help to a younger sibling is a form of sibling competition and it affects pubertal timing of girls (Burger & Gochfeld, 1985; Zacharias & Wurtman, 1969). Parents can better assess a child's economic and reproductive potential over time, which may influence investment. Hewlett (1991) found that daughters

received more parental investment when women contributed more calories to meals, and sons more where warfare was common.

It seems that jealousy is an effective tool for younger children. Perhaps, parents redirect attention to younger children because they are aware they have already invested more in the older child, so the redirection evens things out, or the signaling from the younger child may be more effective early on. Miller, Volling, and McElwain (2000) examined triadic interactions with sibling pairs. Parents were instructed to focus on one child while the other played with toys. The researchers found that both younger and older children were distressed, sad, and angry when asked to play alone while their parents attended to the sibling, but it was younger children who received more response to their jealous displays (Miller, et al., 2000). Additional studies looking at when and what factors impact how caregivers respond to jealousy at multiple points in childhood are needed to clarify how warranted this conclusion is. There could be other explanations for the increased response to the younger sibling.

Sibling jealousy persists into adolescence and adulthood but it is under-studied and confounded with rivalry, which makes partialling out the unique effects of jealousy difficult (Burhmester & Furman, 1990; Bevan & Stetzenbach, 2007). Tseung and Schott (2004) found that perceived preferential treatment of another adolescent sibling was the only significant correlate with feeling sibling animosity, with the greater the perceived affection that another sibling received from parents being proportionate to sibling conflict. Adolescents who are perceived to have better prospects for financial success (Hewlett, 1991; Low, 1991; Low & Clarke, 1991; Volland, Siegelkow, Engel, 1991) and mating opportunities (Dickmann, 1979, Boone, 1986; Bereczkei & Dunbar, 1997, Cronk, 1991) receive more parental investment. Stocker, Lanthier & Furman (1997) reported that college students entering early adulthood displayed dislike and hostility for siblings receiving more parental attention. Data indicate that offspring who show they may obtain social power tend to receive more parental investment, including more inheritance (Blaffer Hrdy & Judge, 1993; Boone, 1986; Hewlett, 1991). Rauer and Volling (2007) showed that adult siblings were acutely aware of differential parental treatment, which was related to romantic relationship functioning, feelings about themselves, and perceptions of others.

Peer Jealousy

Friendship may be a side effect of kin selection; we treat friends like kin in many ways. Friendships form out of mutual interest for emotional support and are based on similarity in sex, intelligence, pastimes, outlook, and personality (Ginsberg, Gottman, & Parker, 1986; Hinde, 1997; Mills and Clark, 1994). Friendship may be the first opportunity for individuals to manage emotional expression and use it to help preserve relationships, and these training opportunities may be necessary practice for later social relationship management (Bedford, Volling, Avioli, 2000). Jealousy between peers arises in childhood with the emergence of friendships and dominance competition. These relationships influence current social standing and reproductive success later on (Berndt, 1982; Younis & Haynie, 1982), including romantic relationships (Hartup, 1996; Feiring, 1999). Jealousy with peers is brought about by a friend interacting favorably with a third child.

Children differentially respond to social sources of threat. Parker, Ramich, and Roth (2009) found that children reported that third party interference would be threatening and would ask the best friend why the plans were broken for the third party and would want to discuss their feelings; boys indicated lower levels of upset across conditions. Direct acts of aggression were not viewed as optimal choices, though the children reported feeling angry. Conflict and perceptions of relationship inequalities often lead to persistent feelings of jealousy and relationship dissolution (Whitesell & Harter, 1996). Roth (2002) found that a common source of dislike for female friends was jealous behavior. Friendship jealousy has been shown to decline around age eleven and to rise sharply two years later, near puberty; it continues to increase throughout secondary school (Parker, Kruse, & Wargo Aikins, 2010).

Girls may experience more jealousy with peers than boys. In the previous study, girls reported greater desire to ignore the best friend by social exclusion or by the silent treatment. Girls are more likely to belong to small peer groups consisting largely of intimate dyads, whereas boys form more prominent dominance hierarchies and socialize in larger peer groups (Baines & Blatchford, 2009; Eder & Hallinan,

1978; Omark, Omark, & Edelman, 1975; Waldrop & Halverson, 1975). Girls may react more negatively to, and may end friendships over, relationship inequalities (Whitesell & Harter, 1996).

It would be interesting to examine whether sex differences in elicitors of jealousy, such as friendship closeness and status similarity or inferiority, carry over to later life. Friends can be a source of mating advice and can enhance mating prospects, but friends are also a source of competition in mating, perhaps partly because friends tend to be similar in many respects. Parker, Campbell, Kollat, & Lucas (2008) reported that the physical attractiveness of an interloper triggers higher rates of jealousy, especially for female friends. In the Parker et al. (2008) study, peer victimization was inflicted by same-sex peers, and this was related to the sexual opportunities of males and females. The more peer victimization, the more sex partners females were likely to have, but there was a negative association in males (Parker, et al., 2008). Future studies should apply causal modeling to this topic to confirm if peer victimization for females is a way of calling attention to a promiscuous female and harming her long-term mating prospects while restricting the sexual opportunities of males (cf. Campbell, 1995).

Sexual Jealousy

In adolescence and adulthood, the affect of jealousy remains the same and is displayed through protest, contact seeking, imitation, and aggression. Beginning with adolescence, the function of jealousy shifts from being used to primarily protect one's parental and peer relationships to being used to guard one's budding reproductive interests brought about by puberty. In adulthood, threats to one's reproductive fitness interests are the most prominent sources of threat.

Sexual jealousy is often used to prevent extra-pair copulations and to prevent mate-poaching. Sexual jealousy can be lethal because of the great fitness consequences of being victimized by infidelity (Daly & Wilson, 1988). At the same time, expressing jealousy can protect relationships before and after threats have occurred. In this way, jealousy may elicit renewed commitment and attachment to the relationship; this echoes data from men and women who state making a partner jealous is an effective means of gaining attention, assuring commitment, and retaining a mate (Buss, 1988). Male and female undergraduate students have expressed agreement that displays of attraction, affection, and attention to a potential interloper are the most effective means for inducing jealousy in a mate (Wade & Weinstein, 2011).

Males are likely to express jealousy in response to threats to the sexual fidelity of one's mate due to the inherent risk to paternity certainty. As a result, male jealousy manifests itself in the form of mate retention tactics such as verbal and physical displays of possessiveness, monopolizing a mate's time, physical abuse of one's mate and the rival, emotional manipulation and derogation of one's mate, threatening rivals (Buunk, Angleitner, Oubaid, Buss, 1996), and copulation with the mate to thwart cuckoldry through sperm competition (Simmons, Firman, Rhodes, Peters, 2004). The use of gift giving for the purpose of mate retention, which would mean continued sexual access to the mate, is significantly stronger in males than in females (Jonason, Centurlo, Madrid, Morrison, 2009). Males with youthful, attractive mates who were perceived to be potentially unfaithful reported copulatory behavior that would be effective at correcting a sexual infidelity through rival sperm displacement, in the form of longer copulating and deeper thrusting (Goetz, et al., 2005). Also, a longer time lapse from the last copulation increases mate retention behavior (Starratt, Shackelford, Goetz, McKibbin, 2007). Male mate retention strategies, as measured by being more attentive and time monopolization, increase near ovulation, coinciding with the time female interest in extra-pair copulations, attractiveness, and fertility peaks (Gangestad, Thornhill, & Garver, 2003).

While it is apparent that males are reactive to risks regarding sexual infidelity, it is not known what the direct effects of mate retention strategies are. A widespread mate retention tactic is physical violence which carries obvious costs to each member of the relationship (Campbell, et al., 2003; Wilson & Daly, 1985). Kaighobadi, Shackelford, and Goetz (2009) suggest that the main threat and use of nonfatal violence is to prevent sexual infidelity, and there is support that nonfatal violence does not reliably end relationships (Walker, 2000), which may speak to its efficacy. One study indicated that mate retention tactics are stable from the newlywed stage of married couples to four years into marriage, suggesting that the fear of losing

one's mate is consistent early in marriage, though frequency of tactic use decreases over that period (Kaighobadi, Shackelford, & Buss, 2009).

Females are vigilant for cues indicating a male's attention to and investment of resources in other females (Harris, et al., 2007), as these behaviors can predict abandonment which could lead to a reduction in parental care of offspring and the loss of a quality mate. Compared with males, females show higher concern for amorous, or "emotional," infidelity than for sexual infidelity, perhaps because an amorous attachment to another is more predictive of mate desertion (Buss, Larsen, Westen, Semmelroff, 1992). Assessment methods using physiological (Buss et al., 1992) and experimental data (Schützwohl, 2008) show the sex difference consistently, as do cross-cultural data. It is true that females report more distress and even report greater anger in response to sexual jealousy (Basset, 2005), but females remain the sex more concerned about when a partner is amorous to another and even report feeling more guilt when engaging in emotional infidelity themselves in comparison to males (Fisher, Voracek, Rekkas, & Cox, 2008).

As expected, attractiveness is a salient feature that drives the expression of jealousy in females. Attractiveness is a signal of fertility and relative health, and, along with youth, it is the most desired feature in females (Buss, 2008). Dijkstra and Buunk (2001) found that women were more likely to heed a rival's waist, legs, hips, and thighs than any other part of the body. Women with smaller waists in comparison to hips, indicative of relative fertility (Singh, 1993), elicited more jealousy from other women. A female is more likely to use self-promotion the higher she rates her own attractiveness, as a way to communicate her mate value, than females with lower ratings (Fisher, Cox, & Gordon, 2009). Brown & Moore (2003) showed that individuals with higher fluctuating asymmetry, who would be less attractive and lower in genetic quality, are more jealous with respect to a mate, but not in a nonromantic context, such as when another received praise or a promotion. Also, the female partners of high status males engage in more mate retention tactics (Buss, 2000), such as self-promotion of one's attractiveness. Platek (2007) demonstrated that jealousy was more pronounced when shown a hypothetical messenger who related that one's partner was in love with another when the messenger more closely resembled the subject. Perhaps, resemblance, which controls somewhat for the attractiveness of the subject, is even more upsetting because it presents a rival who is on equal footing with the subject and is more threatening. Undeniably, features important in mating spur jealousy.

Jealousy seems to be greater when self-perceived mate value is low in both sexes. Buunk, Park, Zurriaga, Klavina, & Massar (2008) reported that a male's height was negatively correlated with jealousy of attractive, dominant rivals; the taller, more dominant males were less jealous. In women, there was a curvilinear relationship; short and tall women were more jealous than women of average height. Regarding the curvilinear relationship for female height, short and tall women are more prone to illness, and tall women may be less feminized and have a lower mate value (Buunk et al., 2008). Unattractive and low-earning men have been shown to derogate their partner more, possibly deterring her from straying from the relationship (Miner, Starratt, Shackelford, 2009).

Relative attachment security affects jealous response in couples. Sharpsteen and Kilpatrick (1997) found that securely attached partners were more likely to say that an instance of jealousy had brought them closer together as a couple through communicating about the jealousy-provoking event, whereas the insecurely attached engaged in more aggression and withdrawing behavior. Further research is needed to replicate this pattern. When individuals are asked to recall jealous responses in the past, there is no quantitative distinction that can be made based on attachment classification (Sharpsteen & Kirkpatrick, 1997; Powers, 2000). However, securely attached individuals were more likely to be angry at their partners, whereas the insecure-anxious attached were more likely to aggress against the rival and with more intensity (Powers, 2000). Guerrero (1998) showed that insecure-anxious attached participants were more likely to withdraw from the relationship when confronted with a jealousy-provoking event. The insecure-avoidant attached participants were not as afraid of rivals, which may indicate a lower value placed on the relationship in general.

Conclusion and Future Directions

Beginning in infancy, humans display reactivity toward potential threats that can affect their care which is connected to their ability to thrive. This reactivity, in the form of jealousy, serves to regain attention and care. Future research needs to address how effective the expression of jealousy is in goal attainment at all stages of the lifespan. The importance of other individual characteristics should be clarified as well, such as child attractiveness, parental warmth and sensitivity, and environmental circumstances that may affect the response to an overt expression of jealousy. The degree of correspondence of jealous behavior and attachment assessments at various developmental stages should be investigated formally, using a range of attachment assessments. Additional research can determine whether jealousy is consistently affected by attachment classification; attachment classification may be predictable based on jealousy expression. Teti and Ablard (1989) showed that secure infants displayed less jealousy toward an older sibling than did insecurely attached infants, and securely attached older children provided more care to the infants than insecurely attached older siblings did. Infant jealousy may be reduced by a more positive relationship with the older sibling, as well as by secure attachment.

Over the life course, threats to relationships take different forms; threats that affect one's care and safety are more monitored in infancy and childhood, whereas threats that can directly affect one's reproductive fitness interests arise at puberty and continue throughout adulthood. Rivals and romantic interlopers are the main sources of threat; however, competition for parental investment endures. It is not well understood how peer, sibling, parental, and romantic jealousy are related across the lifespan beyond a basic connection to reactivity in early life. It is also not known how or if having children influences jealousy; children may result in greater vigilance for potential relationship threats for women, but some differences in male response may be due to paternity certainty. Additionally, evolutionists would suggest that one's declining reproductive status should have an effect on jealous responses because one's overall mate value would be lowered, resulting in the individual feeling more threatened, but this has not been tested. It is also possible that as reproductive value declines, defensiveness in response to threats could also decline. Other populations are under-represented in jealousy research, notably gay and lesbian populations.

One way research on jealousy in couples could be improved is if there were more analyses of partner effects (Kenny & Cook, 1999), so that the impact of the jealousy of one partner has on another can be considered. This is particularly relevant to jealousy research as it can provide support for how effective jealous behavior is. It has been reported that partners of a jealous mate feel more valued (Staske, 1999). However, the jealous partner's behavior can also unleash embarrassment, guilt, and pain (Keltner & Anderson, 2000; Vangelisti & Young, 2000). While a positive or a negative response to jealousy can result in mate retention, the impact on relationship satisfaction and stability are not well understood.

Another direction for jealousy research in adulthood concerns the reproductive success of adult children and whether that elicits jealousy from adult siblings due to differential investment on behalf of grandparents. Also, are adult children aware of differential treatment by their parents based on their mate choice? For example, parental affiliation for an adult child's spouse may affect adult child investment. Also, it would be interesting to study whether parents show jealousy over threats to the sexual relationships of their adult children as well, and whether this differs by sex of the child. Some initial data show that parents are more distressed when sons are cuckolded and when daughters experience amorous infidelity (Shackelford, Michalski, & Schmitt, 2004). The presence of dependent grandchildren may heighten the costs of desertion by the spouse and that is influenced by the sex of the offending party.

Research on jealousy beyond middle adulthood is limited. It would be important to test whether jealousy is used to protect one's fitness interests and if this is moderated by reduced fertility. There may be a greater reduction in jealousy for women, whose fertility ceases at menopause. As reproductive value decreases, older women reported being less concerned with emotional infidelity and more concerned with sexual infidelity (Shackelford, et al., 2004). Perhaps because they no longer have dependent children, potential abandonment is not as threatening. Sexual infidelity may be more threatening to older women in light of their own reduced mate value and fertility. At the same time, the window for reproduction is closing, which could make seeking out reproductive opportunities more important (Bonduriansky, Maklakov, Zajitschek, Brooks, 2008).

Detecting and repelling potential threats that can directly affect one's survival and reproductive success are perceptible advantages to jealousy. Though a number of areas need to be addressed in order to determine the overall effectiveness of jealousy, the data strongly suggest that humans are sensitive and reactive to social exclusion in many forms in an adaptive manner.

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