Article

Grief Functions as an Honest Indicator of Commitment

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Abstract

Grief is a puzzling phenomenon. It is often costly and prolonged, potentially increasing mortality rates, drug abuse, withdrawal from social life, and susceptibility to illness. These costs cannot be repaid by the deceased and therefore might appear wasted. In the following article, we propose a possible solution. Using the principles of social selection theory, we argue that an important selective pressure behind the human grief response was the social decisions of other humans. We combine this with insights from signaling theory, noting that grief shares many properties with other hard-to-fake social signals. We therefore contend that grief was shaped by selective forces to function as a hard-to-fake signal of (a) a person's propensity to form strong, non-utilitarian bonds and (b) a person's current level of commitment to a group or cause. This theory explains many of the costly symptoms of grief and provides a progressive framework for future research.

Keywords

grief, social selection, signaling theory, evolutionary psychology

A bereaved wife every weekend walks one mile to place flowers on her deceased husband's cemetery stone. Neither rain nor snow prevents her from making this trip, one she has been making for 2 years. However poignant the scene, and however high our temptation to exclude it from the cold logic of scientific scrutiny, it presents researchers with a perplexing puzzle that demands reflection. The deceased husband, despite all of his widow's solicitude, cannot return to repay his wife's devotion. Why waste time, energy, effort, resources—why, in other words, grieve for a social bond that can no longer compensate such dedication?

In the following article, we argue that one evolutionary reason for the expression and display of grief is that they send a salient signal to the social world about the sufferer's propensity to form strong commitments and social bonds. These propensities, like many other socially valued traits, are difficult to perceive (Cronk, 2005). Misinformed friendships and alliances are costly, potentially resulting in wasted time, loss of valuable resources, and reputational damage (Cosmides & Tooby, 1992). Therefore, when choosing social partners, people should be particularly attuned to honest indicators of an individual's commitment and cooperative intentions (Barrett, Cosmides, & Tooby, 2010; Zahavi, 1975; Zahavi & Zahavi, 1999). Because grief is costly and because the griever can no longer expect returns from his or her relationship with the deceased, we argue that grief is a hard-to-fake signal of these important propensities and intentions. Using the principles of social selection theory (West-Eberhard, 1979, 1983), we contend that, irrespective of its original function, the human grief response has been elaborated and amplified by the selective pressures of social and sexual partners (preferences and choices).[1]

In this article, we first cover the basics of the human grief response, and then we discuss prior theories of grief, noting their shortcomings and possible connections to our proposal. After, we cover the primary principles of social selection theory and signaling theory. We then articulate our proposal that grief is an adaptation, distinguishing it from a by-product account of grief. Last, we forward a series of testable hypotheses that stem from the signaling theory of grief.

The Human Grief Response

Almost every human will experience grief (Bonanno & Kaltman, 1999) and although its expression varies from culture to culture, the capacity to grieve appears to be a human universal (Archer, 1999; Cowles, 2006; Hewlett, Fouts, Boyette, & Hewlett, 2011). Researchers are not certain, however, whether grief is a uniquely human experience (Archer, 2001; Bekoff, 2008), and some intriguing examples of apparent grief in other species have been adduced. For example,

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Altmann (1980) noted that baboon mothers carried the cumbersome bodies of their dead infants for several days postmortem, only setting the corpses down to forage, before finally leaving them behind. Van Lawick-Goodall (1968) observed similar behaviors among chimpanzee mothers in the Gombe Stream Reserve, although the mothers abandoned their dead infants after a day or less. Researchers have also noted comparable behaviors in gorillas (Schaller, 1963). However, each of these examples can be explained parsimoniously from an error management perspective (Haselton & Nettle, 2006; Nesse, 2005). That is, because of the uncertainty of an offspring's possible death, it might be more costly to leave behind a live but indisposed infant than to carry a dead one for a few hours to a few days. The same logic may explain the solicitous behavior of elephants toward their deceased (Chevalier-Skolnikoff & Liska, 1993). Because there is a paucity of data on animal grief, more research is needed before confident pronouncements can be made.

The signaling theory of grief does not preclude the possibility of grief in non-human animals or in early hominins—but it does make clear predictions about the social capacities required for the appearance of a protracted (*human like*) grief response. In the human lineage, evidence of burials adorned with valuable resources (e.g., food, weapons, jewelry) arises between 130,000 and 50,000 years ago (Klein, 1999; Lieberman, 1993; Pettit, 2010). These indicate a reverence and solemnity toward the dead that suggest the presence of mourning and of a grief response that resembles the contemporary human grief response. Death rituals remain a cultural universal, and literature from around the world is replete with laments for the deceased (Archer, 1999; Brown, 1991; Spargo, 2004). There seems to be a universal human expectation that grief is painful and leads to fairly predictable distressing symptoms (Archer, 1999; Bonanno & Kaltman, 1999).

For the purposes of this article, we divide the grief response into three components: experience, expression, and display. Experience refers to the subjective facet of grief, that is, the generally negative feelings that accompany the loss of a close other. For example, the bereaved wife from the opening example would likely *feel* hurt, angry, lonely, and so on in response to her husband's death. This phenomenological component of grief is hidden from perceivers and scientists alike. Because it can be neither scientifically observed nor easily evaluated, it is difficult to study (only self-report can get at it) and is not centrally important in our theory. Second, expression refers to the physiological effects and manifestations of grief. To return to our example, the bereaved wife would go through a series of minor and major physiological changes, many still unknown, including crying, lethargy, disinterest, and general dysfunction (Archer, 1999; Fredrick, 1971). This component, because it is nearly impossible to fake, may be the most informative to social observers. Last, the display component refers to any of a set of intentional (even if highly motivated) and symbolic behaviors that demonstrate a person's state of grief, including direct statements (e.g., "I really miss my husband") and other symbolic acts such as laying flowers on a grave and creating funds or memorials. Because these acts are intentional and symbolic, they are the easiest to fake. However, as we will discuss, they are often comprised of costly acts—for example, walking a mile every weekend through inclement weather—that seem well designed to discourage dishonesty.

The expression of grief is often costly. It may require significant interruption of a person's ability to perform daily tasks, to participate in social activities, and to seek out romantic partners (Archer, 1999; Averill, 1968; Schwab, 1992). Grief also increases mortality rate, susceptibility to illness, visits to physicians or other health professionals, suicidal ideation, and possibly even suicide (Fredrick, 1971; Hart, Hole, Lawlor, Smith, & Lever, 2007; Maddison & Viola, 1968; Parkes, 1964; Parkes & Brown, 1972; Phillips et al., 2006; see also Hendrickson, 2009 for a cautious review of the literature on parental grief and health). Even conservative estimates of the cost of expressing grief note that it interferes with daily activities (see, for example, Wortman & Boerner, 2007). If nothing else, grieving entails ruminating about the dead, which is costly, at least in so far as it precludes thinking about something else (i.e., something that is potentially fitness enhancing). These costs are not ephemeral; the expression of grief is often protracted, lasting for more than 2 years in some cases (Parkes & Weiss, 1983; Vachon et al., 1982).

Because grief is a widespread and costly human experience, numerous scholars have proposed that it must be functional or a by-product of a functional process (Table 1). Many of these proposals are still influential, and it is important to examine their strengths and shortcomings before expounding the signaling theory of grief. We therefore address some of the most important and/or relevant theories of grief. With the possible exception of Freud's, the signaling theory of grief is not entirely incompatible with any of these. In fact, as with human intelligence, there are probably multiple reasons for the evolution and continuation of the grief response. In other words, we think no single selective force solitarily sculpted humans' capacity for grief.

Prior Theories About Grief

In his essay "Mourning and Melancholia," Freud (1917/1957) argued that grief functions to sever the ego from an object of attachment that no longer exists. According to Freud, grief is a functional process that allows people to disinvest from the dead. Although it is painful, grief is important because it frees libidinal energies, allowing them to be invested in other, possibly new, attachments. Although Freud was circumspect about his speculations, many researchers enthusiastically followed his suggestion that mourning is an experience that needs to be worked through, establishing a

Table 1. Prior Theories on Grief.

Proposer	Theory	Proposal	Weaknesses
Freud	Grief Work	Severs ego's attachment, allows for reinvestment of libidinal energy	Not supported by data
Averill	Group Selection	Promotes group cohesion	Relied on group selection
Archer	By-Product	Consequence of strong attachment system	Possibly weeded out by natural selection
Nesse	Preventative (specialized form of sadness)	Reminds the individual of what led to the death	Incomplete

Note. The preventative (specialized form of sadness) hypothesis does not have any obvious weaknesses, and we view our theory as a possible extension of it.

"grief work" paradigm (Bonanno & Kaltman, 1999; Deutsch, 1937; Lindemann, 1944). Despite its popularity, this hypothesis has not been well supported by current data, which, in fact, suggest that prolonged grief harms rather than facilitates recovery, contrary to the Freudian theory (Bonanno & Keltner, 1997; Nolen-Hoeksema, McBride, & Larson, 1997; Stroebe, 1992; Wortman & Silver, 1989). In general, the modern consensus is that Freud's theory, although insightful and creative, is, at best, empirically unsupported.

To our knowledge, Averill (1968) proposed the first explicitly evolutionary theory of grief, although some features of his proposal were anticipated by Bowlby (1961). Averill argued that grief is a biological reaction that functions to create and sustain group cohesion by causing distressing symptoms in an individual when he or she strays from or is ostracized by the group. Archer (1999) built from both Averill and Bowlby, forwarding the most coherent and comprehensive account of grief from an attachment system perspective. According to this perspective, grief is an ineluctable by-product of the peculiarly strong human attachment system and, to use Parkes' felicitous phrase, it reflects one "cost of commitment" (Parkes, 1972). Archer argued that the tendency to feel distress when separated from an important attachment figure motivates humans to maintain the social bond, seek out the person, and reunite with him or her—in other words, that it keeps a relationship alive even when the attachment figure is out of sight. This distress, therefore, is adaptive. However, when the attachment figure dies, those thwarted desires to reunite lead to the experience of grief. Evolution cannot forge perfectly designed systems and must "tinker" with the material it has at hand (Jacob, 1977). The attachment system is generally functional, but, in the relatively rare case of the attachment figure's death, it is dysfunctional, causing pain that cannot be comforted by terrestrial reunion.

If grief is a product of the attachment system, the grief response should be calibrated to the depth of the attachment the griever had with the deceased. Using evolutionary principles, Archer proposed that one's attachment to a person (and thus grief for that person) should be commensurate with that person's ability to enhance one's own (inclusive) fitness. Data support this proposal. For example, parents' self-reported expectations of grief for a child are correlated with the reproductive value of the child (Crawford, Salter, & Jang, 1989). Other studies have shown that monozygotic twins grieve longer for their co-twins than do dizygotic twins (Littlefield & Rushton, 1986; Segal, Wilson, Bouchard, & Gitlin, 1995). Archer's by-product theory is not necessarily opposed to the signaling theory of grief; and, in fact, it is quite plausible that the grief response originally evolved as a by-product but was eventually shaped and amplified because of the information it conveyed about the sufferer. However, unlike the by-product account of grief, the signaling theory of grief argues that humans' protracted grief response *is adaptive*.

Another evolutionary theory compares grief to physical pain (Nesse, 2005). Although physical pain may appear inexplicably cruel, it serves the important function of preventing costly—perhaps fatal—physical injury (Vertosick, 2000). Similarly, some researchers have argued that the sadness and suffering humans experience after a loss serve important evolutionary functions (Nesse, 2005; Keller & Nesse, 2006; Nesse & Ellsworth, 2009).[2] Just as physical pain alerts an organism to potential somatic damage, so the psychological pain of grief draws attention to possible future social losses. For example, if a father's son dies from consuming poisonous berries, the father's grief will continuously remind him of the danger those berries pose, discouraging him from feeding them to his other children. In other words, both types of pain function as somatic markers (Damasio, 1994), neural signposts that impel a person to remember what caused the pain and to avoid the behaviors and situations that led to it. In fact, physical and psychological pain may share similar neural pathways, making the comparison particularly appropriate (DeWall et al., 2010; Eisenberger & Lieberman, 2004; MacDonald & Leary, 2005). This theory, like the by-product account of grief, does not necessarily preclude a signaling explanation of grief. The grief response may have initially evolved to deter certain behaviors and encourage caution among important group members and kin but was later shaped and intensified because of the information it revealed about grievers' propensity for and current level of commitment. That is, regardless of its origin, once social observers

used the grief response as an indicator of underlying attributes of the griever, the grief response would have been shaped by selective forces—in this case, the social decisions of others.

Here we argue that a more complete picture of grief can be had by combining the insights of social selection and signaling theory. Put briefly, we contend that grief is a hard-to-fake signal of a person's current level of commitment to a group and/or of his or her tendency to form strong bonds with other individuals. Because humans are a profoundly social species, living in large cooperative communities, distinguishing between good and bad social partners (e.g., those who reciprocate and who are strongly committed to the ingroup versus those who do not reciprocate and who are not committed to the ingroup) is vital (Delton, Cosmides, Guemo, Robertson, & Tooby, 2012). However, the level of a person's commitment is not easily perceived and is rarely tested, leading to a dilemma. The strength of a social partner's devotion is most manifest during a crisis: Does the social partner defect when commitment becomes difficult and costly? However, it is precisely during such crises that one most needs the social partner and cannot afford his or her defection (Sosis & Alcorta, 2003). Therefore, honest signals of an individual's propensity to form strong commitments are beneficial to the receiver of the signal, who can use the information to choose loyal allies. They are also beneficial to the sender of the signal because he or she is preferentially chosen as a social partner. We argue that grief is just this: an honest signal of current and possible future levels of commitment. Before fully articulating this argument, we first lay out the basics of social selection theory and signaling theory, the two theories from which we build.

Social Selection

Social selection theory, first forwarded in its contemporary garb in West-Eberhard's two seminal articles (1979, 1983), argues that competition between individuals for socially mediated resources, including social partners, is, along with sexual selection, another important subtype of natural selection. There is an important conceptual distinction between sexual selection, in which organisms compete for access to mates, and social selection, in which organisms compete *socially* for resources and status. Social selection is not an alternative to sexual selection as some have argued (Roughgarden, Oishi, & Akçay, 2006); rather, sexual selection is a subtype of social selection in which the mating decisions of individuals influence biological fitness. However, social selection is much broader than sexual selection:

> Sexual selection refers to the subset of social competition in which the resource at stake is mates. And social selection is the differential reproductive success (ultimately, differential gene replication) due to differential success in social competition, whatever the resource at stake. (West-Eberhard, 1979, p. 158)

The principles of social selection have been applied to diverse phenomena, from the garish colorings of young birds (Lyon, Eadie, & Hamilton, 1994) to the invidious insults of adolescent and mature women (Geary, Winegard, & Winegard, in press). Others have used them to explain the evolution of female weaponry in sundry species because females do not often compete for mating opportunities but rather for resources that are provisioned to offspring (Tobias, Montgomerie, & Lyon, 2012).

More germane to our purposes, the principles of social selection have been applied to human cooperation and commitment. Nesse (2007, 2009), for example, contended that social selection provides one plausible mechanism for the evolution of strong human prosociality. Rivaled by no other mammal groups, human societies are anomalously complicated and cooperative (Alexander, 1990; Axelrod, 2006; Wilson, 2012). Although other animals, including even insects, form alliances and cooperate, humans are the only species that engages in extensive cooperation with genetically unrelated individuals (Dugatkin, 1997; Gintis, 2003). Furthermore, human social alliances and relationships, although sometimes instrumental and ephemeral, are often intimate and protracted, surviving many years and many vagaries (Silk, 2003; Tooby & Cosmides, 1996). Humans' extensive cooperation is buttressed by unique emotional adaptations that lead to empathy, guilt, shame, and so on (Nesse, 2001). Furthermore, humans will often punish or ostracize those who cheat or fail to reciprocate, sometimes even at considerable immediate cost to themselves (Barclay, 2006; Fehr, Fischbacher, Gächter, 2002; Gintis, Bowles, Boyd, & Fehr, 2003; Leary & Cottrell, 2013; see, however, Pedersen, Kurzban, & McCullough, 2013).

A number of researchers have argued that as humans became more ecologically dominant and socially complex, the social environment became an especially important arena of selection. Humans were no longer predominantly battling the exigencies of nature but rather battling each other for control over critical resources. That is, humans became increasingly important to each other as selective agents (through partnerships, deceits, attacks, et cetera), accelerating the evolution of human intelligence and prosociality (Alexander, 1990; Baldwin, 1896; Baumeister, 2005; Flinn, Geary, & Ward, 2005; Humphrey, 1976). This social complexity and reliance on others increased the importance of cooperation and cooperative abilities and forged important cognitive adaptations for social behavior (Cosmides & Tooby, 2005; Dunbar, 1998).

The conditions and mechanics of cooperation and commitment were unveiled by economists and evolutionary scientists in the 1970s. Although some models focused exclusively on utilitarian tit-for-tat exchanges, a few economists emphasized the importance of commitment to human relationships and alliances (see, for example, Nesse, 2001). Using game theory models, Frank (1988), Hirshleifer (2001), and Schelling (1960) examined the logic of human

commitments—the requisite emotions, the costs and benefits of deception and honesty, and the long-term stability of such strategies. Some free partner choice appears an important prerequisite for expansive non-kin-based cooperation and strong prosociality, because it creates a market of potential social partners. Individuals in this market must compete to capture the attention of and form alliances with desirable social partners. Undesirable social partners or exposed cheaters can be shunned, rejected, and ostracized, thus creating even stronger pressures for prosociality and/or for more effective disguises of antisocial proclivities (Kurzban & Leary, 2001).

An often critical component of a desirable social partner is his or her propensity to form *non-calculated* commitments to individuals or groups (Berreby, 2005). By non-calculated, we mean a relationship or bond that is not entirely instrumental or based on conscious calculations of tit-for-tat exchanges (Clark & Mills, 1979). Calculated, or utilitarian, relationships are common when two partners interact for the explicit purpose of exchanging services or goods at a market price (Fiske, 1992). And although these relationships are often useful, providing benefits to both exchange partners, they are limited. Friendships, romantic relationships, and group or tribal relationships are founded on powerful commitments that are not consciously calculated and not imperiled by a momentary shift of incentives. These commitments, if strong enough, become sacred or protected because subjective moral interdictions prevent them from being exchanged for tangible goods (Atran & Axelrod, 2008; Baron & Spranca, 1997). For example, a devoted husband would be morally outraged if one suggested he divorce his wife for a million dollars. Researchers have discovered similar outrage is often provoked when a committed group member is asked to exchange or besmirch his or her group identity for material gain (Atran, Axelrod, & Davis, 2007). Because these bonds are (relatively) immune from material considerations, those who are inclined to form them are loyal and therefore valuable social partners.

As with a person's tendency to form non-calculated bonds with individuals, a person's current level of commitment to a group or cause is critical to discern in a social partner. Humans are often engaged in intergroup conflicts or competitions (Bowles, 2009), and the individuals in them are rewarded for loyalty with status and important resources (e.g., food, mates, shelter, money) and allowed access to sensitive, potentially damaging information; therefore, their loyalty to the group is critical and becomes more critical the more group-based information they possess. For a modern example, corporations often reward loyal employees with higher pay and promotions that result in access to confidential information (Chan, 2003). This valued loyalty is, however, difficult to detect, and simple professions of allegiance are relatively cheap and therefore uninformative. Furthermore, individuals are sometimes motivated to make dishonest professions of loyalty to manipulate individuals and groups and to obtain the benefits that loyal members receive, creating an escalating battlefield of "manipulation" and "mind reading" (Dawkins & Krebs, 1978; see also, Bradbury & Vehrencamp, 1998).

Many groups therefore require costly displays of fidelity (see section on costly signaling) because they are informative of a person's actual level of commitment and are difficult to fake. Grieving for a fallen comrade or leader (e.g., president, religious leader, chief executive officer [CEO]) is one important indicator of commitment because that grief is costly. This might be one reason the death of a valuable leader often occasions an ostentatious funeral and group-wide mourning. Such grief might signal not only an individual's commitment to other group members but also the group's cohesiveness and resolve to other, potentially competing coalitions. The death of a leader often creates instability and vulnerability in a group, which could lead to exploitation by other hostile groups (see Hagen & Bryant, 2003). Therefore, signals communicating commitment, cohesion, and resolve are particularly important at such potentially precarious times. If displays of grief deter exploitation, they could enhance each individual group member's fitness. Thus, grieving the death of a deceased leader may serve important functions at both the group and the individual level.

Detecting an individual's loyalty to a person or group is important as cheating, loafing, and even defecting are ever present and often tantalizing temptations (Van Vugt & Hart, 2004). Examples of infamous betrayers litter the historical records, almost always as objects of obloquy and scorn (e.g., Brutus, Cassius, Judas, Benedict Arnold, Vidkun Quisling, Robert Hanssen). Some caused significant damage to the people they betrayed. For example, the assassination of Julius Caesar by Brutus and Cassius changed the fate of the Roman Republic, leading to a costly civil war. Throughout history and literature, the detection and punishment of traitors are a prominent theme, highlighting the importance that humans place on loyalty and the perils of granting it to those who do not deserve it. Because loyalty—in the form of non-calculated commitments—is essential for successful cooperation in dyads and larger groups, humans are motivated to demonstrate it.

Nesse (2007, 2009), following West-Eberhard, argued that this process of mutual partner choice can lead to runaway prosocial traits and displays very much like the gaudy and showy traits of mating displays (see Fisher, 1958). In other words, some forms of human prosociality might represent conspicuous displays designed to signal partnership qualities to others in the same way that a Bowerbird's exquisite bower is designed to signal dominance and fitness to potential mates (Borgia, 1995). For displays of prosociality (e.g., professions of altruism or signals of commitment) to function honestly, the deceptive displays of cheats and social loafers need to be detected and winnowed out. If the analogy between human prosociality and other runaway traits is

accurate, the principles of honest signaling theory, which have successfully explained the evolution of the other extravagant displays, should apply to human prosociality (Gintis, Smith, & Bowles, 2001).

Signaling Theory

Signaling theory analyzes the logic of animal communication from phenotypic ornamentation to wild guttural calls (Maynard Smith & Harper, 2003; Searcy & Nowicki, 2010). It has been used to explain many previously inexplicable phenomena such as extravagant decorations, elaborate nests, and time-consuming courtship dances (Maynard Smith, 1991; Pryke, Andersson, Lawes, & Piper, 2002). We are interested here in costly or hard-to-fake signals, but not all signals require exorbitant costs to ensure honesty (Bird & Smith, 2005; Getty, 2006; Silk, Kaldor, & Boyd, 2000). The basic principles of costly or hard-to-fake signaling are the following:

1. Individual organisms vary in underlying attributes.
2. The quality of these attributes is not always easily perceivable.
3. The quality of these attributes can be signaled through some more perspicuous trait.
4. The perceiver of the signal benefits from paying attention to the signal and reacting to it (Figure 1).
5. However, the sender of the signal and the receiver have partially conflicting interests, and the sender can deceive and exploit the receiver by enhancing the signal without enhancing the underlying attribute.
6. Receivers must therefore discern honest signals.
7. The solution to the problem of partially competing interests is the development of hard-to-fake or costly signals that are reasonably immune from deception (See, Cronk, 2005; Zahavi, 1975; Zahavi & Zahavi, 1999).

Consider an example from the human world. Men differ in their current supply of status and resources. However, it is not easy to perceive a man's supply of resources nor the status that he commands, especially if one is not well acquainted with him. The man can signal his wealth and status with tangible goods such as a car, a watch, a suit, or a house. A woman deciding whether to mate with the man benefits from attending to these goods because they indicate his wealth and status. However, the man and his potential mate might have divergent interests. If the man is not wealthy or high in status, he would desire to deceive the woman, convincing her that he was; therefore, he might display a good that seemed to manifest wealth he did not possess. The woman, therefore, should be cautious about inferring status or wealth in men who display goods that are easy to obtain and do not actually indicate possession of either. This problem can be solved by displaying hard-to-fake signals of status and wealth such as sports cars, Rolexes, Armani suits, and large, conspicuously wasteful mansions (Sundie et al., 2011; Veblen, 1899/1994; Young, Nunes, & Dréze, 2010).

Researchers have profitably applied these principles to elucidate many previously enigmatic aspects of human social behavior. For example, Miller (2000), influenced by the work of Veblen (1899/1994) and Zahavi (1975), argued that the human brain, like a modern entertainment system, evolved to provoke pleasurable states in the other sex—evolved, in other words, to send sexually selected signals of underlying genetic quality. From his perspective, many cultural artifacts, such as elegant poems, complex novels, and beautifully wrought buildings, are designed to "impress" the other sex because these artifacts display information about their creator's underlying attributes (e.g., intelligence, dexterity, ambition, creativity). Others have applied costly signaling theory to group dilemmas. For example, Irons, Sosis, and others (Irons, 1996a, 1996b, 1996c; Sosis & Alcorta, 2003; Sosis & Bressler, 2003) argued that many of the rituals and taboos of religion are hard-to-fake signals of commitment. Irons, for example, noted that transcending individual human selfishness is sometimes arduous and that obstacles that require collective action pose serious problems for human groups. It is easy to profess a desire to cooperate and then defect when the required behavior entails sacrifice. Costly religious signals of commitment solve this problem in two ways: (a) They force individuals to perform costly behaviors *before* the collective action and (b) they allow others to assess individuals' commitment to cooperation (through the costly rituals). If one is not committed to a particular group, one will probably not spend hours going through laborious and painful initiation rituals.

We suggest that grief functions like these (and other) hard-to-fake signals because it is costly and conveys information about the underlying traits of the griever. Humans' prolonged grief response may act as an honest signal of prosocial proclivities, most importantly, of the proclivity to form strong, non-calculated bonds. According to Cronk (2005), signals are hard to fake for (either one or both of) two reasons: (a) Because they "impose strategic costs which honest signalers can afford but which are difficult for dishonest signalers to bear" (p. 611) and (b) because they are direct indices of the underlying trait (i.e., are inextricably connected to what they signal). We suggest that both of these principles may explain the hard-to-fake quality of grief.[3]

As we have noted, the expression (and often the display, see section "Public Displays: Extended Phenotype Signaling") of grief is quite costly, leading to many behaviors (e.g., withdrawing from social life, losing interest in sex) that diminish the griever's fitness. Zahavi argued that such costs function to preserve the honesty of signals—he called them "handicaps"—because they prevent lower quality organisms from dissembling (Zahavi & Zahavi, 1999). Zahavi's handicap proposal was initially greeted with skepticism, because researchers did not believe that a costly or

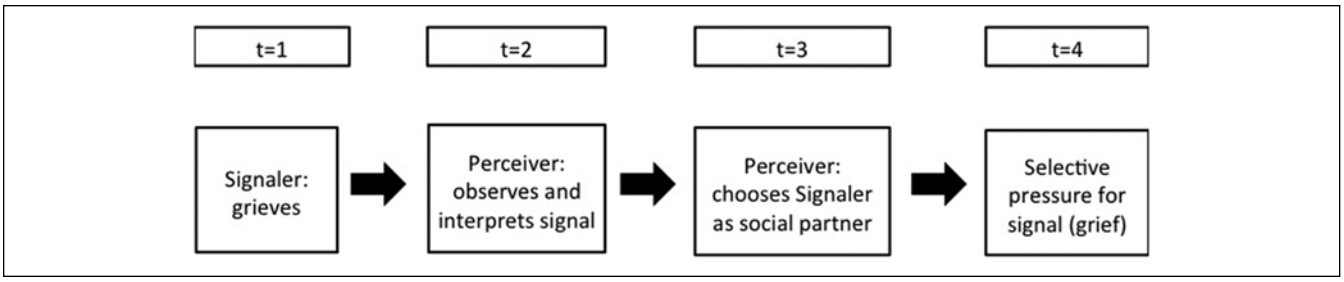

Figure 1. Function and evolution of the grief response as a signal.
Note. t = time.

wasteful trait could increase the inclusive fitness of the organism that possessed it. Furthermore, mathematical models by Maynard Smith (1976) seemed to indicate that the handicap concept was not tenable because although a handicap would initially increase the handicapped organism's number of progeny, the progeny would inherit the cost of the handicap (see Grose, 2011). However, Grafen later reformalized Zahavi's proposal using the concept of *differential* costs and showed that the handicap principle was mathematically viable (Grafen, 1990a, 1990b). What is important, then, is not simply that a signal is costly, but rather that it is *differentially* costly—that is, it costs an organism of one state or quality differently from what it costs an organism of another state or quality (but see Getty, 1998). For the signaling theory of grief, the differential costs are produced by different underlying commitment strategies. Consider an example. Researchers have proposed that both men and women engage in various reproductive strategies; however, for simplicity, the strategies can be conceived as dichotomous: short-term mating versus long-term mating (Buss & Schmitt, 1993). Consider two men who are engaged in the extreme forms of these strategies (ST for short term and LT for long term). In absolute terms, it is equally costly for the two men to display signals of commitment to a potential partner; that is, the dinners, flowers, emotions, and time spent cost the same. However, the displays are differentially costly because the opportunity costs for ST man and LT man are different. For every expensive and time-consuming date the ST man engages in, he is *not* pursuing his preferred short-term strategy at a club or bar. And because he is not planning to invest and commit long term, the rewards for expensive investments in one woman are lower than they are for the LT man.

A relatively low commitment social strategy, one that consists of cheating and manipulating others, may constitute a viable social strategy (Ayala & Campbell, 1974; Mealey, 1997; see Figure 2). If so, intense grief would cost those who pursue such a strategy more *relative* to those who are inclined to form strong bonds because their time, energy, and resources would be better spent searching for and exploiting less costly opportunities. For example, consider a person (Steve) who, rather than committing, flits from group to group, obtaining status and sexual partners where he can before moving on to another group. Although he must

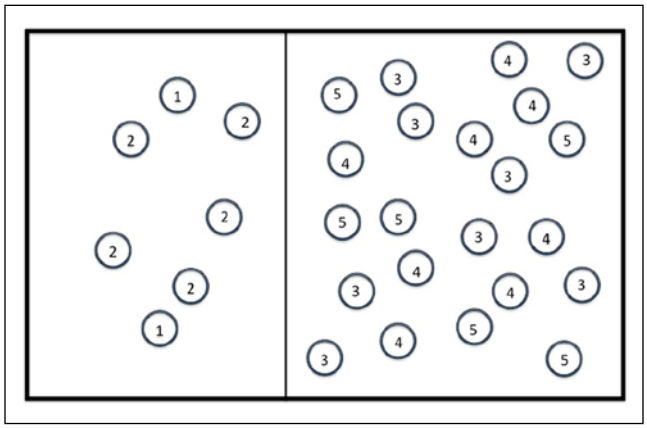

Figure 2. Possible distribution of commitment strategies.
Note. The numbers indicate the individual's capacity for commitment (1 = *no commitment* and 5 = *high commitment*). Those on the left are frequency dependent sociopathic or near sociopathic (subclinical) strategies. Grief response is hypothesized to vary between individuals, such that higher numbers also grieve more intensively, with some caveats addressed at end of the article.

manipulate group members and social partners, and must convince them that he is somewhat loyal, he would benefit most by finding opportunities of doing so that are relatively low cost. Spending significant time and energy grieving over a fallen leader or a friend would *cost him more relative to a person who actually could form such long-standing and non-calculated commitments.* Steve could, of course, attempt to feign grief to elicit the rewards of real grief. However, simple professions and consciously controlled displays of grief are not so reliable as the more protracted symptoms of grief (the disinterest, sadness, and dysfunction) and are therefore not so valued as the other symptoms. Faking the more protracted symptoms would require significant sacrifice and, given Steve's strategy, the costs would outweigh the rewards. Furthermore, if Steve's social partners detected his deception, it would almost certainly outrage them and cause skepticism about Steve's underlying character and value as an alliance member.

Although both groups and individuals are chary of cheaters, some groups and some individuals require stronger signals of commitment than others, possibly because there is a

trade-off between the number of members and social partners a group can acquire and the level of commitment and sacrifice they require from each member. From a cost-benefit analysis, Steve would be served better by joining groups that require only a signature than groups that require protracted initiation rituals (e.g., street gangs). Grief, therefore, functions to separate those like Steve from those who can form strong commitments because it *may have differential costs* for those who enact high commitment versus low commitment social strategies.

The emotions that are expressed during grief might also be indices of a person's amount of suffering—that is, they might be ineluctably connected to the physiological reactions that result from the loss of a person to whom one was strongly attached. Emotions may not be terribly costly, but they are often hard to fake and difficult to conceal; therefore, they are reliable indicators of a person's underlying intentions and propensities (Schloss, 2008). It is difficult for people to portray emotional reactions that they are not experiencing, which is one reason actors are lauded for their abilities. What is important from a perceiver's perspective is to observe *the trigger of a person's emotions.* Most people experience and express sadness, for example, so, in isolation, the expression of sadness is not informative. The trigger of the sadness, however, is informative. A woman crying because she lost her purse is interpreted differently from a woman who is crying because she read an article about a struggling family. Crying at the death of a spouse or a leader might be informative simply because it is difficult to cry when one is not sad (Frank, 1988).

Recall the principles of signaling from above. We propose that (a) humans differ in their propensities to form loyal and lasting attachments; (b) these propensities are not easily perceivable; (c) however, they can be signaled via other, more perspicuous traits such as grief; (d) other humans benefit from attending to a person's grief response and reacting to it; (e) were grief relatively costless, humans could use it to manipulate others; (f) however, receivers would evolve counter-adaptations designed to detect the dishonest grievers; (g) because grief is a costly signal, it is generally honest and those who attend to it and discriminate based on it are rewarded with cooperative partners or group members who form strong attachments.

Putting these points together, the logic of the signaling theory of grief is as follows:

Humans live in large and complicated social groups. Although researchers debate the probable size of ancestral human groups, there is agreement that human groups were larger than most primate groups and certainly more complicated and cohesive than other primate groups (Dunbar, 1992; Marlowe, 2005).

Humans are exceedingly cooperative, even with non-kin. Human cooperation is unique because it is often directed toward non-kin, sometimes even strangers (Bowles & Gintis, 2003). In a variety of economic games, researchers have shown that humans are more cooperative and prosocial than would be expected from an exchange or simple reciprocation model, often behaving in "irrationally" cooperative ways (Fehr, Fischbacher, & Gächter, 2002; Frank, 1988).

However, the possibility of cheating and/or not reciprocating was and is ever present. From an individual's point of view, cheating is a tempting option because it allows one to garner benefits without paying costs (Frank, 1988). Thus, humans evolved cognitive mechanisms that allowed them to regulate social exchanges and alliances, punishing or limiting the effectiveness of non-reciprocating strategies (Cosmides & Tooby, 2005).

Because cheating was possible, humans selectively chose/choose to form alliances with good social partners. One effective regulatory mechanism against cheaters is interpersonal choice (Sober & Wilson, 1999). That is, humans have chosen and continue to choose alliances and exchange partners, granting benefits to those who are chosen and excluding them from those who are not.

This aspect of choice creates a pressure on humans to display prosocial tendencies. Because being chosen as an ally confers important benefits, humans compete with each other to be chosen. One way of successfully competing is to display desirable social traits (Buss, 2009; Nesse, 2007).

However, the display of prosocial tendencies can be faked by cheaters. Professions of altruism are often cheap and easy to fake. Furthermore, such professions, if believed by others, can lead to rewards for the cheater, often at the expense of the deceived.

This leads to the evolution of cognitive mechanisms to detect cheaters. Because the choice of a social partner is important, and because cheating is always possible, evolution should have favored humans who were adept at detecting cheaters. Researchers have shown that this is true: Humans are excellent at ascertaining and punishing cheaters (Cosmides & Tooby, 1992; Fowler, 2005; Verplaetse, Vanneste, & Braeckman, 2007).

This, in turn, leads to the development of costly or hard-to-fake signals of cooperative intentions and propensities. Hard-to-fake signals are reasonably honest; therefore, they supply others with information that can be used to make social decisions (Cronk, 2005). Humans have developed a number of honest signals of cooperative intention, including facial expressions (Schmidt & Cohn, 2001) and costly altruistic acts (Bowles & Gintis, 2003).

Because grief is costly and hard to fake, it signals one's propensity to form non-calculated social commitments. Grief, as noted above, is costly and hard to fake. This means that the information that it conveys to others is useful because it is reliable.

Humans who displayed a prolonged grief response were preferentially chosen by social partners and rewarded with status by social groups. Because the grief response is an honest indicator of prosocial propensities, people may have preferentially chosen as social partners those who grieved.

Similarly, groups (e.g., tribes, small hunting groups, modern political parties) may have bestowed status on those who grieved for fallen members, especially if those members possessed high status.[4]

Is Grief an Adaptation? Distinguishing From the By-Product Account

The signaling theory of grief proposes that, whatever its original function, grief has been sustained and amplified because it is hard to fake and because it sends important social information. That is, once people began to discriminate between others based on their grief responses, the pressures of selection would have shaped its expression. This is similar to the evolution of flowers. Bright, gaudy, and beautiful, today's flower petals originally evolved from the more prosaic leaf structures of plants. Once pollinators (bees, humming birds, moths, et cetera) began to discriminate between more and less attractive flowers, however, there was a powerful selection force on flowers to develop enticing features (e.g., bright colors, large and elegant shapes; see, Chittka, 1996; Cubas, Coen, & Zapater, 2001; Nilsson, 1988). The subtle preferences of pollinators appear to have driven the development of the elegant flowers humans (and pollinators) now enjoy. Similarly, the length and depth of humans' current grief response may have evolved from a more basic response, a response that was the by-product of the attachment system.

Although we are sympathetic to the by-product account and agree that grief may have originally arisen as a by-product of the attachment system, our account and the by-product account have different clinical and historical implications. If the by-product theory is correct, for example, alleviating grief with a pharmacological agent should have no (or at least few) deleterious side effects. In contrast, if the signaling theory is correct, such interventions might have serious side effects because they would diminish an important social signal that others use to make crucial social judgments—they might also attenuate the other possible adaptive functions that the grief response serves (see also Nesse, 2000).

According to the by-product account, grief itself has no benefits. Selection pressures favored an attachment response, and grief is one form of it. Distress is triggered by any separation from the attachment figure, including that person's death. Given the rarity of death, perhaps, there were not sufficiently strong selection pressures to differentiate (useless) grief from (functional) separation anxiety. In contrast, if the grief response can be distinguished from the more general attachment system activation response, then humans who possessed one and not the other would have been favored by evolution. Grief, as we have noted, is incredibly costly and without some fitness recompense, it is functionally senseless. The dead person is neither returning nor repaying debts. If evolution could tease apart an individual's response to a missing attachment figure and a dead one, the costly response to the dead attachment figure should have been winnowed out, *unless grief serves an adaptive function, as we have proposed.* The important question, then, is whether these two processes can be separated.

The first and perhaps most powerful indication that humans can distinguish between absence and death (and have long been able to do so) is the universality of death related ceremonies (Klein, 1999; Rosenblatt, Walsh, & Jackson, 1976). Although the anthropological record presents a variegated array of rituals, there are underlying similarities. Perhaps most importantly, all known cultures have a way of disposing the deceased person's corpse, often to avoid "pollution" from the dead (Palgi & Abramovitch, 1984). From an evolutionary perspective, this fear of pollution, often explained with elaborate myths, is understandable: Decomposing bodies are a potential source of pathogens (Bloom, 2004). Cultures may explain these rituals by referencing gods or immortal souls; but regardless of the purported reasons for these practices, the existence of death specific rituals displays an understanding of death. Burial, as noted above, might be 130,000 years old. Conservative estimates trace it back to at least 50,000 years ago, although archaeological evidence is notoriously difficult to interpret (Archer, 2001; Binford, 1983; Lieberman, 1993; Pettit, 2010). Even if one accepts the conservative estimate, 50,000 years, as modern researchers have shown, is enough time for significant amounts of evolutionary change (Cochran & Harpending, 2010).

The second indication that grief can be separated from a more general attachment system response is that knowledge of death often incites different emotions from knowledge of absence. For example, Nesse (2000), in his review of Archer's book, suggested this thought experiment: Suppose you have lost touch with a close friend who has moved to another continent. This might sadden you and you might miss the person; however, if you later found out that your friend had died, a new and more terrible emotion would overtake you: grief. We wish to forward another: Suppose you learn that your romantic partner has left the country on a sybaritic singles' cruise. In his or her absence, you are plagued by jealousy and anger, painfully imagining every possible infidelity he or she might commit. A few days after this discovery, you receive a call telling you that your partner has died. The jealousy would immediately cease, and again you would be overcome by another intense emotion: grief. In both cases, knowledge of death clearly and swiftly changes one's strongest emotional responses toward a loved one's absence. If this knowledge is capable of quickly extinguishing jealousy, it seems that it would also be possible to extinguish the stress and anguish of separation anxiety (by-product grief). That is, if the intense reaction that followed a loved one's death were not functional, it should be extinguished in the same way that one's jealousy and anger are extinguished by knowledge of death. Furthermore, as the two examples above illustrate, a loved one's absence can be greeted with a

variety of emotions depending on one's understanding of the absence. Absence for war is different from absence for an infidelity, which is different from absence for an important and unavoidable relocation. And these emotional responses seem exquisitely functional, each tailored to the particular reason for the loved one's absence. This flexibility suggests that humans are capable, both cognitively and emotionally, of distinguishing between death and other forms of absence.

A third indication that grief is not a by-product is the specific pattern it follows. Anthropologists and psychologists have noted two important factors that determine the strength of a person's grief response: the closeness of his or her bond with the deceased and the social status of the deceased (Hertz, 1960; Segal et al., 1995; Van Gennep, 1960).[5] From the by-product perspective, the first predictor is explicable, but the second is not. That is, a lost attachment should produce distress regardless of how the dead person was regarded by others, and there would be little reason to grieve for a high-status person with whom one did not have a close relationship. If grief is a signal of commitment and loyalty, however, then grieving over someone who had high status but not an intimate bond with oneself is understandable. Mourning the loss of an important figure—a tribal chief, a famous pop star, or the president of the United States—is, as we have argued, a way to communicate one's commitment to the cause he or she stood for. The death of John F. Kennedy, to take one example, caused deep grief for many in the United States, although most had never met the man personally. More than one million letters of mourning and condolence were sent to his bereaved wife, many with deep and eloquent expressions of torment and anguish. Dr. Ira Seiler, who saved John and Jacqueline's son from death, wrote that he lamented that he could not die in John's place. Although he had a personal connection to John, unlike many of the letter writers, he had met him only twice (Zezima, 2010). Most of the people, then, who took time from their lives to write letters of sympathy, to create shrines and memorials, or to cry and commiserate had no personal attachment to John and therefore no reason (from the by-product account) to grieve his death. From a signaling perspective, their grief displayed commitment to the United States and, because the grief was disruptive and costly, it conveyed to others a kind of patriotism that is more effective than simply hoisting a flag or proclaiming loyalty.

Public Displays: Extended Phenotype Signaling

Thus far, we have focused primarily on the expression of grief, the more private symptoms of the solitary sufferer. However, all known cultures provide public outlets for the display of grief, ranging from public wailing to elaborate feasts and parties (Palgi & Abramovitch, 1984; Rosenblatt et al., 1976). Although such rituals almost certainly serve myriad functions such as restructuring a ruptured social order, they can also be seen as "extended phenotypic" signals of commitment (see Nesse, 2005 for similar ideas). The extended phenotype is a concept introduced by Dawkins (1999), who argued that the effects of genes extend beyond an organism's phenotype proper and that such effects should be considered a kind of extended phenotype. For example, a beaver's dam is, in some sense, just as much a part of its phenotype as are its teeth. Its genes predispose it to build a dam because dams enhance the likelihood of genetic replication in the same way that its gene's predispose it to grow large incisors. More recently, Schaedelin and Taborsky (2009) noted that extended phenotypes provide unique opportunities for signaling because they are independent from the body, potentially persist through time, and often require cognitive skills to construct or display.

Consider, for example, a modern cemetery. It is a remarkable display of affection for and commitment to the dead, lined with large, expensive, and carefully crafted stones to mark each person's burial location. Although estimates range, the average tombstone seems to cost between 300 and several thousand dollars, with some ranging much higher (Barrouquere, 2013). A tombstone is, *inter alia*, a signal of one's devotion to the deceased and serves as an extended signal of one's grief. In fact, tombstones are an excellent example of an extended phenotypic signal because they (a) are independent from the body, signaling in absence of the person or family who placed them, (b) potentially persist for hundreds of years, and (c) require large sums of money. Furthermore, they act as a shrine to the dead that can collect flowers and other gifts that also function as signals of grief and commitment.

The costly displays of modern funeral/burial practices are not the result of greedy corporations trying to commodify death. Such displays are, with variation, common across cultures and predate capitalism by many thousands of years (Morris, 1990; Pearson, 1999). The ancient Egyptians created complicated vaults inside magnificent pyramids for dead pharaohs. They then filled these vaults with expensive and luxurious metals and jewels (Baines & Lacovara, 2002). The first emperor of China, Qin Shi Huang, in one of the most ostentatious burials in history, was interred with an entire terracotta army consisting of some 7,000 soldiers and 700 horses (Kinoshita, 2007). These two examples may be extreme, but similar practices are common. Since the rise of symbolic consciousness and extreme sociality, death has occasioned elaborate rituals and displays, often including the sacrifice of important resources for the dead (Lothrop, 1954). Such sacrifices may be explained by noting that the dead need to take their or others' valuables with them to an afterworld, but they also function as hard-to-fake or costly signals.

Human sacrifice, whether voluntary or not, is perhaps the most extreme form of this signaling; and despite its grisly nature, such sacrifices appear in many different cultures, including Egyptian, Indian, English, and Mesoamerican (Galvin, 2005; Pearson, 1999). In some communities of India, widows were expected by religious leaders and family

members to immolate themselves on their husbands' funeral pyres, a practice known as suttee (Stein, 1978). It is tempting to speculate that these sacrifices recompensed families of the victims with rewards and status (their loyalty was rewarded), thus operating as a form of kin selection (Hamilton, 1964a, 1964b); however, at present, not enough is known to assert this with confidence. At the very least, however, human sacrifice may have been the ultimate signal of a family's commitment and loyalty.

We contend that there is an underlying motive to display devotion to the dead and that this motivation gives rise to the variety of funerary practices found in the archaeological and anthropological records. In other words, just as the motivation to form exclusive or near exclusive pair bonds impels humans to create cultural institutions and rituals that celebrate and sanctify pair bonds (i.e., marriage), so the motivation to signal one's commitment to the dead compels humans to create cultural institutions and rituals that honor and pay tribute to the deceased. The archaeological record suggests that this motivation existed at least since the rise of modern *homo sapiens.* It is worth noting that Neanderthals, a subspecies of the genus *homo*, buried their dead with flowers and other relics, indicating that this motivation existed in another species of *homo*—a species that, like modern *homo sapiens*, was relatively intelligent, symbolic, and social (Solecki, 1977; Trinkaus & Shipman, 1993).

However, it is important to point out one shortcoming of public displays of grief: They can be relatively easy to fake. For example, mere professions of or even displays of grief for a fallen leader are relatively cheap. Most funerary rites, as the above illustrates, integrate costlier signals than mere assertions or displays of grief; but many of these can still be dissembled, especially if the deceiver is certain that such subterfuge will be returned with rewards of status and group commitment. Furthermore, such public displays might be more of a signal of resource holdings and generosity than of a true propensity to form non-calculated commitments (Smith & Bird, 2000). Therefore, the relatively private components of grief (suffering, disruption, depression, et cetera) may be more reliable indicators of the commitment proclivities of the griever. And, *ceteris paribus*, people should be more attuned to them when judging the qualities of a potential ally.

Predictions

The following predictions issue from the signaling theory of grief:

1. There is a positive correlation between intensity of grief and level of commitment to a person or group.
   a. People who are more committed to the deceased, *ceteris paribus*, will grieve more intensively than others.
   b. People who are more committed to the group of the deceased will grieve more intensively than others.
   c. People who generally form more powerful non-calculated commitments will tend to grieve more than others.
2. People will be judged for their grief responses.
   a. People who show longer, more intense grief responses[6] than others at the death of a loved one or important group member will be viewed as more loyal, trustworthy, and inclined to non-calculated commitments.
   b. People who show longer, more intense grief responses than others at the death of an important member of the ingroup will be viewed as more committed to that group.
   c. People who show longer, more intense grief responses than others at the death of a close other will be viewed as more desirable as a long-term partner by members of the other sex.
3. Judgments of others based on their grief responses will translate into social choices.
   a. Showing a longer, more intense grief response than others will increase an individual's likelihood of being chosen as a social partner (e.g., as a friend), particularly for relationships that involve substantial interdependence and trust.[7]
   b. Showing a longer, more intense grief response than others at the death of an important member of the ingroup will increase the likelihood of receiving status and cooperation from other ingroup members.
   c. Showing a longer, more intense grief response than others at the death of a close other will increase the likelihood of being chosen by members of the other sex as a long-term romantic partner.
4. Displays of public grief will be judged and responded to based on their apparent honesty.
   a. Perceivers will differentiate between apparently honest versus dishonest proclamations of grief (e.g., as they do between Duchenne and non-Duchenne smiles; Mehu, Little, & Dunbar, 2007).
   b. Displays that are relatively more costly to the griever will be judged as more honest.
   c. Wanting to be accepted by a person or group will increase the likelihood of an individual using costly displays in public (i.e., to show that his or her grief is honest).
   d. Individuals who display grief that is deemed fake (as compared with honest) will be negatively evaluated and broadly distrusted by perceivers.
   e. Being viewed as displaying fake grief will increase the likelihood of being punished (e.g., excluded from social alliances; reputational blows).

Table 2. Predictors of a Higher Grief Response.

Predictor	Study
Young age of griever	Bonanno, Galea, Bucciarelli, & Vlahov, 2007; Hardison, Neimeyer, & Lichstein, 2005; Liechtenstein, Gatz, Pedersen, Berg, & McClearn, 1996; Nolen-Hoeksema & Ahrens, 2002; Zisook, Paulus, Shuchter, & Judd, 1997
Female gender of griever	Bonanno, Galea, Bucciarelli, & Vlahov, 2007; Bruce, Kim, Leaf, & Jacobs, 1990; Chen et al., 1999; Goodenough, Drew, Higgins, & Trethewie, 2004; Hardison, Neimeyer, & Lichstein, 2005; Melhem, Day, Shear, Day, Reynolds, & Brent, 2004; Murphy, Johnson, Chung, & Beaton, 2003
Harmonious marriage	Bonanno, Wortman, et al., 2002; Prigerson, Maciejewski, & Rosenheck, 2000
Longer relationship	Folkman, Chesney, Collette, Boccellari, & Cooke, 1996
Emotionally supportive marriage preloss	van Doorn, Kasl, Beery, Jacobs, & Prigerson, 1998
Emmeshment (intense family closeness)	BrintzenhofeSzoc, Smith, & Zabora, 1999
Being closely related to deceased	Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004; Segal &Ream, 1998; Segal, Wilson, Bouchard, & Gitlin, 1995
Less social support	Bonanno, Wortman, et al., 2002; Macias, Jones, Harvey, Barreira, Harding, & Rodican, 2004; Murphy, Johnson, Chung, & Beaton, 2003; Ott, Lueger, Kelber, & Prigerson, 2007
Violent death	Kaltman & Bonanno, 2003; Murphy et al., 2003; Ott, Lueger, Kelber, & Prigerson, 2007
Lack of preparation	Barry, Kasl, & Prigerson, 2002; Jones et al., 2003
Rated positively by interviewer	Bonanno, Maskowiwtz, Papa, & Folkman, 2005
Higher interpersonal dependence	Bonanno et al., 2002; Ott, Lueger, Kelber, & Prigerson, 2007

Note. This table is composed of previous studies from 1990 to present. It is not an exhaustive table but presents representative results.

f. If public displays of grief are not informative (because of lack of cost, et cetera), observers will seek further information by assessing the griever's expression of grief (e.g., determine the griever's daily dysfunction, determine the griever's amount of upset).

Predictors of Grief and Future Directions

Despite intense and extensive studies, the grief literature offers few consistent predictors of the strength of the grief response (e.g., Bonanno, Keltner, Holen, & Horowitz, 1995; Middleton, Burnett, Raphael, & Martinek, 1996; Murphy, Johnson, & Lohan, 2002; Schulz et al., 2003). Furthermore, grief-related research was dominated for many decades by the quasi-Freudian idea of "grief work," which has proven an empirical dead end. Researchers have lamented a lacuna in grief studies because few overarching theories of grief exist to organize and guide current investigations (see Bonanno & Kaltman, 1999). Our own reading of the literature has uncovered a varied palette of predictors, few of which are consistent across studies (see Table 2). Nevertheless, the few that do stand out provide provisional support for the signaling theory of grief. For example, the single variable that most reliably predicts intensity of the grief response is closeness to the deceased (measured in various ways, e.g., "dependency," "marital closeness," and "close kinship"; see also Lobb et al., 2010). A few studies have shown that identical twins grieve longer for co-twins than do fraternal twins (Segal & Ream, 1998; Segal et al., 1995; Woodward, 1988). Other studies have shown that closeness to or dependency on a spouse predicts the intensity of a person's grief response (e.g., Bonanno, Wortman, et al., 2002; Ott, Lueger, Kelber, & Prigerson, 2007), and one study showed that the harmoniousness of the marriage predicted the use of more health services during the bereavement process (Prigerson, Maciejewski, & Rosenheck, 2000). Another study that supports this pattern found that emotionally supportive marriages predicted elevated grief symptoms (van Doorn, Kasl, Beery, Jacobs, & Prigerson, 1998).

These results are consistent with our predictions, but do not allow one to distinguish between different theories of grief. For example, commitment to a twin or spouse does predict more grief, as the signaling theory would expect, but a by-product account would also make this prediction. To our knowledge, although there is anecdotal anthropological evidence (see section "Is Grief an Adaptation?"), no empirical studies have investigated grief for a deceased leader or important group member, so future studies are needed to fill this deficit. Another clear prediction of the signaling theory of grief is that those who are, for whatever reason, relatively incapable of forming strong, non-calculated bonds with another human will exhibit a muted or non-existent grief response. Research has not yet systematically tested this hypothesis. Bonanno, Field, Kovacevic, and Kaltman (2002) did find that self-enhancement was related to lower levels of grief, and self-enhancement has been linked to narcissism (Paulhus & Williams, 2002); however, this extrapolation is tentative, at best, and researchers have warned that low

levels of grief are not necessarily indicative of undesirable personality characteristics (Bonanno, 2004; Nesse, 2005; Wortman & Boerner, 2007). In fact, a number of researchers have argued that "minimal" or "absent" or "resilient" grief is prevalent and that "normal" or "common" grief (grief that involves high initial distress that slowly abates) is rarer than was once believed (e.g., Bonanno, Wortman, et al., 2002).

These arguments might seem to contradict our proposal that grief is a costly and therefore hard-to-fake signal of commitment (see Bonanno, 2004; Bonanno, Wortman, et al., 2002). Wortman and Boerner (2007), for example, noted that a number of studies have shown that a significant percentage of people do not experience "normal" grief, and that many (ranging from 26% to 78%) exhibit symptoms of "minimal" or "absent" grief (what Bonanno (2004) termed "resilience"). However, a number of studies cited by Wortman and Boerner examined the grief responses of elderly spouses. For example, in the Bonanno, Wortman, et al. (2002) study, which found that 46% of the participants experienced "resilient" grief, the mean age of the participants was 72 years. The mean age of the participants in the Bornstein, Clayton, Halikas, Maurice, and Robins' (1973) study, which found that 57% of the participants experienced low or minimal grief, was 61. And Lund, Caserta, and Dimond (1986) found that a full 78% of the participants, ranging in age from 50 to 93, experienced low or minimal grief.

Although there are several plausible explanations for the high rates of resilient grief among the elderly, the signaling theory of grief suggests one: Older people are perhaps less likely than younger people to seek new social alliances or to be engaged actively in status-striving. Furthermore, the costs and benefits of grieving are different for the elderly. As a person reaches old age, his or her efforts "should" be invested in supporting younger kin and facilitating the alliances of these younger kin rather than in costly displays that enhance his or her own alliances (see Kaplan, Hill, Lancaster, & Hurtado, 2000 for an overview of life history theory). As noted above, studies that examine younger people often find stronger and more intense grief responses (see Table 2). For just one example, Murphy et al. (2002) found that 5 years after the death of a child, 61% of mothers and 62% of fathers met diagnostic criteria for mental distress—the mean age of participants in this sample was 47, meaning that the mean age of the participants at the time of the death was 42. Bonanno, Maskowitz, Papa, and Folkman (2005), however, showed that resilient grief was relatively common among young bereaved gay men. The mean age of their sample was 36.6. Bonanno et al. (2005) defined a resilient individual as one with " . . . levels of depression [that] fell within one standard deviation of the mean level of depressed mood observed in the nonbereaved comparison group" (p. 835). At 4 and 14 months postloss, exactly half of the sample was resilient. However, the resilient group in this sample did not have significantly lower depressive symptoms until 2 months after the loss, and even after 8 months, a full 50% of the sample experienced chronic depression, a number that dwarfs those found in most studies on bereavement in the elderly.

Summing up, the available evidence is tentatively supportive. However, more research is needed. There are few normative patterns for grieving, and we do not want to suggest, without strong evidence, that those who do not express significant dysfunction at the death of a loved one are somehow deficient in important character traits. The evidence supports our broad hypothesis that closeness to the deceased predicts a more intense grief response, but individual variation is common and the causes of such variation are still relatively obscure. The signaling theory of grief suggests some fruitful avenues for future research.

For example, researchers could measure grief symptoms among group members after the death of a leader or other high status group member and examine the relation between the intensity of the members' grief symptoms and the strength of their commitment to the group. To our knowledge, there are no published data examining how perceivers judge grievers or whether intense grievers are preferentially chosen as social partners. The current authors conducted essay-based studies that support predictions that expressions of grief are related to perceptions of commitment capacity. Studies using manipulated video expressions of grief could advance this line of research. Studies that examine individual differences in the expression of grief would also be illuminating. For example, the relation between commitment related disorders or personality traits (e.g., Machiavellianism, narcissism, sociopathy) and grief could buttress (or cast doubt on) the contention that grief is a signal of one's propensity to form strong social bonds with others. Comparisons between the grief reactions of different species could also provide comparative evidence for or against the signaling theory of grief. Because the signaling theory contends that grief is a signal to potential and/or current social allies, it predicts that animals in species that do not form bonds with non-kin conspecifics and do not have the freedom to choose social partners should not show a prolonged grief response. Conversely, animals in species that freely choose such alliances (and that possess the requisite cognitive capacities) *could* exhibit a protracted grief response.

Conclusion

We have argued that the human grief response was shaped by the forces of social selection because it provided and continues to provide observers with important information about a person's current level of commitment to a group as well as his or her propensity for forming non-calculated commitments. We believe that this theory allows researchers to make sense of the prolonged and costly nature of grief: It is prolonged and costly precisely because those features make it a reliable signal. The bereaved wife at the beginning of this article may not understand the forces that impel her to make the long walk to her deceased husband's cemetery stone, but

her dedication to her husband's memory is an honest indicator of her loyalty and commitment to him and, therefore, of her proclivity to form devoted bonds with others. The more costly her behaviors, the more powerful the signal. From a functional perspective, her gestures are not vain communications to the dead; rather, they are effective signals to the living.

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Notes

1. In this article, we focus on social selection, treating sexual selection as a subset of social selection.
2. Nesse (2005) called grief a "specialized form of sadness" and urged that researchers keep in mind that "one emotion has many functions, and any given function is served by many emotions" (Nesse & Ellsworth, 2009, p. 132). Although we believe that this is correct, for simplicity of exposition, we have decided to categorize this general perspective as a "pain/prevention" function for grief. So long as researchers understand the complexities and multifunctional nature of emotions, this does not appear a misleading label.
3. The boundary between costly signals (signals that impose a strategic cost on their bearer) and indices is not always perfectly clear. In the case of grief, for example, one could argue that it is primarily an index, because grief can be conceptualized as being inextricably connected to the committed relationship one had with the individual or group that was lost. However, one could also argue that grief is a costly signal, in the sense that the opportunity costs associated with grief (e.g., experiencing dysfunction and temporarily losing the ability to pursue social connections that help satisfy personal goals) may be excessively costly for (and thus rarely displayed by) individuals who rely on forming relatively uncommitted (and presumably more short-lived) social relationships. That is, the opportunity costs of grief may be higher for those pursuing a low commitment social strategy as compared with those for whom long-term committed relationships are the norm. The predictions that derive from our theory are largely the same regardless of whether grief is a costly signal or an index. Nevertheless, both of these possibilities should be borne in mind, and we regard our attempt at delineating the mechanisms that insure that grief is an honest signal as provisional. It may turn out that grief is *more* of an index than a costly signal and future research would benefit from seeking greater clarity on this important but unresolved issue.
4. Social norms may significantly constrain the expression of negative emotions such as grief (Kramer & Hess, 2002). For example, among male warriors, the expression of grief may be curbed or managed by customs. Those nuances in cultural display rules, however, are beyond the scope of this article.
5. To our knowledge, psychologists have not examined the relation of status/leadership to grief, but anthropologists have noted it. Although such ethnographic observations should be treated cautiously, these match everyday observations and have been discussed by other researchers (Nesse, 2000). Further research is needed on this topic.
6. Importantly, when we say, "longer, more intense grief response," we are not referring to the display of grief. We are also not necessarily referring to public crying or moaning. We are referring to the more protracted symptoms of disinterest, depression, lethargy, rumination, and dysfunction.
7. There may also be an upper bound to this relation. That is, grief that is too long or too intense may be maladaptive and may be a burden on current social partners. Future research will need to determine the boundary between grief as an effective signal versus a maladaptive burden.

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