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Not Just Dead Meat: An Evolutionary Account of Corpse Treatment in Mortuary Rituals

*Claire White**

Department of Religious Studies, California State University, Northridge, 236 Santa Susana Hall, 18111 Nordhoff Street, CA 91330-8316, USA

**Corresponding author, e-mail: claire.white@csun.edu*

Maya Marin

Institute of Cognition and Culture, Queen's University, 2–4 Fitzwilliam Street, Belfast BT7 1NN, UK

Daniel M.T. Fessler

Center for Behavior, Evolution, and Culture, Department of Anthropology, UCLA, 375 Portola Plaza, 341 Haines Hall, Box 951553, Los Angeles, CA 90095-1553, USA

Abstract

Comparing mortuary rituals across 57 representative cultures extracted from the Human Relations Area Files, this paper demonstrates that kin of the deceased engage in behaviours to prepare the deceased for disposal that entail close and often prolonged contact with the contaminating corpse. At first glance, such practices are costly and lack obvious payoffs. Building on prior functionalist approaches, we present an explanation of corpse treatment that takes account of the unique adaptive challenges entailed by the death of a loved one. We propose that intimate contact with the corpse provides the bereaved with extensive veridical cues of death, thereby facilitating acceleration of a grieving process that serves to recategorize the deceased as no longer a relationship partner, opening the door to relationship replacement and a return to social functioning. The benefits of exposure to such cues are tempered by the costs of exposure to cues of disease risk, a balance that in part explains the relative rarity of highly invasive mortuary practices that exacerbate the latter factor. We conclude by discussing implications of our model for contemporary mortuary practices in the developed world.

Keywords

corpse – cultural evolution – grief – human relations area files – mortuary rituals – mourning

1 Introduction

Mortuary rituals are ubiquitous features of human cultures. One aspect often noted by anthropologists is the extent and complexity of practices surrounding the treatment of the corpse (e.g., van Gennep, 1909; Malinowski, 1948; Hertz, 1960; Goody, 1962; Metcalf and Huntington, 1979; Bloch and Parry, 1982; Durkheim, 1995; Hunter, 2007). Even a cursory examination of the anthropological record reveals the many ways that people treat their dead prior to disposal: corpses are washed, embalmed, anointed, pickled, dismantled, painted, adorned with jewellery, clothed, wrapped, placed in a container, moved, viewed extensively, touched, embraced, wept over, shouted at, danced over, and force-fed food, among other practices. Despite striking differences in the details of the treatment, there appears to be one constant feature: people engage in highly regulated, functionally opaque, and elaborate sets of behaviours that result in close and often prolonged contact with the deceased. At first glance, such practices appear costly, and lack obvious payoffs. Here, motivated by a theory that links exposure to cues of death with changes in bereavement, we first document overarching patterns in the seemingly endless diversity of mortuary practices evident around the globe, then offer evolutionary explanations for these patterns.

Without discounting the importance of local variations on mortuary practices to those who follow them, our goal is to look beyond such variation to determine whether parochial practices share features that are amenable to non-parochial explanations, i.e., we explore the possibility of cross-cultural uniformity or near-uniformity in mortuary practices. Specifically, because we are concerned with the impact of mortuary practices on the bereaved, we seek to investigate both the nature of contact with the corpse and the relationship between those involved in corpse preparation and the deceased. The ethnographic literature includes rich accounts of bereavement and mortuary rituals (see Eisenbruch, 1984), with authors often attending to particular culture regions, or highlighting striking aspects of ritual practices (e.g., double burials, Hertz, 1960; Metcalf and Huntington 1979). Despite this wealth of material, little relevant systematic cross-cultural research has been conducted. Archaeologists

(e.g., Carr, 1995) have undertaken large-scale cross-cultural comparisons of mortuary customs, but, by its nature, such work cannot address the questions at issue here, as archaeological evidence generally does not reveal the identities of those who prepared a corpse (e.g., family members versus ritual specialists, etc.). As part of their assessment of religious rituals around the world, Atkinson and Whitehouse (2011) evaluated 93 funerary rituals, drawn from 39 cultures. However, the authors did not assess the extent of interaction with the corpse. Following their earlier (1976) cross-cultural survey on mourning practices, Rosenblatt, Walsh, and Jackson (2011) conducted extensive ethnological analyses of mortuary rituals, including an attempt to assess the amount of contact by the bereaved with the corpse in 186 cultures. However, for 70% of the cultures addressed, with regard to this question, the authors were unable to identify sufficient information in the ethnographic search methods employed, and hence they were unable to draw any conclusions. Given the dearth of existing analyses addressing the questions at issue, we conducted (to our knowledge) the most extensive systematic cross-cultural investigation of ethnographic accounts of corpse interaction in mortuary rituals. After describing our methods, we present results showing that, while the details of practices differ from culture to culture, nonetheless, the vast majority of mortuary rituals provide the bereaved with visual exposure to, and tactile interaction with, an identifiable corpse. Arguing that existing explanations of mortuary rituals are insufficient to explain this pattern, we propose an explanation for the near-ubiquity of corpse interaction that draws upon a consideration of the adaptive challenges facing the bereaved and the group in which they are embedded.

2 A Cross-Cultural Investigation of Corpse Interaction in Mortuary Rituals

2.1 *The Inclusion Criteria for Cultures and the Sample of Mortuary Rituals*

To investigate the possibility of overarching cross-cultural commonalities in the manner in which the corpse is treated in mortuary rituals, we assessed the extent and nature of interaction with the corpse in mortuary rituals from 57 cultures from around the globe, as documented in the electronic version of the Human Relations Area Files (eHRAF Collection of Ethnography, available online at <http://www.yale.edu/hraf/index.html>). This database contains over a million pages of descriptive ethnographic information, from a variety of source documents, on many aspects of life in diverse cultures from around the globe. The source information is indexed at the paragraph level according

to the HRAF's comprehensive culture and subject classification systems: the Outline of Cultural Materials (OCM). This indexing system enables an efficient search capability for 710 indexed topics. In addition, researchers can also perform keyword searches at the paragraph level.

Our sample was the Probability Sample Files (PSF) which contains material on 60 cultures selected to be representative of world cultures while offering a broad temporal and geographic sample that controls for cultural contact and historical relatedness between societies, and thus minimizes the risk of committing Galton's error, the assumption of independence among societies that do not constitute independent data points (Ember and Ember, 1998). Twenty-two undergraduate students were recruited to glean material from the PSF. To obtain as much information as possible on mourning rituals for the selected cultures, they performed both index searches (e.g., burial practices and funerals, special burial practices and funerals) and key word searches (e.g., 'corpse', 'death'). A mortuary ritual was defined as a conventional action following the death of an individual, conducted prior to, or during, initial corpse disposal (note that this definition excludes the phenomenon of secondary burial, or more accurately, secondary treatment of the deceased, since this is beyond the scope of the current study (see Hertz, 1960; Metcalf and Huntington, 1979)). While other features have been used as the basis for definitions of rituals generally (e.g., Bloch, 1974; Humphrey and Laidlaw, 1994; Whitehouse, 2004), the definition employed reflects our focus on ritualized behavioural responses surrounding the corpse.

It is possible that, within cultures, there are differences in the extent and nature of corpse interaction in mortuary practices, especially for cultures with multiple religious traditions, or funerals in select groups such as high status individuals and the wealthy (see for example, Chapman et al., 1981; Parkes et al., 1997). Likewise, it is likely that the nature of mortuary practices change over time within a single culture (e.g., see Laderman, 1996; Walter, 2005). However, an initial assessment of the text gleaned from the eHRAF indicated that the available ethnographic materials do not afford an examination of such within-culture variation or multiplicity in practices. We therefore limited our evaluation to only the best-described variant of a given culture's mortuary practices. To maximize the accuracy of the material examined with regard to the dimensions of interest, we then further refined our inclusion criteria so as to ensure that all accounts employed were descriptions of contemporary practices observed by the ethnographer, or of contemporary or recently-discontinued practices recounted by participants to the ethnographer; we achieved this by limiting inclusion to ethnographic material collected after 1901, and excluded accounts based on archaeological or historical materials.

Likewise, to maximize resolution in the sample, we included only mortuary rituals that were explicitly described in the ethnography, rather than merely mentioned. This preliminary investigation revealed that there was insufficient data for three cultures (Bahia Brazilians, Bemba, and Serbs) in the sample of 60, and they were thus excluded from further investigation. Further, mortuary practices involving high-status individuals, such as kings or chiefs, were excluded from the analyses because they are likely not representative of mortuary rituals in general in the given culture.

2.2 *Coding of Ethnographic Data*

Viewed functionally, rituals can occur for any of a wide variety of reasons, for example, to control potential fitness threats in the environment, to signal commitment to the group, and/or to promote in-group cooperation (e.g., see Sosis, 2004; Boyer and Liénard, 2006; Henrich, 2009). While mortuary rituals certainly afford a diverse spectrum of possible functions — and, correspondingly, appear to be put to a wide range of uses — nevertheless, the circumstances in which mortuary rituals occur are united by the central feature that, in the majority of cases, a discrete set of individuals has suffered a marked loss, and, as a consequence, they are in considerable emotional distress. We begin with the premise that this central feature importantly drives the cultural evolution of mortuary rituals. *Ceteris paribus*, kin are more likely to be affected by the deceased's passing than are unrelated individuals. Accordingly, if mortuary rituals function in part to address bereavement, then it is logical to focus our investigation on the actions that kin are expected to undertake.

For each mortuary ritual examined, we recorded three variables. First, we evaluated whether kin are visually exposed to the corpse (yes/no/no information). If so, we then assessed whether kin have contact with the corpse (yes/no/no information). Lastly, when contact with the corpse occurs, we evaluated the level of the contact, using a scale of 1–3 in terms of intimacy (where 1 = low, 2 = moderate and 3 = high). For instance, low intimacy contact would be “paying respect” to the corpse by briefly touching it during the funeral ceremony. Moderately intimate contact includes more prolonged or extensive actions such as kissing, embracing, and preparing the body for funerary rites by washing and dressing it. Highly intimate contact is characterized by inner body contact (i.e., penetration of natural orifices, cutting through the flesh, dismantling the corpse, etc.) and/or consumption of the remains. The coding scheme is presented in Table 1.

To maximize reliability, ten research assistants compiled relevant ethnographic material from the eHRAF, whereafter a separate group of ten assistants

coded that material. First, assistants were each randomly assigned six cultures from the Probability Samples Files. They were instructed to read the relevant ethnographic materials and to record verbatim the descriptions of each ritual given in the HRAF; if multiple rituals were described for a given culture, raters then selected that ritual described in greatest detail. After data were collected for all sixty cultures, an additional ten assistants rated the excerpted material according to the three questions described earlier, with each rater assessing six cultures. As a check on rater reliability, two other assistants evaluated the excerpted material from all sixty cultures; their ratings were then compared with those produced by the corresponding members of the set of ten raters. Initial inter-rater reliability across all three questions was high — (average Cronbach's alpha = 0.82). All subsequent disagreements were resolved by discussion between the original coders and the two additional research assistants. The cross-cultural data for analyses are presented in Table 2.

TABLE 1 *Coding schema*

Variable	Coding schema
Visual exposure to corpse by kin	1 = absent 2 = present 99 = no information*
Contact with corpse by kin	1 = absent 2 = present 99 = no information*
Level of intimacy with corpse by kin	1 = low 2 = moderate 3 = high 99 = no information* 88 = not applicable

*Not enough information to make a judgment.

TABLE 2 *Data for analyses*

Culture	Visual exposure to corpse by kin	Contact with corpse by kin	Level of intimacy with corpse by kin
Akan	P	P	M
Amhara	P	P	M
Andamans	P	P	M
Aranda	P	P	M
Aymara	P	P	M
Azande	P	P	M
Blackfoot	P	P	L
Bororo	P	P	M
Central Thai	P	P	M
Chukchee	P	P	M
Chuuk	P	P	H
Copper Inuit	P	P	M
Dogon	P	P	M
Eastern Toraja	P	P	NI
Ganda	P	P	M
Garó	P	P	M
Guarani	P	P	NI
Hausa	A	A	NA
Highland Scots	P	P	M
Hopi	P	P	M
Iban	P	P	M
Ifugao	P	P	M
Iroquois	P	P	M
Kanuri	P	P	M
Kapauku	P	P	M
Khasi	P	P	M
Klamath	A	A	M
Kogi	P	P	M
Korea	P	P	M
Kuna	P	P	M
Kurds	P	A	NA
Lau Fijians	P	P	M
Libyan Bedouin	P	P	M
Lozi	P	P	L
Maasai	P	P	M

Culture	Visual exposure to corpse by kin	Contact with corpse by kin	Level of intimacy with corpse by kin
Mataco	P	P	L
Mbuti	P	P	M
Ojibwa	P	P	M
Ona	P	P	L
Pawnee	P	P	M
Saami	P	P	M
Santal	P	P	M
Saramaka	P	P	H
Shluh	A	A	NI
Sinhalese	P	P	M
Somali	P	P	M
Taiwan Hokkien	P	P	M
Tarahumara	P	P	L
Tikopia	P	P	M
Tiv	P	P	M
Tlingit	P	P	M
Trobriands	P	P	H
Tukano	P	P	M
Tzeltal	P	P	M
Wolof	P	A	NA
Yanoama	P	P	H
Yukut	A	A	NA

Coding key: P = present, A = absent, H = high, M = moderate, L = low, NI = not enough information to make a judgment, NA = not applicable.

3 Results

3.1 *Variation across Societies*

All descriptive data are presented in Tables 3, 4 and 5. As displayed in Table 3, the vast majority of mortuary rituals include visual exposure of the corpse to the kin (93%). Furthermore, as displayed in Table 4, in most mortuary rituals (89.5%), kin of the deceased have physical contact with the corpse. As displayed in Table 5, most of this physical contact involves moderately intimate practices (82%), such as washing or dressing the corpse prior to disposal,

as compared to rituals that included low intimate contact (10%) or highly intimate contact (8%) (see also Figure 1).

3.2 *Regional Effects*

To investigate regional variation in mortuary rituals along the intimacy dimension, we conducted the Kruskal–Wallis analysis of variance for independent samples with intimacy-of-contact ratings as our dependent variable and world regions as our grouping variable. The 60 samples which comprise the PSF are categorized into eight regions: Africa ($n = 16$), Asia ($n = 14$), South America ($n = 10$), North America, ($n = 8$), Oceania ($n = 5$), Central America and the Caribbean ($n = 3$), Europe ($n = 3$) and the Middle East ($n = 1$). To assess regional effects, we collapsed North America, South America, Central America and the Caribbean into one category, and removed societies from Europe and the Middle East because of their low representation in the data set. We also conducted a Kruskal–Wallis test for independent variables with regions as grouping variable and intimacy-of-contact ratings as the dependent variable without collapsing the eight geographical regions. No significant regional effects were found.

TABLE 3 *Visual exposure to corpse by kin*

	Frequency	Percent	Valid Percent
Absent	4	7	7
Present	53	93	93
No information	0	0	0
N/A	0	0	0
Total	57	100	100

TABLE 4 *Contact with corpse by kin*

	Frequency	Percent	Valid Percent
Absent	6	10.5	10.5
Present	51	89.5	89.5
No information	0	0	0
N/A	0	0	0
Total	57	100	100

TABLE 5 *Extent of intimacy with corpse by kin*

	Frequency	Percent	Valid Percent
Low intimate	5	8.8	10
Moderately intimate	41	71.9	82
Highly intimate	4	7	8
No information	3	5.3	–
N/A	7	7	–
Valid total	50	–	100
Total	57	100	

We found no significant regional effects on the level of intimacy of interaction with the corpse. Together with the manner in which, by design, the Probability Sample Files minimize the problem of shared cultural phylogeny, this result strongly suggests that the overarching pattern of nearly universal visual exposure and moderately intimate contact is not driven primarily by historical factors, and instead likely reflects convergent cultural evolution operating across a wide range of environments.

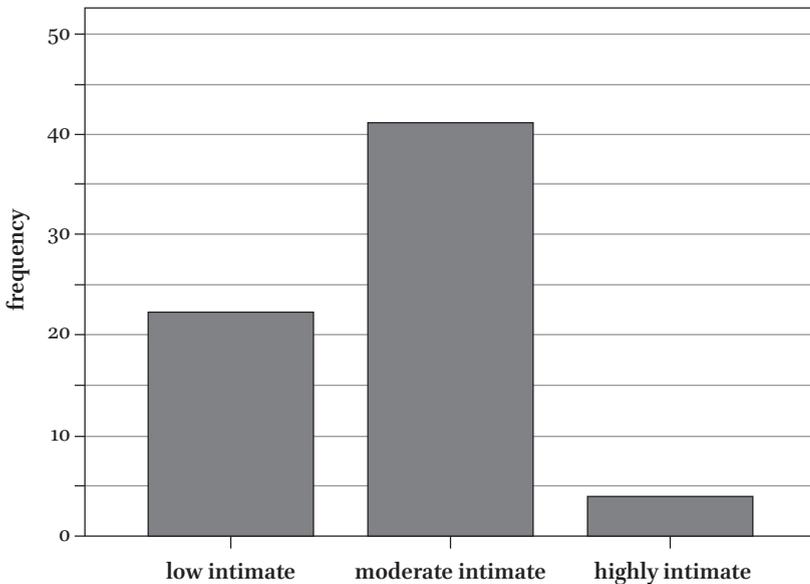


FIGURE 1 *Distribution of intimacy levels of physical contact with corpses by kin across cultures (n=50).*

4 Discussion

Our study of ethnographically described mortuary rituals in a representative sample of the world's cultures reveals that, in nearly all of the cultures examined, the family of the deceased engage in considerable physical contact with the corpse, with moderately intimate interaction occurring in the vast majority of cultures. Notably, such rituals seldom involve highly intimate contact (e.g. inner-body contact and/or remains consumption), but, when they do, these actions too are typically performed by kin rather than for example, by ritual specialists. These patterns are robust across the cultures sampled, and, being unrelated to geographic region, are very unlikely to be due to common cultural phylogeny. The relative uniformity of these patterns leads us to ask why mortuary rituals involve such extensive contact between the bereaved and the corpse of the deceased. Below we will evaluate existing theories of mortuary practices, paying particular attention to their ability to explain our findings. Drawing on evolutionary perspectives on the relationship between mind, culture and behaviour, we then propose an alternative explanation of such practices.

4.1 *Symbolic and Functionalist Explanations of Mortuary Rituals*

Symbolic approaches attempt to explain mortuary practices in terms of the meanings they hold for those who perform them. Holding aside others' objections that most rituals do not actually convey coded meanings except in the most vague sense (Sperber, 1975), we acknowledge that it is possible that many mortuary rituals perform some or all of the above functions. From this perspective, the treatment of corpses in mortuary rituals is ultimately a product of shared ideas about the process of death, the identity of the dead in the afterlife, and the identity of the living — all of which are intrinsically related (e.g., van Gennep, 1909; Hertz, 1960; Metcalf and Huntington, 1979; Bloch and Parry, 1982). Thus, mortuary rituals are thought to convey culturally-coded meanings that the anthropologist must decode in order to understand why the corpse is treated in specific ways. As such, symbolic approaches are necessarily intimately tied to the details of local belief systems. Such approaches may thus help to explain culturally specific variations in mortuary rituals (such as double-burials, the use of grave goods, or washing of the corpse prior to burial), though the extent to which mortuary practices reflect afterlife beliefs is debated, and evidence is not consistent (e.g., Ucko, 1969; Binford, 1971; Carr, 1995). However, their linkage to the specifics of local beliefs means that symbolic approaches are generally poorly equipped to address patterns, such as those that we have documented, that manifest independent of beliefs per se, occurring as they do across disparate cosmologies and eschatologies.

In contrast to the focus on meaning that characterizes symbolic approaches, existing functionalist perspectives contend that mortuary rituals confer tangible benefits to the social group that exceed their costs. Postulated benefits include controlling the fear of mortality induced by the sight of the corpse, reaffirming the social order (including practicalities such as the redistribution of goods), reinforcing core group values, and redefining social relationships at a time of social uncertainty and change (e.g., van Genneep, 1909; Malinowski, 1948; Hertz, 1960; Goody, 1962; Bloch and Parry, 1982; Durkheim, 1995; Hunter, 2007). However, as was true of symbolic approaches, traditional functionalist accounts do not readily pertain to the patterns evident in our results — why, for example, should intimate contact with the corpse be nearly ubiquitous in activities designed to reaffirm the social order? Moreover, if the function of the ritual is to militate against existential fear, why should the task of corpse preparation be allocated to those who are best positioned to recognize that the idiosyncratic animated individual whom they had once known is now no longer evident, replaced by a cold and unresponsive carcass? Indeed, more broadly, it is unclear how interacting with a decomposing corpse allays, rather than exasperates, fear of it and of one's own mortality, since engaging with a corpse is surely a tangible reminder of what is to be feared.

One promising branch of functionalist approaches postulates that rituals surrounding death provide direct psychological benefits to the bereaved following their loss. Employing cross-cultural comparison, Rosenblatt, Walsh and Jackson (1976) found a positive association between the absence of a final ceremony and the presence of prolonged grief (as measured by reports of disrupted work, troubled dreams, suicidal behaviour, deviations from societal norms, and illness). This suggests that a functional consequence of mourning rituals is the reduction of the duration of suffering and pragmatic impairment caused by grief, an outcome that would clearly benefit the bereaved and, by reducing their suffering and hastening their return to productive social life, the group as well. Other research suggests a role for regained feelings of control and social support via shared physiological states, or signalling support through ritual participation (Xygalatas et al., 2011; Norton and Gino, 2014).

Existing functionalist theories plausibly account for some prevalent features of mourning rituals, such as the overt expression of distress, and the use of communal gatherings. However, such theories do not explain why people would engage in practices that maximize and prolong exposure to the contaminating corpse when it would be more efficient and less costly for a few individuals to simply remove it from the immediate environment with minimal exposure, with such actions most readily being performed by individuals who, not being close to the deceased, are not handicapped by grief. Here, we

seek to extend functionalist reasoning by considering the evolved psychological mechanisms that plausibly play roles in the events surrounding the death of a loved one.

4.2 *Evolutionary Considerations*

Previous explanations of mortuary rituals have not provided a compelling account of the emergence and apparent stability of corpse interaction in mortuary rituals. Despite an abiding interest in human evolution, anthropologists and archaeologists have largely overlooked the possibility that evolved features of the mind have influenced how the living bury their dead. Thus, one way to advance understanding of our findings is to identify psychological mechanisms that give rise to such ritual practices within an evolutionary framework. In what follows, we address corpse interaction specifically within a cultural selection framework, which assumes that recurrent features of human cultures reflect the winners in a constant process of generation and selection of new variants (see Boyd and Richerson, 1985; Sperber, 1985). We outline the adaptive challenges faced by our ancestors following the death of a group member, and, correspondingly, identify several evolutionarily plausible mechanisms that gave rise to corpse contact in mortuary rituals.

The death of a close biological relative entails direct decrements to inclusive fitness. However, biological relatedness is not the only avenue whereby the death of another can harm the survivor's fitness. Given the selective advantage that social relationships bring, the potential fitness costs of the death of a relationship partner are also substantial, as the death of a partner equals the loss of reproductive and social resources (via offspring, sexual partners, and the expensive social resource of "trust"). Grief is the near-universal response to the loss of a valued other, be it consanguineal relative or partner. Recently White and Fessler (2013) have proposed a cognitive account of grief that integrates two existing evolutionary theories of the function of this emotion, namely the reunion theory, which proposes that the proper domain of grief is the loss of a partner due to separation or estrangement rather than death (Archer, 2001; Bowlby, 1982), and the reorientation theory, which posits that grief following the death of a loved one is a unique functional process that evolved to cope with a terminal loss by facilitating disengagement from the deceased (Freud, 1914/1951; Nesse, 2005). In our view, multiple evolved psychological mechanisms are deployed when an individual is separated from a valued other. These include both (1) mechanisms designed to promote reunion with a lost agent where this is possible (predominantly taking the form of symptoms such as yearning for reunion; see Bowlby, 1982), and (2) when there is evidence that the valued other is deceased, mechanisms designed to promote

coming to terms with the permanent loss of the other by disengagement and reorientation to a new status without him or her (predominantly taking the form of symptoms such as rumination and sadness; see Nesse, 2005a,b). This account is consonant with the finding that different symptoms are characteristically evinced at different times in the grieving process, namely, yearning for reunion within the first 6 months, and acceptance between 7 and 12 months (Maciejewski, et al., 2007). Thus, grief is a process that has two functions: First, in cases where reunion is possible, grief enhances the likelihood that it will occur, thus leveraging existing investments in a valuable relationship and avoiding the time, energy, and opportunity costs of establishing a replacement relationship. Second, in cases where reunion is not possible — death of the relationship partner being the most definitive variant thereof — grief facilitates the reconceptualization of the other as no longer a viable relationship partner, opening the door to investment in new relationships.

According to this cognitive account of grief, cues that respectively indicate that the loved one is or is not alive will be crucial to the unconscious process whereby the bereaved can reconceptualize the loved one as a non-viable relationship partner. Indeed, research shows that recently bereaved individuals are exceptionally vigilant in detecting information about the lost agent in the environment, (Olson et al., 1985; Weisman, 1990; Archer and Winchester, 1994; Shear and Shair, 2005; Freed et al., 2007, 2009; Maciejewski et al., 2007), presumably reflecting a search for indications as to whether reunion is possible. Myriad environmental cues will often raise the possibility that the lost agent is in the immediate vicinity, and grief entails hypersensitivity toward them. Rosenblatt, Walsh and Jackson's (1976) assessment of the ethnographic literature suggests that most societies contain mores that remove cues of the recently deceased from the immediate environment. For example, 91% (71/78) of the cultures surveyed prescribe the immediate destruction of the deceased's property, 81% (63/78) stipulate the abandonment of the deceased's residence, and 60% (46/78) taboo mention of the deceased's name for the close kin and local community. Similarly consonant with the approach outlined above, Rosenblatt et al. also found a strong positive correlation (.80) between the practice of immediately destroying the deceased's property and high marriage rates, suggesting that the former may facilitate the rapid establishment of replacement relationships.

While hypersensitivity to cues that reunion with the lost agent is possible may undergird a variety of cultural practices that function to remove such cues, the nature of the adaptive problem at issue is such that, although these practices may accelerate the grief process (see White and Fessler, 2013 for an example), nevertheless, even the absence of cues of the possibility of reunion

will not in itself eliminate grief. This is because evaluating the possibility of reunion entails an error-management problem (Haselton and Buss, 2000; Nesse, 2001, 2005a,b; Haselton and Nettle, 2006; Johnson et al., 2013). Given the fitness value of the relationships at issue, there is an asymmetry in the types of errors that the bereaved can commit. On the one hand, continuing to entertain the possibility of reunion when no such possibility exists entails energy and opportunity costs, delaying the formation of a replacement relationship. On the other hand, prematurely abandoning efforts at reunification entails the costs of unnecessarily losing the relationship. The higher the value of the relationship, the greater the latter costs relative to the former, and hence the more that it is worth persevering in efforts aimed at reunification. One manifestation of this should be a (generally unconscious) scepticism regarding the death of the deceased, such that, for example, the absence of cues of agency should only weakly trigger death inferences (see Barrett and Behne, 2005).

As Barrett and Behne (2005) argue, there is likely to be a living/dead discrimination mechanism that is based on detecting a hierarchy of death cues, with those cues that provide the most reliable information being most capable of triggering death inferences. Crucially, however, while the postulated mechanism responsible for grief takes input from the living/dead discrimination mechanism, the two are not identical, as the function of the former is to determine whether any given target is alive or dead, while the function of the latter is to determine whether a particular valued other is alive or dead. Accordingly, operating in parallel with the aforementioned hierarchy of death cues are inputs regarding the identity of the target being evaluated.

The facial recognition system enables people to recognize particular individuals, importantly including those in whom they have invested (Bruce and Young, 1986; Shah et al., 2001). Evidence from the social and neurobiological sciences suggests that, for each familiar individual, we store in memory a unique constellation of information, known as a personal identification network. This memory network is activated primarily by seeing the given individual's face (Fiske and Taylor, 1991; Guthrie, 1995; Leveroni et al., 2000; Shah et al., 2001). This has two implications for contexts of bereavement. First, the conjunction of facial recognition and unambiguous cues of death will have the greatest impact in accelerating the bereavement process. Second, because the functional utility of person-specific memory networks derives from their ability to contribute to successful social interactions with the individual thus represented, and because reclassifying the deceased from agent to object takes time, the facial recognition event will initially motivate social interaction despite the presence of death cues. A corpse is not just "dead meat" to those who had built important relationships with the deceased. We automatically

represent corpses as people (Boyer, 2001); as a consequence, the bereaved are likely to initially treat the deceased with care, and are predisposed to engage in interactions that they would perform for a living individual, such as feeding, washing and dressing them.

Physical cues that the familiar other is dead become stronger over time, especially within the first few days after death. Although corpses are non-agentive, the same is temporarily true of living agents while they are asleep. However, within a fairly short time, corpses begin to look, feel and smell differently from living people. Nevertheless, in order to obtain access to these cues, the bereaved must be in the immediate vicinity of the corpse following death and, for fullest exposure, must engage in physical contact with the corpse. Against the backdrop of the intersection of (a) error-management considerations regarding determining whether a valued other is alive or dead, and (b) the social inclinations elicited by person recognition, it is thus not surprising that recently bereaved individuals experience a compelling desire to see the corpse and engage in contact with it, even in societies where traditional doctrines explicitly prohibit it (see McCorkle, 2010, for the case of Buddhism). Indeed, rudimentary urges to engage in tactile contact with the corpse are found in social birds and mammals: naturalistic observations often report mothers carrying their dead infants, probing them, and allowing other group members to manipulate the carcass before finally abandoning it (e.g., see Archer 2001; Cronin et al., 2011). Consonant with the importance of close sensory contact with the corpse as a means of exposure to compelling death cues, many traditions place enormous importance on locating dead bodies and returning them to the family of the deceased. Likewise, people find it difficult to accept the death of a loved one when no body is present but the person is presumed dead (e.g., war, kidnapping) — even after an extended period of time.

Commensurate with the above model, it is now generally accepted in the clinical literature that long-term outcomes are better for those who view the body of a loved one, as doing so is thought to help people come to terms with the death (Hinton, 1967; Kübler-Ross, 1983; Wertheimer, 1991; Wright, 1991; Hodgkinson and Stewart, 1991; Haas, 2003; Chapple and Ziebland, 2010). Naturalistic data suggests that even in traumatic circumstances, viewing the body of a loved one may increase anxiety and distress in the short term, but is associated with less distress in the longer term (Hodgkinson, 1995; Raphael, 1997). Conversely, not seeing the body (such as in cases when the body cannot be recovered) is associated with more difficult, prolonged grief (Kübler-Ross, 1983; Hodgkinson and Stewart, 1991). Health care professionals often observe that spending time both viewing and touching the body of a deceased loved one is conducive to better outcomes (Raphael, 1983; Jolly, 1987).

Both (a) the compelling proximate need to recognize the deceased person and cognitively register him or her as dead, and (b) the ultimate functional benefits of such a process conflict with evolved disgust mechanisms designed to protect against potential hazards. Although the risk of contagion posed by dead bodies in modern environments is not as great as is widely assumed (see McCorkle, 2010 for an overview), nevertheless, given the absence of any sanitary facilities in the ancestral past, corpses would have posed a legitimate disease threat for most human communities. Correspondingly, in many cultures, corpses are perceived as polluting, and correspondingly, are likely to elicit disgust (Rozin et al., 2000; Boyer, 2001; Curtis et al., 2004; McCorkle, 2010). Granted, the strength of this reaction is likely tempered by the social closeness of the bereaved to the deceased, as feelings of disgust differ depending on the source of the disgusting material; that is, disgusting stimuli which emanates from oneself and familiar others elicits less disgust than that which comes from strangers (i.e., the ‘source effect’, see Peng, Chang and Zhou, 2013, see also McCorkle, 2010). Nevertheless, even a moderated disgust reaction is still likely to generate ambivalence in the bereaved — the bereaved wants to see the body in order to “believe” that the person is actually deceased, yet simultaneously experiences distress at the prospect of seeing the corpse (e.g., Boyer, 2001; Davies, 2005).

The above considerations shed light on the patterns evident in our findings, helping to explain why practices that involve breaching the body envelope of the corpse are unlikely to become widespread. We found that highly intimate mortuary rituals that violate body envelopes, reprocess or destroy the corpse (e.g. dismemberment, mummification), or involve any form of cannibalism are quite rare, composing only 8% of our sample. While these practices have the advantage that they entail exposure to additional exposure to death cues that could facilitate reclassifying the deceased as dead, there are probably diminishing returns to such additional exposure — the experience of manipulating a cold, unresponsive, and immobile corpse, along with possible rigor mortis or odours of putrefaction, would likely provide conclusive evidence of death, such that information provided by, say, dismemberment would be largely superfluous. In contrast to such marginal benefits, highly invasive mortuary practices enhance exposure to disgust-eliciting cues of disease risk, thus making such rituals more aversive at the proximate level, while simultaneously increasing the real risk of disease transmission, making such rituals costly to both the individual and the group at the ultimate level. In contrast to the rarity of highly invasive practices, the vast majority of cultures surveyed (82%) practice moderately intimate, outer-body contact with the deceased by the bereaved. Such practices plausibly constitute the optimal balance between, on the one hand, the proximate desire to see and touch the deceased loved one

and the corresponding ultimate benefits of thereby facilitating reclassification from living to dead, and, on the other hand, the proximate desire to avoid contact with cues of disease and the corresponding ultimate benefit of reduced risk of disease transmission. Lastly, the ritualized nature of mortuary practices plausibly in itself reduces anxiety associated with contact with corpses (Boyer and Lienard, 2006), thereby further tipping the scales in favor of providing valuable input to the psychological mechanisms that produce reclassification and relationship replacement.

5 Conclusion

Our results demonstrate the striking cross-cultural similarities in how those who were socially close to the deceased interact with the corpse in mortuary rituals. Specifically, extensive visual exposure to, and tactile interaction with, an identifiable corpse is remarkably consistent in mortuary rituals around the world, while more invasive modifications of the corpse are rare. Despite wide variation in the particulars, the relative uniformity of this pattern of moderate interaction with the corpse across disparate cultures strongly suggests that these practices have utility for the individual and/or the group. We have proposed that this utility derives from the manner in which exposure to death cues ends searching behaviour and facilitates reclassification of the loved one, key functional features of the grief process. Such facilitation thus plausibly aids the bereaved in the long run by diminishing the duration of grief and accelerating recruitment of a replacement individual. In turn, the group reaps benefits from these outcomes, as groups gain competitive advantage by shortening the period of grief-induced disability suffered by their members and facilitating the reformation of social bonds. Evolved disease-avoidance reactions conflict with the above proximate and ultimate goals, as they make interaction with the corpse aversive. Such negative responses are mitigated in part by the reduction in disgust reactions entailed by familiarity with the deceased, and in part by the assuaging nature of ritual itself. However, the capacity for such mitigation is itself likely constrained, explaining at a proximate level the rarity of highly invasive corpse-processing procedures, a pattern associated with the ultimate benefit — to both the individual and the group — of avoiding more extensive exposure to pathogens.

Both our empirical findings and our interpretations thereof are consonant with a growing clinical movement that recognizes exposure to the corpse as a means of aiding the bereaved in coming to terms with the death of a loved one (Hinton, 1967; Kübler-Ross, 1983; Raphael, 1983, 1997; Jolly, 1987; Wertheimer,

1991; Wright, 1991; Hodgkinson and Stewart, 1991; Hodgkinson, 1995; Haas, 2003; Chapple and Ziebland, 2010). Bereavement is a substantial threat to health — the death of a loved one is associated with higher rates of physical and mental difficulties, including an increased risk of mortality itself (Stroebe et al., 2007). Indeed, at a societal level, it is estimated that, in the USA alone, bereavement accounts for over \$100 billion annually in absenteeism and lost productivity (Friedman and Cline, 2003). At the same time, the combination of the rapid medicalization of the dying process and the parallel professionalization of mortuary services in modern nations is such that industrialized societies have become outliers on the spectrum of the world's cultures. Today, bereaved individuals in developed nations rarely participate in the preparation of the corpse, and, indeed, have minimal exposure to cues of death of any sort — even when visual contact does occur, it most often follows complex professional preparation of the corpse aimed at minimizing cues of death. If our theoretical framework correctly explains the near-universal nature of the patterns evident in the ethnographic literature, then the likely result of such institutions is an exacerbation of individual suffering and the attendant costs to society.

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