Human Grief: Is Its Intensity Related to the Reproductive Value of the Deceased?

Charles B. Crawford, Brenda E. Salter, and Kerry L. Jang

Department of Psychology, Simon Fraser University, Burnaby, British Columbia, Canada

Thurstone's method of comparative judgment was used to measured the intensity of grief that parents of high-, moderate-, and low-reproductive value were expected to experience at the death of male and female children of different ages. The results were correlated with reproductive values for male and female British Columbians and for !Kung Bushwomen. Grief ratings were more highly correlated with reproductive value than with age and more highly correlated with reproductive values of !King Bushwomen than with those of British Columbians. The correlations were higher for male- than for female-stimulus children. The correlations of female ratings with reproductive value were higher than male ratings with reproductive value, although not as high as expected. However, the correlation between grief ratings and reproductive value did not increase as the reproductive value of the raters declined.

KEY WORDS: Grief; Reproductive value.

Sanders (1980) reports that the death of a child produces more intense grief than the death of either a spouse or a parent. These results make sense from a sociobiological perspective because a child's death can be expected to have a greater impact on the inclusive fitness of an individual than the death of either a parent, who will likely be of lower reproductive value than the child, or the death of a spouse, who does not share alleles with the individual.

Recently, Littlefield and Rushton (1986) argued that the degree of both genetic investment and loss experienced at the death of a child should be proportional to the propagation potential of the deceased child and, therefore, that some children are expected to be grieved for more than others.

In a study of the intensity of grief experienced by parents in a bereaved-parents association, they found a) that mothers grieved more than fathers; b) that the death of unhealthy children produced less parental grief than the death of healthy children; c) that boys were grieved for more than girls; d) that sex and health of child interacted to produce the inequality: healthy male > healthy female = unhealthy female = unhealthy male for intensity of grief; e) that children physically more similar to parents were grieved for more than dissimilar children; f) that maternal grandmothers grieved more than either maternal grandfathers or paternal grandmothers, who in turn grieved more than paternal grandfathers; and g) that mother's siblings grieved more than father's siblings.

Littlefield and Rushton (1986), however, did not find support for their prediction that older children would be grieved for more than younger children and that older parents would grieve more than younger parents. In this paper we argue that reproductive value is a more appropriate variable than chronological age when studying the relation between age and the intensity of grief experienced over the loss of a child. We report evidence on the relationship between the intensity of grief that individuals of high-, moderate-, and low-reproductive value expect parents to experience at the death of children with different reproductive values.

GRIEF AND REPRODUCTIVE VALUE

If, as Bowlby (1960) suggested in a seminal paper on grief and mourning in infancy and early childhood, the emotional substrate of grief is part of the "inherited behavior repertoire of man" (p. 9), it would have been adaptive for its intensity to vary as a function of the characteristics of the griever, the deceased, and the population in which they resided. However, because of his psychoanalytic orientation, he saw the experience of the infant as the prototype for all grief. In the above paper he wrote ". . . my principle aim will be to demonstrate that the response to be observed in young children on the loss of the mother figure differs in no material respect (*apart probably from certain consequences*) from those observed in adults on the loss of a loved object" (p. 10, emphasis added).

However, recent work on the evolutionary significance of intrafamily relationships (Trivers 1974, 1985) suggests that the intensity of the emotional responses of a parent over the loss of a child might be regulated by different cues than those determining the intensity of grief of a child for the loss of a parent. For a child, the death or long absence of a parent might mean death. Moreover, there is no reason to expect that the age of the parent would have been a cue regulating the intensity of the child's grief because the loss to the child is the same irrespective of the parent's age.

There is reason, however, to expect that both the child's age and the parent's age might be cues regulating the intensity of parental grief at the

loss of child because the loss to the parent depends on both these ages. For example, the loss of a very young child to a young parent, measured in terms of the parent's fitness, is less than the loss of an adult child to an old parent.

There are many factors that may regulate the intensity of parental grief at the loss of an offspring. Fisher's (1930) concept of reproductive value provides a measure of those factors related to the age of both the offspring and the parent. It is the relative number of offspring still to be born to an individual of age x. In most species reproductive value rises sharply right after birth because of infant mortality, peaks near the age of sexual maturity, and then declines as individuals become older.

The intrinsic rate of population growth has an impact on the reproductive value function. For example, the intrinsic rate of population growth in industrialized countries is less than that of developing nations; therefore, infants in industrialized countries have increased reproductive value since they, as adults, will make up a relatively greater proportion of their population than infants of the same age in developing countries. Another factor differentiating the reproductive value curves of these two types of countries is infant mortality. The sharp increase in reproductive value, due to infant mortality, characteristic of most animal populations as well as human populations lacking good health care and an adequate diet, is absent in the industrialized countries.

Reproductive value curves for South Africa (1961) for blacks and whites, Japan (1964 and 1966), Sweden (1967) and Mexico (1966) are plotted in Figure 1 from Keyfitz and Flieger's (1971) computations. Note the differences between the curves for black and white South Africans and for Japan for 1964 and 1966. These figures suggest that reproductive value is a measure that may capture at least some of the cues that may regulate the intensity of parental grief over the death of offspring.

There is at least one other factor that may influence the relationship between the intensity of experienced grief and reproductive value of offspring. The minimal investment required for a female to produce an additional offspring is greater than that for a male to produce an additional offspring (Trivers 1972). Therefore, female parents can be expected to be more sensitive to the reproductive value of their offspring than male parents.

PREDICTIONS

Based on the above arguments we made the following predictions about the relationship between the reproductive values and ages of deceased children and the intensity of grief experienced by parents at their deaths:

1. The intensity of grief experienced by parents at the death of their children of different ages will be highly correlated with the reproductive value of the children since the reproductive value is an important indicator of the child's ability to transmit parental alleles.
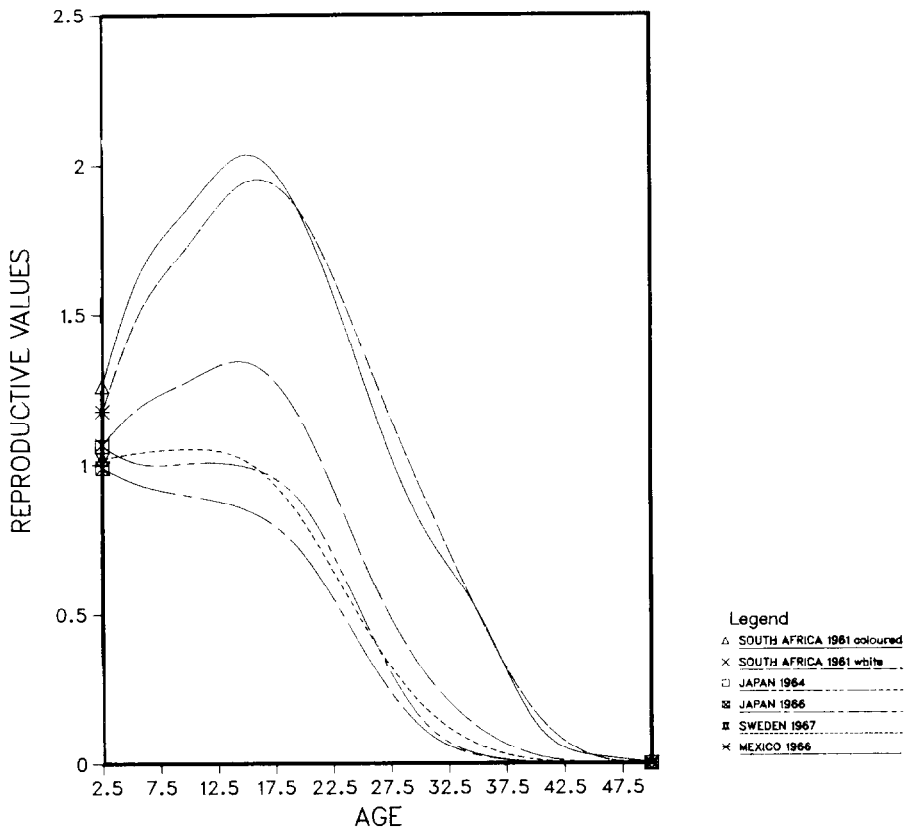
FIGURE 1. Reproductive value curves for several industrialized and developing nations. The data are plotted from the computations of Keyfitz and Flieger (1971).

2. The correlation between the intensity of grief experienced at the death of children of different ages will be more highly correlated with the reproductive value of the children than with the age of the children since reproductive value is a better indicator of the ability to transmit alleles than is age.
3. The correlation between the intensity of grief experienced at the death of children and the reproductive value of children will be greater for female than for male parents because the minimal parental investment required for a female to replace a child is greater than the minimal investment required for a male to replace a child.

These predictions were tested by assessing the intensity of grief that subjects expect parents to experience at the death of children of different reproductive values.

METHOD

Thurstone's (Guilford 1954) method of comparative judgment was used to study the intensity of grief that subjects of different ages expect parents to

feel at the death of male or female children varying from 1 day to 50 years of age. The method produces an equal interval scale when applied to data generated from a comparison of all pairs of a set of stimuli. Ten different ages (1 day; 1, 2, 6, 10, 13, 17, 20, 30, 50 years) were chosen to provide a reasonable coverage of the normal range of reproductive values typical of an industrial society.

We formed two stimuli sets: One for male children and one for female children and subjects were randomly assigned to one of the stimulus sets. The subjects were told that two daughters or two sons had both died in an automobile accident, that they were not the same age and that, although the parents experienced a sense of loss for both children, it might be greater for one or the other of the two children. Subjects were asked to indicate whether parents would experience a greater sense of loss for child "A" or child "B". We did not explicitly ask the raters to identify with a male or female parent when completing the questionnaire, but assumed that female raters would implicitly identify with female parents and male raters would identify with male parents.

We administered the scales to 436 subjects from the population of Simon Fraser University and from off-campus senior citizen's centers in Vancouver, British Columbia. We constructed a matrix containing the proportions of the time each age stimulus was judged as producing more grief than the other age stimuli. The proportions were converted to standard normal deviate scores and the columns summed to obtain the scaled scores. Negative scale values were eliminated by adding the absolute value of the largest negative column sum to each of the values (See Guilford 1954 or Nunnally 1978 for a full treatment of this method of scaling stimuli).

We computed reproductive values for 1-year intervals for males and females for the Province of British Columbia using 1981 Canada Census data. In order to make the grief and reproductive value curves comparable, we rescaled the grief curves so that each one would have the same maximum value as the corresponding reproductive value curve. Product moment correlation was used to analyze the data.

RESULTS

The reproductive value curves for males and females for the Province of British Columbia[1] are plotted against age in Figure 2. Pooled grief values for sons and daughters are also plotted for these same ages. The reproductive value curve computed for the !Kung Bushman from Howell's (1979) data are also included on this figure to facilitate comparisons with a reproductive value curve that might have been characteristic of our Pleistocene ancestors.

Correlations between the intensity of grief expected by male and female

[1] Census data for 1-year intervals for males and females for the Province of British Columbia were provided courtesy of Statistics Canada and are available from the senior author.
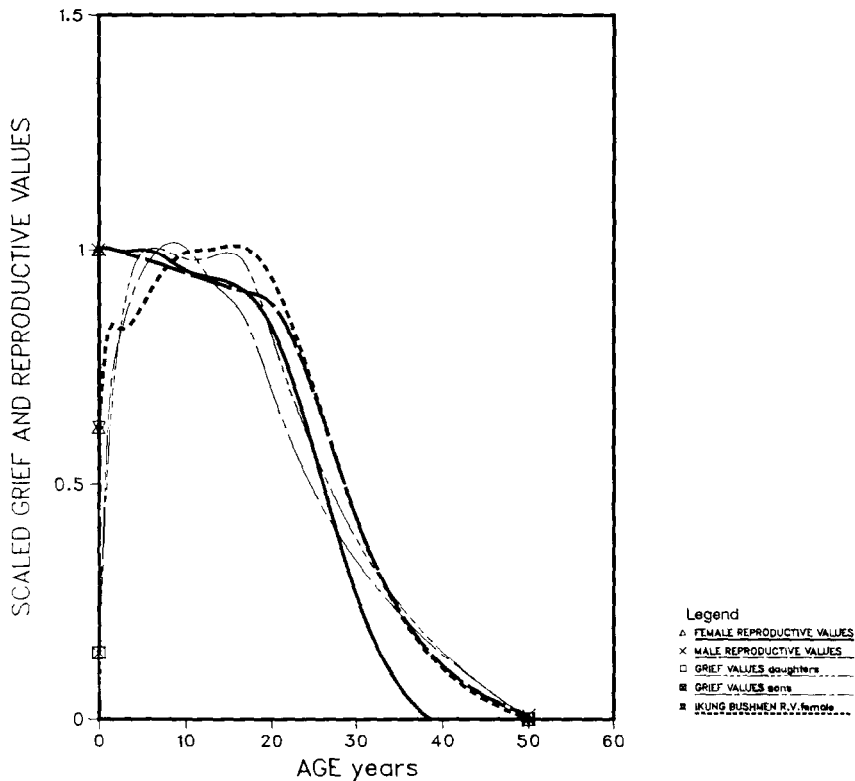
FIGURE 2. Reproductive values for males and females based on British Columbia 1981 census data and data for female !Kung Bushmen (Howell 1979) and rescaled grief values for deceased daughters and sons stimulus conditions plotted as function of age.

raters at peak-reproductive value (15–25 years of age), moderate-reproductive value (26–50 years of age), and low-reproductive value (50 years and older) with both reproductive value and age of deceased are given in table 1. Table 2 contains the correlations between expected grief values and reproductive values for !Kung Bushmen. For the British Columbia data, grief values for males were correlated with male reproductive values, and female grief values were correlated with female reproductive values. Because only female reproductive values were available for !Kung Bushman, the grief scores for both male and female offspring were correlated with female reproductive values. The correlations are based on the ten age groups, which were not a random sample of the population of ages.

Note that if the correlations were tested, the degrees of freedom would be (the number of ages − 2) = 8, not (the number of subjects − 2) as is usually the case when testing correlations for significance. Moreover, the generalization would be to the population of ages from which the ten ages were systematically chosen, not to the populations from which the subjects were sampled.

Table 1. Correlations Between Reproductive Value (R/value), Age, and Grief Ratings for Male and Female Raters of High, Moderate, and Low Reproductive Value[a]

Reproductive Value of Raters	Male Raters of Grief for					
	Sons		Daughters		Mean	
	R/value	Age	R/value	Age	R/value	Age
High (15–25 yrs)	0.73	0.57	0.55	0.30	0.64	0.44
N[a]	65		31		96	
Moderate (26–50 yrs)	0.79	0.65	0.40	0.43	0.60	0.54
N	38		43		81	
Low (50+ yrs)	0.77	0.66	0.40	0.20	0.59	0.43
N	15		23		38	
Means	0.76	0.63	0.45	0.31	0.61	0.47
N	118		97		215	

Reproductive Value of Raters	Female Raters of Grief for					
	Sons		Daughters		Mean	
	R/value	Age	R/value	Age	R/value	Age
High (15–25 yrs)	0.73	0.54	0.67	0.46	0.70	0.50
N	31		47		78	
Moderate (26–50 yrs)	0.91	0.79	0.75	0.29	0.83	0.54
N	50		42		92	
Low (50+ yrs)	0.56	0.41	0.46	0.29	0.51	0.35
N	22		29		51	
Means	0.73	0.58	0.63	0.35	0.68	0.47
N	103		118		221	

[a] The sample sizes cannot be used for statistical tests for generalizing to individuals not included in the study because the correlations were computed for ages not individuals. The Ns are provided to indicate that the study was based on reasonable samples of individuals, and, thus, that similar results would likely be obtained if the study were replicated.

Table 2. Correlations Between Reproductive Value of !Kung San and Grief Ratings for Male and Female Raters of High-, Declining-, and Low-Reproductive Value[a]

Reproductive Value of Raters	Male Raters of Grief for		
	Sons	Daughters	Mean
High (15–25 yrs)	0.91	0.85	0.88
Moderate (26–50 yrs)	0.93	0.92	0.93
Low (50+ yrs)	0.88	0.74	0.81
Means	0.92	0.84	0.88

Reproductive Value of Raters	Female Raters of Grief for		
	Sons	Daughters	Mean
High (15–25 yrs)	0.93	0.91	0.92
Moderate (26–50 yrs)	0.96	0.93	0.95
Low (50+ yrs)	0.93	0.75	0.84
Means	0.94	0.96	0.95

[a] The sample sizes are the same as in Table 1.

Therefore, the correlations were not tested for statistical significance and were treated as purely quantitative measures of the similarity of the grief and reproductive value curves for the subjects tested. However, the sample sizes are provided in the table to give the reader some indication of the stability of the correlations.

An inspection of the reproductive value and grief curves and the correlations between these curves indicates that there is considerable support for prediction 1. The grief and reproductive value curves in Figure 2 are very similar. The pooled correlation between the grief values and the reproductive values computed from British Columbia census data is 0.64. However, the pooled correlation between the grief values and the !King Bushman reproductive values is 0.92. The intensity of expected grief is much more highly correlated with the reproductive value of the !Kung Bushmen than with that characteristic of a modern industrial society.

The data in Table 1 also provide support for prediction 2, that the correlation between the grief values and the reproductive values would be greater that the correlation between the grief values and the ages of deceased children. For all comparisons the grief-reproductive value correlations were greater than the grief-age correlations. For the British Columbia data, the mean correlation of grief and reproductive value was 0.64, while the mean correlation for grief and age was 0.47.

There was little support for the prediction that the intensity of expected grief would be more highly correlated with reproductive value of children for female than for male raters of parental grief. For the British Columbia reproductive values, the average correlation for female raters for both sons and daughters was 0.68 while the correlation for males was 0.61. For the !Kung Bushman reproductive value curve, the average for females was 0.95 and the average for males was 0.88. Although the differences in the correlations are in the direction of the prediction, they are not large enough to provide much confidence in it.

The information in Table 1 also indicates that grief is more highly correlated with reproductive value of sons than daughters when reproductive values are computed for British Columbia data. This tendency is stronger for male than for female raters. For male raters, the correlations for sons and daughters are, respectively, 0.76 and 0.45, while for female raters they are 0.73 and 63. No consistent trends emerge when the data are broken down by age of raters.

DISCUSSION

The results of this study do not provide information on the amount of grief that parents feel for offspring. They bear only on whether the grief that is felt reflects the reproductive value of the deceased children. The fact that male ratings of grief correlate higher with reproductive value of sons than

of daughters does not mean that males grieve more for sons. Moreover, the grief ratings are not actual assessments of the intensity of grief, as were those in Littlefield and Rushton's (1986) study, but are measures of how much the subjects expected parents to grieve over the loss of children of different ages. Thus, the validity of this study depends on the assumption that the subjects empathized with the situations described in the questionnaire. The variation in the correlations between grief and reproductive value for the different conditions suggests that it holds for this study.

Since the correlations could not be tested for statistical significance, the generalizability of the results to individuals not included in the study requires discussion. The reproductive values are population values. Although some measurement error may be associated with them, the data are not affected by sampling error. The grief values are not population values. However, the Thurstone scaling procedure gives highly replicatable results (Guilford 1954). We thus believe that very similar results would be obtained if the study were replicated on a different sample of individuals.

Both the reproductive values computed from contemporary demographic data and those computed on the basis of the population statistics for our Pleistocene ancestors are of interest when comparing reproductive value and the intensity of grief. The finding that the intensity of grief is more highly correlated with reproductive values for a population similar to our ancestors (here estimated from vital statistics for !Kung Bushwomen) than reproductive values for a contemporary industrial society suggests that a certain amount of "hard-wiring" may influence our reactions to the death of children of different ages.

The prediction that the intensity of expected grief would be more highly correlated with reproductive value of children for female than for male parents (prediction 3) was not supported. For humans the sex difference in minimum parental investment required to bring an offspring to independence (assumed in making prediction 3) may not be large enough to produce detectable sex differences in our grief measures.

There was no consistent relationship between the reproductive value of the raters and the correlations between reproductive value and intensity of grief. Cohort effects may have obscured this relationship. The questionnaire appeared quite innocuous to young subjects. However, older subjects often had difficulty completing it or where unable to complete it, because of their strong emotional responses to it. Thus, the data from the older subjects may not be entirely representative of the responses of older subjects because those with stronger emotional responses may be the ones that were unable to complete the questionnaire.

We do not have a good explanation of why grief and reproductive value of the deceased are more highly correlated for sons than for daughters and why this tendency is stronger for male than for female raters. Is it possible that since male reproductive success varies more than female reproductive success, information about the likelihood of a particular male's reproductive

success is more relevant to the griever's fitness than is information about a particular female's reproductive success and, hence, that this information is more valuable to male than to female grievers, and that it influenced the grief ratings?

There are other possible explanations for these results. For example, frequency of association might explain them. The raters of grief could have assumed that parents will feel more grief over children with whom they frequently associate. Such an assumption could have caused them to downgrade the amount of expected grief at the death of middle-aged and older children. However, frequency of association would not explain the sharp upswing in the grief curves that occurs right after birth because there is a high level of association between parents and infants. Comparing the amount of grief expected in parents of adopted-away biological children and home-reared biological children could provide information on the importance of association in determining the intensity of grief expected at the death of children differing in age.

In conclusion, this study provides considerable support for the notion that the intensity of parental grief at the death of children of different ages is a reflection of the reproductive value of the children. However, the relation between the intensity of expected grief was more highly correlated with a reproductive value curve characteristic of our hunter gatherer ancestors than one characteristic of a modern industrial society. These results suggest that ancestral reproductive value may be an important independent variable, that it deserves further study, and that it should be included in studies where the relationships between age and dependent variables are of interest.

Finally, although these results are consistent with Bowlby's (1960) argument that the emotional substrate of grief is part of the inherited behavior repertoire of man, they do not provide strong support for it because they do not provide evidence on the function that grief might have served in an ancestral population (Williams 1966). Further research is needed to address this question.

The results, however, are not silent on the issue of the evolutionary significance of grief. Reproductive value is a fundamental measure of fitness. If it had not correlated with the intensity of expected grief, the results would have provided evidence against Bowlby's statement.

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