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A Life Course Perspective on Childhood Cheerfulness and Its Relation to Mortality Risk

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Under some conditions, cheerfulness promotes health, but cheerfulness also has been associated with unfavorable health outcomes. This study follows up the inverse relation between childhood cheerfulness and longevity found among 1,215 men and women first assessed as children by Lewis Terman in 1922. Risky hobbies, smoking, drinking, and obesity, as well as cause of death, are examined, along with adulthood personality and adjustment. Several hypotheses about mediating variables can be eliminated by these analyses; these data do hint, however, that cheerful children grow up to be more careless about their health. Although correlational and survival analyses suggest that health behaviors play a role, they are unable to explain the observed cheerfulness-mortality link, thus supporting the idea that cheerfulness is multifaceted and should not be assumed to be related to health in a simple manner.

Common lore has it that cheerful people are happy, healthy, and perhaps even wise. But what exactly does it mean to be cheerful, and is such a demeanor related to physical health? A careful reading of the psychological literature on this topic reveals many contradictory notions. Furthermore, findings from the longest longitudinal study to ever address the question suggest that cheerfulness can be related to longevity, but not in the way most people would think. A prospective life-span[1] study by Friedman et al. (1993) found that increased mortality risk, certainly an important health indicator, was positively associated with ratings of childhood cheerfulness. That is, children who were rated by their parents and teachers as more cheerful/optimistic, and as having a sense of humor, died earlier than those who were less cheerful. This finding is provocative because it so clearly opposes popular wisdom and appears to also contradict much, although not all, of the empirical literature on the relationship between positive attitudinal/emotional characteristics and physical health. To make sense of this intriguing finding, we must first address the construct itself and then examine the pathways through which this association might occur.

The construct labeled cheerfulness is a combination of two items: (a) cheerfulness/optimism and (b) sense of humor (see Friedman et al., 1993, for description of the factor analysis that produced this dimension). In the 1920s, the child's parent(s) or teacher (in most cases both parent and teacher) rated the child on an 11-point scale as to the degree to which she or he possessed each of these characteristics (see Method section). Our measure of cheerfulness is thus a combination of the perceptions of close adults regarding a child's cheerfulness, optimism, and sense of humor. Ratings by knowledgeable others are recognized as one of the most valid assessments of personality (Funder, 1991).

The cheerfulness construct, and others derived from archival data, are meaningful and replicable today. To evaluate its validity, the 1920s questionnaire from which it was created, along with the NEO PI-R, were administered to the parents of 167 California children in 1995 (Martin, 1996; Martin & Friedman, 2000) and the archival items were then subjected to careful scrutiny, including (a) correlational comparisons of the archival versus contemporary responses; (b) tests of measurement invariance; and (c) rational analyses of items according to the five-factor model of personality, conducted by trained judges. These analyses demonstrated that adult raters understood and responded to the items similarly in 1922 and 1995.

Framed according to a five-factor model of personality, childhood cheerfulness correlates moderately, $r(167) = .31$, $p < .001$, and significantly with childhood agreeableness, as measured by Costa and McCrae's (1992) NEO PI-R, but does not correlate significantly with any of the other Big Five personality dimensions (Martin & Friedman, 2000).[2] Cheerfulness in childhood is most strongly associated with the trust ($r = .40$) and straightforwardness ($r = .41$) facets of agreeableness and rather weakly, but still significantly, associated with modesty ($r = .15$). Correlations with the other facets of agreeableness are as follows: altruism ($r = .24$), compliance ($r = .31$), and tender-mindedness ($r = .23$).

Although there is certainly some overlap between cheerfulness and other key constructs such as happiness and dispositional optimism, they do not appear to be equivalent. Dispositional optimism is generally defined as the tendency to expect good or positive outcomes in one's future (e.g., Scheier & Carver, 1985, 1992). Accordingly, optimism functions as a self-regulating mechanism, with optimistic people more likely to persevere toward a goal (Carver & Scheier, 1981). A related construct is that of unrealistic or illusory optimism, in which the individual is overly inclined to expect positive future outcomes, even in the face of contrary evidence (e.g., Taylor, 1983; Weinstein, 1984). Happiness, sometimes referred to as life satisfaction or subjective well-being, is fairly stable over time, despite changing life circumstances (Diener, 1994). Self-other agreement is generally high, with those who say they are happy also judged by others as happy (Sandvik, Diener, & Seidlitz, 1993), although people who are satisfied and content with their lives are not necessarily unusually cheerful or highly optimistic (Lyubomirsky, 2001). In our current study, the item reflecting cheerfulness and optimism has at its positive pole the following description: "Extraordinarily cheerful and optimistic. Never sees dark side. Never worries" and at its negative pole the following description: "Usually extremely depressed and pessimistic. Looks on dark side of everything. Worries constantly." Thus, this item includes some element of dispositional optimism but captures more of the emotional happiness than the perseverance. The degree to which our cheerfulness measure taps into unrealistic optimism is not clear but will be investigated by looking at some behavioral correlates.

Good humor or having a sense of humor is also often viewed as a healthy characteristic because it is thought to ward off or reduce stress. In our study, the item assessing sense of humor has at its positive pole the following description: "Extraordinarily keen sense of humor. Witty. Appreciates jokes. Sees the funny side of everything" and at its negative pole the following: "Extremely lacking in sense of humor. Serious and prosy. Never sees the funny side." Although positive emotions are generally viewed as being good for physical health (Cohen & Rodriguez, 1995; Herbert & Cohen, 1993; Salovey, Rothman, Detweiler, & Steward, 2000), it is not always clear that having a sense of humor means that one is usually feeling positive, as many dark satirists can confirm. Humor has been conceptualized as a mechanism for coping with stress (Dixon, 1980; Martin & Lefcourt, 1983) and also has been linked (as a protective factor) to burnout and physical illness symptoms (Fry, 1995). However, there are inconsistent results, such as Rotton's (1992) finding that individuals with a good sense of humor do not live any longer (or shorter) lives than those who are more sober.

In terms of health associations, dispositional optimism, the more cognitive construct, has been associated with fewer symptom reports, better self-care, faster recovery times following surgery, and effective coping in the short term (e.g., Aspinwall & Taylor, 1992; Carver et al., 1994; Fry, 1995; Helgeson & Fritz, 1999; Scheier & Carver, 1985; Scheier et al., 1999; Taylor et al., 1992), although some researchers fail to find any effects of optimism on health-related behaviors or outcomes (e.g., Fontaine & Cheskin, 1999; Lai, Hamid, & Cheng, 1999; Scioli et al., 1997). When individuals are overly optimistic about their levels of risk, they are more likely to neglect important health behaviors (e.g., Bauman &

Siegel, 1987; Jones, 1990; Schwarzer, 1994; Weinstein, 1982); again, not all researchers find this effect (e.g., Taylor et al., 1992; Van der Velde, Hooykaas, & Van der Plight, 1992).

The importance of happiness, optimism, cheerfulness, and positive emotions is central to current thinking in health psychology, and yet these constructs are not well understood outside of a simple reliance on self-report measures. The idea that cheerfulness might not be positive, or in fact might even be harmful across long periods of time, is counterintuitive. Yet, despite the tendency to view cheerfulness as a health-promoting factor, no empirical studies examined the life-long association between cheerfulness and mortality risk until 1993 when Friedman and his colleagues published their surprising findings that increased mortality risk was positively associated with ratings of childhood cheerfulness. The purpose of this follow-up is to better understand the reasons for this association.

Personality factors may be related to physical health in several different ways (e.g., Contrada & Guyll, 2001; Martin & Friedman, 2001). Bio-behavioral models postulate that personality is linked to health through health-related behaviors. In terms of our hypotheses, this type of model predicts that more cheerful children might have poorer health behaviors, perhaps because they are less concerned about things that could go wrong with their bodies (Hypothesis 1). They may tend to smoke and drink more, thinking that their own risk for contracting associated diseases (such as cancer or cirrhosis) is low, or they might fail to take precautions (such as wearing seatbelts) and instead engage in more high-risk activities (such as hunting or flying small planes).

Psychophysiological models posit that physical health may be influenced by individual differences in typical bodily responses to environmental stressors. In terms of our hypotheses, this type of model would suggest that more cheerful individuals might be less emotionally prepared to deal with life's difficulties. Everyone experiences life stress, but individuals who have never seriously considered such possibilities may have no framework in which to deal with setbacks, obstacles, or disappointments. This "Pollyanna-like" attitude (Matlin & Gawron, 1979) may lead, through one or more pathways, to negative health outcomes. If this is the case, adult psychological adjustment should be negatively related to childhood cheerfulness, indicating a decreased ability to adapt among those with unrealistically high levels of cheerfulness (Hypothesis 2a). In addition, this kind of model suggests that cheerful children who later experience more hardships would be at greater risk than cheerful kids who experience fewer life difficulties, that is, an interaction effect (Hypothesis 2b).

A third hypothesis is that children who appeared more cheerful were, in fact, masking underlying psychological or emotional difficulties. Thus, their high ratings on cheerfulness (made by parents and teachers) might indicate a lack of stable positive emotion and optimism rather than distinguishing them as psychologically healthy. Such children might be cutups or smart alecks. Although this hypothesis cannot be fully addressed with the available data, an inverse association between childhood cheerfulness and adult adjustment might indicate masking instead of (as in Hypothesis 2) a transition from cheerful adjustment in childhood toward poorer adjustment following life's hardships. We also might find hints regarding this hypothesis in the adult (this time, self-reported) personalities of these children. These individuals may report lower levels of agreeableness, conscientiousness, and extraversion, along with higher levels of neuroticism, regardless of their appearing cheerful to others (Hypothesis 3).

To examine these hypotheses, cheerfulness, mortality risk, cause of death, and the possible mediating variables were examined within the prospective cohort (Terman data set) that yielded the initial finding of a relationship between cheerfulness and earlier mortality risk. Given the variety of theories and findings, these issues have significant theoretical importance and, in light of popular efforts to encourage people to be cheerful and think positively, there is significant practical import.

METHOD

Participants

The data employed were obtained in part from the Terman Life-Cycle Study that was begun in 1921-1922 by Lewis Terman (Terman et al., 1925; Terman & Oden, 1947) and for which data are still being collected. The Terman study includes 1,528 participants, both men and women, who have been followed up every 5 to 10 years. Most participants were recruited from schools in California after being identified by their teachers as gifted. All participants had IQ scores of at least 135 and most were from middle-class families and White. Because the original goal was not to conduct a longitudinal study of the effects of personality on health and longevity, this prospective study offers a rich data source free from several common sources of bias. The reverse side of this coin is that data were not collected on everything that is of interest to researchers today. Nonetheless, the data are abundant, with more than 4,000 variables and a time frame that spans more than seven decades.

In keeping with the criteria for inclusion in the previous study (Friedman et al., 1993), those not of school age at the time of initial data collection (i.e., participants not born between 1904-1915 inclusive) were excluded ($N =$

155). Participants who died before 1950 were excluded because some of the behavioral information was not collected until 1950, and those lost to follow-up before 1950 also were eliminated ($N = 112$). Last, individuals who were missing all of the childhood personality data were excluded, leaving a final sample size of 1,215. The mean date of birth was 1910 ($SD = 4$ years). Deaths were predicted from 1950 through 1986 to remain consistent with the Friedman et al. (1993) report, although a check on all analyses also was done using deaths through 1991, with consistent findings. Of the sample, 34% ($N = 419$) died between 1950 and 1986 with date of death known. Of the remaining, 84% ($N = 796$) participated in the 1982 or later waves of data collection.

Measures

Childhood cheerfulness. The measure of cheerfulness employed in this study is the same as that used by Friedman et al. (1993). The personality scales reported in the 1993 paper were created by first selecting variables from the data set, which, based on theoretical considerations, were expected to be indicative of underlying personality traits. Items with little variation or excessive missing data were eliminated, intercorrelations among variables were examined, and a factor analysis was conducted. The dimension called cheerfulness is a combination of two items measuring (a) cheerfulness/optimism and (b) sense of humor. The child's parents or teacher (and in most cases there was both a parent and teacher rating) rated the child on an 11-point scale as to the degree to which he or she possessed each of these traits. Participants who were missing more than two of these four (parent and teacher, on optimism/cheerfulness and humor) ratings were not given a cheerfulness score. For those who were missing one or two of the ratings, missing values were replaced with the group mean for that rating.[3] The scale was then formed by summing the standardized scores for each of the four ratings (two from parent, two from teacher). Cronbach's alpha for this four-item scale was .52, which is generally considered acceptable for a short scale such as this (e.g., Briggs & Cheek, 1986).

Despite the fact that the cheerfulness construct was sufficiently robust to predict mortality (Friedman et al., 1993), the alpha reliability reflects the fact that agreement between parent and teacher ratings is often imperfect (Achenbach, McConaughy, & Howell, 1987; Gagnon, Vitaro, & Tremblay, 1992). (For each of the two individual items, parent-teacher correlations were .14, both ps < .001.) The correlation between the two items (cheerfulness/optimism and humor), when rated by parents, was .36 ($p < .001$) and, when rated by teachers, was .48 ($p < .001$). The two items were comparable in their ability to singly predict mortality risk (relative hazard [rh] both items = 1.22; rh cheerful/optimistic = 1.13; rh humor = 1.12).

Childhood cheerfulness is uncorrelated with cumulative level of education as of 1950 ($r = .01$, *ns*).

Cause of death. To follow up on the 1993 study, cause of death data were obtained from death certificates, most of which we gathered. A certified nosologist, supervised by our research team's physician, coded each certificate for underlying cause of death using the 9th revision of the International Classification of Diseases (ICD-9, 1980). In cases where we were unable to obtain a death certificate ($N = 81$), information from next of kin was used (where available) by our physician to classify deaths into the following categories: cardiovascular disease, cancer, accident/injury, other, and unknown.

Alcohol use. Alcohol use was self-reported in both 1950 and 1960. At each time we classified participants as *never drinks or only rarely* (1), *drinks moderately (never or seldom intoxicated)* (2), and heavier drinker (3). (The original coding for this variable included four options; our 3 is comprised of the originally coded *fairly heavy drinker* and *alcohol is a serious problem.*) Either the 1950 or 1960 rating, whichever indicated the heavier drinking, was used to indicate the level of alcohol consumption for each participant (the correlation between drinking in 1950 and in 1960 was .60, $p < .001$). This variable was chosen for its relevance to Hypothesis 1.

Smoking. Although Terman did not collect information on the smoking behavior of his participants, we collected retrospective self-report data on smoking in 1991-1992. If the individual had died, next of kin were asked to report on his or her smoking behavior. Based on whether the participant had smoked, how long she or he smoked, and the average number of cigarettes smoked per day during the time she or he smoked, number of pack-years smoked was computed for each respondent: (Years Smoked × Cigarettes Per Day)/20. The number of pack-years ranged from 0 (*never smoked*) to 180. The subsample of individuals for whom data on smoking was obtained is somewhat biased. Because these data were collected in 1991-1992, individuals who had died earlier were not able to respond and their relatives were less likely to be locatable (79% of the participants for whom we obtained smoking information were still alive, compared with only 48% for whom we were unable to obtain this information). Thus, those on whom we have smoking data lived longer. This variable also was selected because of its relevance to Hypothesis 1.

Obesity. Participants reported their height and weight in 1940. This self-report information was used to calculate body mass index (BMI = weight in kg/height in m²). As with the previous two variables, BMI was selected for its relevance to Hypothesis 1.

Risky hobbies. Between 1922 and 1940, participants were asked at several different times to report their leisure activities and hobbies. These questions were open-ended and we compiled a comprehensive list of all activities/hobbies mentioned. All activities were then independently rated by two trained coders on a 6-point scale (1 = *little or no risk involved* to 6 = *much risk involved*) (unadjusted interrater correlation = .79). Hobbies coded as 1 (*little or no risk involved*) were things such as sewing, reading, and listening to music, whereas activities coded as 6 (*much risk involved*) were responses such as aviation and hunting. Although occupations also were rated, virtually no one had an occupation that could be classified as risky; therefore, occupations were not analyzed. The coders' ratings were then averaged to obtain a separate physical risk score for each activity. Activities with physical risk scores of at least 5.5 were labeled risky. Participants were then divided into two groups: (a) those who reported engaging in at least one risky activity (N = 154) and (2) those who reported no such activities (N = 1,061). This variable was selected for its relevance to Hypothesis 1.

Adult adjustment and mental health. In 1950, participants reported on aspects of their own personalities. They were asked to rate themselves, using an 11-point scale, on various traits and characteristics. A measure of adult psychological adjustment was constructed by combining six of these items (Tucker, 1993). The items included in this scale were (a) happiness of temperament, (b) self-confidence, (c) easy to get along with, (d) moodiness (reverse-coded), (e) feelings of inferiority (reverse-coded), and (f) sensitive feelings (reverse-coded). The alpha reliability for this scale is 0.73 and higher scores on this scale indicate better adjustment.

Also in 1950, Terman and his colleagues classified participants into one of three categories (satisfactory adjustment, some maladjustment, or serious maladjustment) based on interviews and on their responses to queries in 1936, 1940, 1945, and 1950. Satisfactorily adjusted individuals were those viewed as typical in terms of their emotional makeup, whereas those with some maladjustment were considered functional although they had experienced (or were experiencing) significant feelings of inadequacy, anxiety, or emotional conflict. Those with serious maladjustment had experienced a nervous breakdown, shown evidence of psychopathic personality, or demonstrated marked depression or anxiety. This mental health variable has been shown to predict earlier mortality, particularly for men (Martin et al., 1995).

On theoretical grounds, a single item indicating a carefree attitude (measured in 1940) also was examined in relation to the childhood measure of cheerfulness. The wording of the item was as follows: "Are you the care-free sort who never worried over possible misfortunes?" and although only this single item was available, it was considered potentially important because it captures the essence of an individual who believes that everything will work out fine in the end and thus has no worries–no cares. These mental health and adjustment variables were assessed because of their relevance to Hypotheses 2a and 3.

Interaction of cheerfulness with life's hardships. At the 1950 assessment, participants reported on their marital status and history and provided information about accomplishments and misfortunes, both personal and familial. Questions regarding marital status and family deaths were straightforward (i.e., "Offspring: . . . " "If not living, age at death"). Indicators of misfortune were taken from open-ended questions in which participants were queried as to the "special accomplishments, activities, honors, or misfortunes . . . in last few years" for themselves and significant family members. From the available data we selected indicators of hardship: (a) misfortunes experienced by spouse, (b) death of offspring, (c) other deaths in the family, (d) misfortunes experienced by participant's mother, (e) misfortunes experienced by participant's father, and (f) misfortunes experienced by participant's sibling(s). (Note that the experience of parental divorce during childhood and one's own marital history have both been shown to be unrelated to childhood cheerfulness in previous studies of this sample; Schwartz et al., 1995; Tucker, Friedman, Wingard, & Schwartz, 1996.) Participants were given one point for each hardship mentioned, creating a scale that ranged from 0 (*no major hardship experienced*) to 9 (*extensive hardship experienced*). This scale was then used to create an interaction variable, reflecting the interaction between level of childhood cheerfulness and later life hardship, as is relevant to Hypothesis 2b.

Adult personality. The personality traits of neuroticism, extraversion, agreeableness, and conscientiousness were assessed in adulthood using data collected in 1940 (Martin & Friedman, 2000). In 1940, participants answered 53 items selected by Terman from the Bernreuter Personality Inventory (Bernreuter, 1933) and completed 14 self-ratings on aspects of their personalities. An exploratory factor analysis with these items showed five factors and a principal factor analysis for a five-factor model yielded four conceptually sound factors. Scales were then created by summing standardized scores for the items comprising each scale and adding a constant to eliminate negative values. These four scales were validated (Martin & Friedman, 2000) using both rational analyses and empirical comparisons with neuroticism, extraversion, agreeableness, and conscientiousness as measured by the NEO PI-R (Costa & McCrae, 1992).

These scales were then labeled as follows: neuroticism (Cronbach's α = .85), extraversion (Cronbach's α = .65), agreeableness (Cronbach's α = .72), and conscientiousness (Cronbach's α = .65). These variables were included because of their relevance to Hypothesis 3.

Statistical Analyses

Correlations were first used to explore the association of cheerfulness with behavioral and dispositional measures. When studying associations between psychological variables and health behaviors or longevity in a long-term, prospective study, large effects are typically in the $r = .20$ range and small but significant effects are in the $r = .05$ range. Even these small effects can have important public health implications (depending on the marginals or proportions) and are comparable, in terms of application, to risk ratios of 0.80 or effects commonly reported as "20% reduction in risk" and so on (Rosenthal, 1991).

Consistent with other papers emerging from the larger project, proportional hazards regressions, which assess mortality rate while accounting for age, were then used to test the effects of the predictors on longevity and cause of death and to determine the explanatory power of each potential mediating variable (e.g., Friedman et al., 1995; Tucker et al., 1996, 1997). For each of these proposed mediating variables, we looked for interactive effects with gender and found no interaction. The commonly used Cox model makes no assumptions about the shape of the survival curve but does assume that the ratio of the hazard functions for participants with different values of the covariates does not vary with age (time) and, therefore, that the effects of the covariates on the hazard rates can be expressed as a log-linear function. The Gompertz model assumes that the risk of death at any particular time (as described by the hazard function) can be represented by an exponential function that includes age and this model is therefore better able to determine whether the predictor is weaker or stronger at different ages. In this article, we present results from the Gompertz model, and in each case, we have replicated the analysis using the Cox model. Tuma's (1980) RATE program was used to conduct all survival analyses.

RESULTS

Correlations of Cheerfulness With Potential Mediators

Consistent with Hypothesis 1, analyses indicated that children higher on cheerfulness grew up to drink more alcohol, $r(1,137) = .07$, $p < .01$, smoke more cigarettes, $r(688) = .19$, $p < .001$, and engage in more risky hobbies and activities, $r(1,214) = .07$, $p < .01$, suggesting these as possible mediators of the cheerfulness-mortality associa-

TABLE 1:   Frequencies and Percentages of Deaths by Cause, as of 1986

	Total Sample		High- Cheerful		Low- Cheerful		Risk Ratio
Alive	796	(65)	387	(64)	409	(67)	
Dead	419	(34)	221	(36)	198	(33)	1.18
Causes							
Cardiovascular disease	141	(12)	69	(11)	72	(12)	0.99
Cancer	144	(12)	72	(12)	72	(12)	1.07
Accident/injury	31	(2)	18	(3)	13	(2)	1.43
Other causes	69	(6)	38	(6)	31	(5)	1.30
Unknown causes	34	(3)	24	(4)	10	(2)	2.55*

NOTE: $N = 1,215$. Risk ratios (proportional hazards) are risks associated with being high-cheerful versus low-cheerful (determined by median split) for each cause of death, individually, controlling for sex and age. Percentages are in parentheses.
*$p < .05$.

tion. Childhood cheerfulness was not associated with adult obesity, $r(1,043) = .03$, ns.

Childhood cheerfulness was positively associated with adult adjustment, $r(970) = .09$, $p < .01$[4] and there was no relationship between cheerfulness and cumulative mental health problems in 1950, $r(1,103) = .00$, ns. Cheerful children grew up to be somewhat more carefree, $r(1,049) = .06$, $p < .05$. These correlational results disconfirm the hypothesis that more cheerful individuals might be at increased risk for early mortality because they are more poorly adjusted later in life (Hypothesis 2).

Childhood cheerfulness was not related to adult agreeableness ($r = .04$, ns) and was only marginally (and inversely) associated with adult neuroticism ($r = -.05$, $p < .07$). Slightly larger associations were seen with adult extraversion ($r = .07$, $p < .02$) and adult conscientiousness ($r = -.07$, $p < .03$). These results, combined with the positive association of cheerfulness to adult adjustment, suggest that cheerful behavior in childhood as a mask for underlying psychological problems (Hypothesis 3) is unlikely.

Cause of Death

In this sample, through 1986, 141 individuals (12%) died from cardiovascular disease (CVD), 144 (12%) from cancers, 31 (2%) from injury, 69 (6%) from other causes, and 34 (3%) from unknown causes. As can be seen in Table 1, the differences between the percentages, when comparing causes of death for those scoring above versus below the median on cheerfulness, are generally small, although larger for injury and deaths from unknown causes, which may include a substantial number of unverified suicides. Because of the relatively smaller numbers of individuals dying of these causes, however, these differences are not statistically significant in the Gompertz models, presented next.

TABLE 2: Goodness of Fit for Three Gompertz Models Predicting Cause Specific Mortality From Sex and Childhood Cheerfulness (deaths through 1986)

Statistical Fit

Model	Chi-Square	df	Probability
Model 1, predicting mortality from sex	282.65	10	*p* < .001
Model 2, predicting mortality from sex and cheerfulness, constraining effect of cheerfulness to be equal across all causes of death	287.68	11	*p* < .001
Model 3, predicting mortality from sex and cheerfulness, not constraining effect of cheerfulness to be equal across all causes of death	291.03	15	*p* < .001
Model 2 vs. Model 1	5.03	1	*p* < .05
Model 3 vs. Model 1	8.38	5	*ns*
Model 3 vs. Model 2	3.35	4	*ns*

NOTE: *N* = 1,215.

Survival analyses, which take age at death into account as the preceding descriptive statistics do not, were employed to determine whether cheerfulness is differentially related to particular causes of death. Table 2 gives the relative statistical fit of Gompertz models predicting mortality from sex and childhood cheerfulness. Model 1 predicts mortality from sex alone. Model 2 predicts mortality from sex and cheerfulness but is statistically constrained such that cheerfulness predicts equally to all causes of death. Model 3 also predicts mortality from sex and cheerfulness but does not constrain the effect of cheerfulness. Comparing Models 1 and 2 shows the value of adding cheerfulness as a predictor. The change in chi-squares from Model 1 to Model 2 is 5.03 (change in *df* = 1, *p* < .05), indicating that adding cheerfulness to the equation significantly improves the fit of the model. A comparison of Models 2 and 3 shows that childhood cheerfulness predicts equally well to all causes of death. The change in chi-squares from Model 2 to Model 3 is 3.35 (change in *df* = 4), which is not statistically significant. Thus, cheerful children grew up to be more likely to die in any given year but not more likely to die of any particular cause.

Hypothesis 1: Health Behaviors

Alcohol consumption. Because alcohol consumption was found to correlate with cheerfulness, a proportional hazards regression analysis was used to predict mortality from sex, cheerfulness, and alcohol use. These results are presented in Table 3. Model 1 contains the parameter estimates for an equation that includes only the effects of sex and childhood cheerfulness. The continuous-time hazard function indicates how the log of the

TABLE 3: Gompertz Models Predicting Mortality From Sex, Childhood Cheerfulness, and Alcohol Consumption

Variable		Model 1	Model 2
Sex (M = 0, F = 1)	b	–0.32**	–0.27*
	rh	0.72	0.76
Cheerfulness	b	0.19*	0.18*
	rh	1.21	1.20
Alcohol	b		0.21**
	rh		1.23

NOTE: *N* = 1,091. The relative hazard (rh) associated with cheerfulness compares those at the 75th percentile with those at the 25th percentile. The relative hazard for alcohol is associated with a 1-point change on that scale. M = male, F = female.
*p < .05. **p < .01.

instantaneous rate at which death occurs is related to various predictors; the relative hazard (rh) indicates the estimated ratio of risks for individuals who differ on a particular predictor. We see in Model 1 that the risk associated with cheerfulness is significant (rh = 1.21), indicating that those at the 75th percentile of cheerfulness are estimated to be 21% more likely to die at any given time than are those at the 25th percentile. (Note that survival analyses employ the entire sample, but because the resulting relative hazard describes the risk associated with a single point change on the cheerfulness scale, quartile comparisons are used to make interpretation clearer.) In Model 2, alcohol consumption is added to the regression equation and the effect of cheerfulness on mortality risk decreases slightly. The fact that cheerfulness remains a significant predictor indicates that the cheerfulness-longevity link cannot be explained by alcohol-related behavior, despite significant associations between alcohol and cheerfulness and alcohol and mortality. In addition, although moderate alcohol use has sometimes been shown to be protective, no such curvilinear effect was found when we used dummy coding to compare those who rarely or never drank to those with moderate or with heavy drinking habits. Because the alcohol index was defined as either alcohol use reported in 1950 or 1960 (whichever indicated heavier drinking) and deaths were predicted from 1950 on, an additional survival analysis was conducted using an alcohol index that refers only to usage in 1950. In this analysis, the sample size decreased (*N* = 1,102) but the effect of cheerfulness remained identical when alcohol was controlled (rh = 1.20, *p* < .05), although the effect of alcohol itself was greater (rh = 1.52, *p* < .001).

Smoking. Next, a proportional hazards regression analysis was used to predict mortality from sex, cheerfulness, and smoking. Within this smaller and biased subsample (*N* = 689), neither cheerfulness nor sex is a significant predictor of earlier mortality. Smoking behavior, however, is a strong predictor of mortality in

this subsample for whom we have smoking information (rh = 1.29, $p < .001$). The failure to find relationships of sex and cheerfulness with longevity in this subsample is not necessarily surprising. Many more individuals in this subsample were alive in 1991 to respond to the questionnaire. That is, this group of respondents lived longer and thus are biased with respect to the outcome measure (death). The fact that smoking behavior is able to predict even within this longer-living subsample speaks to its importance; the fact that even such a well-established predictor as sex fails to predict makes the failure of cheerfulness to predict questionable. By 1986, 79% of those in the subsample for whom we obtained smoking information were still alive, compared with only 48% of those whose smoking information was unavailable. To clarify the differences between these two groups (those with and without smoking data), two t tests were conducted. First, the two groups were compared on childhood cheerfulness. Second, the two groups were compared on alcohol consumption. Those without smoking information were significantly higher on childhood cheerfulness, $t(1, 214) = 2.21$, $p < .03$, and consumed significantly more alcohol, $t(1, 137) = 3.68$, $p < .001$. Although we do not have smoking information for these individuals, they seem to fit our hypothesized pattern of cheerful disregard for health, as evidenced by their drinking. In addition, smoking and drinking are correlated, $r(648) = .39$, $p < .001$, in this sample and so it is certainly possible that these individuals also smoked more heavily and that this contributed, in part, to their earlier mortality.

Risky hobbies. Although correlations indicate that cheerful children grew up to engage in more risky hobbies and activities than did those with low cheerfulness, this behavior did not predict earlier mortality (rh = 0.76, *ns*). Additional analyses indicate that individuals who reported engaging in risky hobbies were not significantly more likely to die from injury.

Hypotheses 2a and 2b: Adult Adjustment and Cheerfulness × Hardship Interactions

Individuals rated higher on childhood cheerfulness reported better adjustment and being more carefree in adulthood than those who were less cheerful as children, and neither of these factors was a risk factor for earlier mortality. Thus, childhood cheerfulness seemed not to identify a decreased ability to adapt. In our sample, childhood cheerfulness also was unrelated to later experience of mental health problems (see also Martin et al., 1995). It remained possible, however, that an interaction between childhood cheerfulness and life's later hardships might exist, explaining the association between cheerfulness and lifetime mortality risk. That is, cheerful children might be less prepared for life's hardships;

therefore, cheerful children who later experienced substantial hardship might be at increased risk for early mortality while cheerful children whose lives were easier might not experience greater risk. We tested this hypothesis by conducting a survival analysis in which both childhood cheerfulness and the cheerfulness by hardship interaction were entered as predictor variables. In this equation, the main effect for cheerfulness remained statistically significant but the interaction did not add to the explanatory power of the model. Thus, an additive model remained more parsimonious and appropriate for explaining these data.

Hypothesis 3: Masking

We had posited, in our third hypothesis, that outwardly visible signs of cheerfulness in childhood might indicate a masking of underlying characteristics that are detrimental to physical health and which become evident later in life—a portion of this hypothesis was addressed by the analyses for Hypothesis 2a (adult adjustment and mental health) and no evidence for it was found.

In terms of adult, self-reported personality, lower levels of neuroticism were associated with childhood cheerfulness; other analyses (Martin & Friedman, 2000) have shown adulthood neuroticism to be unrelated to mortality risk in this sample. Adult agreeableness was not associated with childhood cheerfulness and extraversion, although associated with cheerfulness, was not linked to mortality risk. A small but significant inverse association was found between childhood cheerfulness and adulthood conscientiousness, and lower levels of conscientiousness in adulthood are predictive of earlier mortality (Martin & Friedman, 2000). In the subsample of individuals for whom we have both child and adult personality data, the effect of childhood cheerfulness on mortality was only marginally significant (rh = 1.15, $p < .08$, $n = 1,050$). When adult conscientiousness (rh = 0.83, $p < .03$) was entered into the equation, the effect of cheerfulness changed only slightly (to rh = 1.13). In all, our findings do not suggest that cheerful children are masking underlying psycho-emotional difficulties.

DISCUSSION

Longitudinal, life-span data permit a deep analysis of the competing theories regarding cheerfulness and health. Our goal was to explore potential mediating variables and cause of death in an effort to better understand the nature of the cheerfulness-mortality risk relationship. Given the existing literature, we hypothesized that this inverse relationship might be due to a more careless approach to health behaviors, regardless of coping influences, and that these tendencies might be exaggerated by a historical context in which drinking and

smoking were more fashionable than today. Indeed, it was shown that children who were reported to be especially cheerful in childhood grew up to smoke and drink more, and this indicated a pathway through which earlier death might come about. More extensive analyses, however, demonstrated that although these behaviors were related to the personality measure, they did not account for the relationship between cheerfulness and longevity within this sample. Controlling for alcohol use within the survival analysis did little to modify the effects of cheerfulness; in addition, because of the incomplete nature of the smoking data, we were unable to fully determine the effects of smoking, although smoking does seem relevant to the association. In other words, although more cheerful children did grow up to smoke and drink more heavily than those less cheerful, these behaviors cannot fully explain their relatively early deaths. As was previously noted, the smoking data were collected retrospectively (in 1991); therefore, smoking information was more often unavailable for those who died earlier. The data on alcohol consumption also were less precise than we would have preferred. It thus remains possible that better and more extensive measurement of various unhealthy behaviors might have provided an explanation of the cheerfulness effect, and this should be a focus of future research on other data sets.

Cheerful children's greater participation in risky hobbies later in life did not explain their earlier deaths. We initially hypothesized that having risky hobbies might be associated with more physical injuries and thus greater mortality risk. Cheerful children did not, however, experience significantly more injury deaths. In our sample, risky activities themselves were not associated with significantly more injury deaths, so the failure of childhood cheerfulness to differentially predict specific cause of death is not surprising. The finding that engaging in risky hobbies actually showed a trend toward an inverse (although nonsignificant) relation to earlier mortality might be explained by the fact that the higher risk activities were often those that required more physical exertion. This increased level of exercise may have proven beneficial in terms of physical health, outweighing any negative effects due to injury risk.

Children who were rated as cheerful in childhood grew up to report that they were better adjusted and more carefree in adulthood, as well as being more extraverted. Thus, it seems not to be the case that cheerful children are ending up emotionally unprepared for the rigors of life or that the early tendencies observed in them were merely a facade for already-present psychological difficulties. Based on the associations seen between childhood cheerfulness and adulthood characteristics, it seems likely that cheerful children grew up to

be cheerful adults (there is, for example, some content overlap between the childhood measure of cheerfulness and the adulthood measure of adjustment). This also would be consistent with literature suggesting that childhood personality and/or temperament are modestly associated with adulthood personality (e.g., Block, 1993; Caspi & Roberts, 2001; Caspi & Silva, 1995). The cheerfulness construct itself was not measured in adulthood, however, and so we cannot be certain.

The evidence reported here is consistent with the idea that cheerful children grow up to lead a somewhat less healthy life in terms of what they consume, although the consequent links to death are weak in these archival data. It is not the case that cheerful children are hiding psychological difficulties, and they are not more or less prone to such difficulties as adults.

It might be argued that the cheerfulness–earlier mortality link is mainly due to one of the components of cheerfulness—the humor, but this is not the case. Each of the items comprising the cheerfulness dimension was equally powerful in its ability to predict premature mortality. Nevertheless, although the associations between childhood cheerfulness and adult personality were here examined primarily in terms of a five-factor model, different models might provide more relevant perspectives on this construct. Goldberg (1993) suggests that personality scales, facets, and even items might be best understood as blends of two or more of the Big Five traits. Self-disclosure, one of the blended facets proposed by Goldberg (1999), contains several items that seem directly relevant to cheerfulness as measured in the Terman sample (e.g., "Laugh my way through life," "Express childlike joy," "Joke around a lot," "Like to amuse others"). This facet blends high extraversion with low conscientiousness, and the negative prospective relationship between childhood cheerfulness and adult conscientiousness suggests that perhaps cheerfulness should be viewed using a more complex framework than that provided by a five-factor model.

In all, it appears that the cheerfulness-longevity relationship does not manifest itself through any one obvious pathway. We were unable, with the available data, to explain fully the cheerfulness effect in terms of mediating variables. Many participants had data on only some of the health behaviors, which precluded us from developing a more complete model that included all health-related behaviors. By testing the mediators singly or in pairs, however, we were able to eliminate some of the possible explanatory mechanisms, thus narrowing the focal area for future research endeavors. We conclude that although optimism and positive emotions have been shown to have positive effects when people are faced with short-term crisis, the long-term effects of high levels of cheerfulness are more complex and seem

not entirely positive. In contrast with optimism, which is a more cognitive construct, and happiness, which has a strong perceived-emotional component, cheerfulness is a complex lifelong pattern that leads one in a number of directions, some of which seem to involve unhealthy habits. Concern about the life-long health of children who are low on cheerfulness is unwarranted at this time, and future efforts to untangle the complexity of the relationship will require more reliable and extensive data regarding health behaviors. The findings presented here highlight which are likely to be the most fruitful avenues for future research and direct us away from others that are less promising.

NOTES

1. This article is one of a series developed from our large-scale, multi-year, multidisciplinary project on psychosocial predictors of health and longevity. The data are partly derived from the Terman Life-Cycle Study archives and partly collected by us as a follow-up to Terman's study. All relevant findings are included in each manuscript to the extent feasible but multiple publication is necessitated by several factors: (a) the complexity and scope of analyses must be appropriate for the scope and space of the journal; (b) the project systematically followings up each set of major findings, and follow-ups cannot be planned or known in advance; and (c) the diversity of the relevant literatures and time frames precludes simple integration. Therefore, prior publications from our project are cited when appropriate, and care should be taken not to include overlapping findings in meta-analyses or other reviews. Note also that sample sizes change from paper to paper as old data are refined, new data are gathered, or time periods change. This article is a direct follow-up to Friedman et al. (1993) on childhood personality and longevity. These findings (cheerfulness predicts premature mortality) were so unexpected that substantial efforts were then applied to investigate likely mediators of this effect.

2. To determine whether cheerful/optimism and sense of humor were each related to Big Five factors in the same way, correlations were computed separately by item. Correlations with agreeableness were .30 and .31, respectively; no associations were found with other Big Five factors.

3. Although several methods for dealing with missing data exist, we selected mean replacement because it yields scales that are uncorrelated with the missing-data dichotomy, thus excluding the missing-data aspect from influencing other aspects in simultaneous analysis (Cohen & Cohen, 1983).

4. Because one of the adult adjustment items (happiness of temperament) had substantial overlap with an item from the cheerfulness scale, this correlation was replicated with a modified five-item scale that excluded happiness of temperament. Results were identical ($r = .09$, $p < .01$).

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