

# Heading for an early grave?

Anna C. Phillips and Douglas Carroll on stress, health and death

**Does psychological stress send us to an early grave? Although research shows links between stressful events and illness, there is conflicting evidence regarding the relationship between stress and mortality. Stress can be measured in different ways, and this has an important impact on the links between stress, health and death. In addition, it appears that stress is not always bad for our health. This has implications for the theoretical models and scientific methods we use in studying stress and its consequences.**

## questions

Are there other feasible ways of measuring stress that avoid the biases of traditional measures?

In mortality studies, could stress operate at an earlier level, leading to a burden of disease/health problems and, subsequently, death?

## resources

American Psychosomatic Society [www.psychosomatic.org](http://www.psychosomatic.org)  
International Society for Behavioral Medicine [www.isbm.info](http://www.isbm.info)  
Lovallo, W.R. (2005). *Stress and health: Biological and psychological interactions* (2nd edn). Thousand Oaks, CA: Sage.

Does psychological stress kill us? Many psychologists and much of the general public appear to believe so. However, epidemiologists and physicians remain sceptical. Certainly, there is ample evidence implicating stress in the development and progression of several different diseases. For example, in an experiment administering cold viruses nasally to quarantined participants, the degree of stress reported was related in a dose-response way to the incidence of colds contracted (Cohen et al., 1993). Further, in the INTERHEART study, individuals who had suffered a recent heart attack reported higher levels of stress in the previous year than age-matched controls who had not had a heart attack (Rosengren et al., 2004).

The mechanisms for these effects of stress on illness occurrence are likely to be via the impact that stress has on the specific bodily systems involved. For example, stressful life events have been shown to be related to a reduced ability of the immune system to produce antibodies following medical vaccinations even in

young healthy adults (Phillips et al., 2005).

However, counter evidence for a relationship between stress and ill health exists. For example, stress was not related to the occurrence of heart attacks or, indeed, death from heart attacks, in a large prospective epidemiological study of Scottish men (Macleod et al., 2002). These discrepancies in the literature may be a consequence of the differing ways in which stress is measured and when it is measured.

## What do we mean by psychological stress?

Two major approaches to measuring stress can be identified. The first measures individuals' perception of how stressful they regard their general life to be; for example, 'In the last month, how often have you felt nervous and stressed?' and 'In the last month, how often have you dealt with irritating life hassles?'. Although popular, such measures are susceptible to reporting bias, as a function of individual differences. For example, individuals may differ in such things as plaintive set and negative affectivity (i.e. the propensity to whinge or complain about one's life in general), which will be reflected in the answers to items on questionnaires. In addition, specific discourse patterns (i.e. contents of speech) have predominated at particular times in different parts of society (Heslop et al., 2001) and can impact on the responses to measures of perceived stress. In the early 1970s it is likely that for some particularly vulnerable groups, such as the working classes, stress was simply

**Discrepancies in evidence of a link to mortality may be a result of differing ways in which stress is measured**

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not part of their vocabulary. After all, this was the time when the concept of 'executive stress' had substantial currency (Brady, 1958). In addition, particular demographic groups, such as older adults, may be less used to identifying themselves as 'feeling stressed' due to having grown up in a period where stress was less talked about than it is today, which again will impact on questionnaire responses. It was this approach of asking about perceptions of stress that was used in the study of Scottish men described above (Macleod et al., 2002).

The second approach conceives of stress as exposure to life events presumed to be negative and undesirable (e.g. divorce, death of a close family member, sexual difficulties, job loss, financial problems). The number of such events experienced over a given period is assessed. Although this approach has a subjective component, it is less liable to reporting bias. However, a simple count of the number of events fails to recognise that some events are likely to have a greater impact than others. As a result, many such measures include some sort of weighting of the psychological impact of the event – in the development stage, large samples will have been used to generate average severity weightings to individual events, with higher weightings assigned to events considered more serious.

In addition, the same objective event can impact quite differently on different individuals, to the extent where certain events usually considered as negative may actually be perceived as positive by some individuals (e.g. divorce). For this reason, some stressful life events measures have included the opportunity for self-ratings of the severity or stressfulness of individual events in Likert scale format or similar. However, this again introduces a more subjective component subject to reporting bias.

Even taking into account severity weightings and stressfulness self-ratings, stressful life event measures struggle to include all of the features of psychological stress. For example, the perceived

controllability of an event will affect its impact and severity, yet this aspect has not been incorporated into existing life events measures. Further, life events can differ in the amount of change they precipitate, and it has been suggested that it is this feature of life change that is more important in terms of psychological stressfulness than the undesirability or negative nature of an event (Dohrenwend, 1973). It is worth noting that studies cited above that report a positive association between stress and ill health used stress measures that contained a negative life events component.

### Mixed findings

Despite these criticisms, stressful life events measures remain among the strongest feasible tools for assessing psychological stress impact. However, even with life events measures, the evidence for an association between stress and death remains mixed. For example, from a sample of 752 Swedish men, those who had experienced three or more stressful life events during the year prior to study entry were more likely to have died during the following seven years (Rosengren et al., 1993). In contrast, in a study of breast cancer in 673 women, stressful life events and their impact prior to diagnosis did not predict either all-cause or breast cancer-specific mortality during the seven years following diagnosis (Maunsell et al., 2001). Finally, in the largest study to date, of over 12,000 men from the Multiple Risk Factor Intervention Trial cohort, the number of life events during the previous year accumulated across five yearly assessment visits was negatively related to all-cause mortality, such that people who had accumulated more events were slightly less likely to have died during the six-year follow-up (Hollis et al., 1990).

### Making sense of it

What sense can we make of these conflicting findings? Again the issue of measurement arises. Stressful life events

## Definitions

**Chronic stress – severe and enduring stress generally lasting several days, weeks or months; e.g. severe life events like bereavement, and difficult personal circumstances like caregiving for a spouse with dementia.**

**Acute stress – short-term stress generally lasting minutes or hours; e.g. mental arithmetic tests in a laboratory, giving a lecture, watching England lose to Argentina on penalties.**

**Antibodies – proteins produced by white blood cells; their task is to circulate in the body and tag, destroy or neutralise bacteria, viruses or other harmful or foreign materials.**

include a whole variety of serious and less serious experiences that span a great number of domains, such as finance, relationships, bereavement and work. This makes it important to consider the consequences for mortality of events in different domains. With the exception of the two studies of healthy participants mentioned above (Hollis et al., 1990; Rosengren et al., 1993), most inventories of life events include items about health-related experiences (Dohrenwend et al., 1984), which, as well as being stressful, can indicate ill health. Clearly ill health would be expected to relate to an increased risk of death.

In our own recent study, we examined the overall influence of stressful life events, and the separate impact of health and other life events on mortality in community sample of 968 Glaswegian men and women (Phillips et al., 2008). Stressful life events over the previous two years and their psychological impact were assessed at baseline, 8/9 years and 12/13 years later. Mortality was tracked for 17

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years during which time 266 participants had died. We found that the frequency of life events and the stress load they imposed were associated with mortality. However, it was the health-related events that strongly predicted death, whereas the other health-unrelated events did not.

### End of story?

Can we resuscitate the psychological cadaver? There are two arguments stemming from our study of stressful life events and mortality which might indicate that we can. The first argument is that it is possible that health-related events, such as 'an operation' or 'a serious illness diagnosed', might be related to death because of their powerful psychological impact. Unfortunately, the results from our study argue against this because mortality was related to the number of health-related events as well as scores which took into account their psychological impact. The high numbers of health events endorsed by participants suggest the presence of serious illness. Further, health-related events were rated as less stressful and disruptive than non-health-related events. This suggests that health events are not affecting mortality through their high psychological stressfulness but that it was the illness they belie that was killing participants. The second argument is that it is possible that health-unrelated events only have their impact after health-related events have taken their toll. However, over 27 per cent of our sample had died during the 17 years of follow-up, a proportion exceeding that reported in other comparable studies. Nevertheless, a longer follow-up should shed some light on this issue and, in contrast to some populations, such as the Japanese (Marmot & Smith, 1989), the life expectancy in areas such as Glasgow will allow this. Either way, these results

highlight the importance of disaggregating these two classes of life events stress in studies of stress and health outcomes.

However, it may still not be the case that only health-related stressful life events are related to mortality. There is now evidence that certain types of life events, particularly natural and man-made disasters and cultural catastrophes, can precipitate acute illness and even sudden death. For example, increases in admissions to coronary care units and death from heart attacks have been recorded after earthquakes hit California, Greece and Japan (e.g. Katsouyanni et al., 1986). Similar effects have been found during military conflicts. For example, the number of heart attacks treated in Tel Aviv's main coronary care unit in late January 1991, the peak of the Iraqi Scud missile attacks on the city, was almost twice as high as normal (Meisel et al., 1991).

Now take the unlikely example of football: the day England lost in the

penalty shoot-out against Argentina (and the following two days) in the 1998 World Cup, emergency admissions to hospital in England for heart attack were 25 per cent above the levels observed on other control days (Carroll et al., 2002). Further, between 1995 and 1999, on days when the local professional football team lost at home, relative to days with other match outcomes, death from heart attacks and strokes was found to increase, again by 25 per cent, in men in the North East of England (Kirkup & Merrick, 2003). Taken together, it appears that certain types of short-term intense and distressing experiences may indeed have the capacity to kill us.

How might this happen? We are starting to unearth clues from laboratory studies of the effects of acute psychological stress on physiological systems. It has been appreciated for a long time that acute psychological stress, such as undertaking difficult mental arithmetic in conditions of time urgency

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Phillips, A.C., Burns, V.E., Carroll, D. et al. (2005). The association between life events, social support and antibody status following thymus-dependent and thymus-independent vaccinations in healthy young adults. *Brain, Behaviour and Immunity*, 19, 325-333.

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but it is health-related events that prove predictive. *British Journal of Health Psychology*, 13, 647-657.

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and social evaluation, increases blood pressure and cardiac activity way beyond what would be expected on the basis of the physical energy requirements of the stress task (see e.g. Carroll et al., in press). Our group has recently shown that such stress tasks also affect the consistency of the blood, making it thicker and stickier, and reducing the time it takes to clot (de Boer et al., 2007). It would seem that these are just the physiological conditions that would increase the likelihood of a heart attack or stroke in vulnerable individuals.

However, even the effects of such acute stress on health-related physiological mechanisms are more complicated than they appear at first sight. It may not be all bad news. Although acute intense stress affects the cardiovascular system in ways that may be injurious to health, its effects on the immune system may be beneficial. For example, our group has recently shown that exposure to the same or similar acute stress task to the one described above can have many different beneficial effects on the immune system, including enhancing the antibody response to an influenza vaccination (Edwards et al., 2006). Thus,

although catastrophes may make us more prone to acute cardiovascular events, they may help protect us from infectious disease. Finally, our research into the Glasgow sample has shown that those who show the greatest cardiovascular response to our acute stress task, while showing a greater rise in blood pressure over a five-year period, are less likely to be and become obese (Carroll et al., 2008) and are more likely to report good health.

### Taking the secret to the grave?

Clearly the effects of psychological stress on health and mortality are more complicated than the accounts provided by many of the theoretical models of stress that inform our present thinking on

the subject. On the basis of the current evidence, epidemiologists and physicians are right to remain cautious, and many psychologists may need to temper their assertions. However, research evidence is growing, hinting that stress and how we react to it physiologically can be both health injurious and health protective, depending on the nature of the stress and the biological system in question. New models of stress that incorporate this type of nuance and studies of stress that encompass both objective health outcomes, including death, and measures of potential underlying biological pathways are the challenges facing psychologists interested in the still-to-be-answered question of whether psychological stress can indeed lead to an early grave.



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