



A Review of the Relationship Between Psychosocial Stress and Chronic Disease for Indigenous and African American Peoples

Yin Paradies
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Executive Summary

Emerging international literature suggests that psychosocial stress is an important contributor to chronic diseases and there is a large volume of research investigating this topic. Minority groups are confronted by particular stressors as a result of their disadvantaged circumstances within societies. There is a dearth of research on the social and cultural context of stress for Indigenous peoples and hence this review sought to address two broad research questions:

What evidence is there linking psychosocial stress to the development of chronic disease or the complication of its management for Indigenous peoples? and

What psychosocial stress interventions have been attempted and what strategies have been effective in reducing the impact of stress on Indigenous peoples?

The review sought to describe the literature relevant to psychosocial stress and chronic disease for Indigenous peoples, identify efforts towards prevention or treatment of psychosocial stress, and management of stress for Indigenous peoples and disseminate the results to relevant services, policy makers and other organisations. The review was conducted primarily by searching available electronic databases using an iterative process that included items produced until the end of 2003. In total, approximately 4500 relevant works were located and examined by the author.

This report begins with a brief history of the concept of stress followed by a discussion of the modern landscape of stress research. The various theoretical models (stimulus, response or interactional), measurement approaches (life events/traumas, chronic stressors and daily hassles/uplifts) and disciplinary perspectives (biomedical, psychological and sociological) used in the study of stress are considered. This is followed by a critique of these approaches including a discussion of the meaning and role that stress plays in explaining health, the interplay between objectivity/subjectivity and individuals/society as well issues in the conceptualisation of 'stress'.

The review included studies of Indigenous people and African Americans. A total of 47 studies examining the relationship between stress and were included in the review. Of these, 13 were conducted with Indigenous populations (6 in Australia) and the remaining 34 with African Americans. The latter studies were included because African-Americans experience social contexts within a first world nation which are comparable in many ways to Indigenous peoples and because considerable research has been conducted with this group. Ten of the studies were qualitative with the majority being quantitative cross-sectional (30 studies) and longitudinal studies (7 studies). Findings indicate that a range of poor health outcomes were associated with stress for Indigenous peoples and/or African Americans, including psychological distress, depression, anxiety, suicidal ideation and reduced self-esteem, hypertension, reduced immune function, diabetes, hyperglycemia, heart disease, cholesterol levels and artery thickness, pre-term birth, drug misuse, and cigarette smoking. Active problem-focused responses to stress, social

support, hardiness and religiosity acted as stress buffers for Indigenous peoples and/or African Americans while identified stress exacerbators included neuroticism, substance misuse and experiences of racism.

Sixteen intervention studies were included in this review. Six were randomized controlled trials, one was a retrospective cohort study and the remaining nine were demonstration studies. Eleven involved African Americans, four Indigenous Australians and one Native Americans. Intervention activities included transcendental meditation, progressive muscle relaxation, focused support groups, empowerment programs, yoga and aerobics, biofeedback relaxation, psychoeducational group experience and stress reduction workshops. These interventions were associated with improved outcomes such as decreased over-all and cardiovascular mortality, artery thickness, blood pressure, heart rate and cardiac output, depression, neuroticism and sleep dysfunction as well as increased energy, general mental health and health locus of control.

Based on the review, there are a number of promising interventions that may be appropriate for the Australian Indigenous context. Existing programs designed specifically for Indigenous Australians should be adapted to include transcendental meditation techniques as well as group-oriented stress management and empowerment programs. These programs should be provided through both existing mainstream providers and the social & emotional well-being centres of Aboriginal Community-Controlled Health Services. In order to maximise their effectiveness in reducing the relative burden of chronic disease for Indigenous Australians, interventions should take into account pertinent theoretical issues in the conceptualisation and measurement of stress.

Section 1: Introduction

There has been increasing interest in and evidence of social determinants of health within the field of public health (Berkman & Kawachi 2000; Evans et al. 1994; Leon & Walt 2001; Majer & Saper 2000; Marmot & Wilkinson 1999). Within this field, two broad categories of socioeconomic factors can be defined. The first are structural/material determinants, including accessibility of health related infrastructure (water supply and quality, sewerage systems, roads, health services), level of income, level of education and level of employment (Marmot & Feeney 2000). The second category can be described as 'psychosocial' factors, including status in a social hierarchy, stress, self esteem, degree of social support and social exclusion (Glover et al. 1999).

The significance of psychosocial factors was recently illustrated by the 'Whitehall I' and 'Whitehall II' studies conducted among civil servants in the UK (Marmot et al. 1991). These studies demonstrated that the lower the relative income or social status, the higher the likelihood of disease (Marmot et al. 1991; Marmot & Feeney 2000). This trend, described as the "social health gradient", is not a new concept and had previously been attributed, primarily, to material determinants of health. The Whitehall studies, however, suggest that psychosocial factors such as the 'control factor' (i.e. the extent to which people have control over their lives and life choices) has a larger impact on health than previously acknowledged (Carroll et al. 2001; Hemingway et al. 2001; Marmot & Feeney 2000; Marmot & Wilkinson 1999; Marmot et al. 1991; Singh-Manoux et al. 2003).

The impact of the 'control factor' has been demonstrated in other studies around the world (Evans et al. 1994). This factor, however, is only one component of a range of inter-connected psychosocial factors that can contribute to poor health in general and to chronic diseases in particular. Emerging international literature suggests that psychosocial stress, while related to the control factor, is in itself an independent contributor to chronic diseases (Avison & Gotlib 1994; Brunner 1997; Brunner & Marmot 1999; Cassidy 1999) and there is huge volume of research investigating this topic. In the early years of the 21st century alone there have been over 60,000 articles indexed in PubMed with the term 'stress'.

Apart from stress associated with socioeconomic status, there is increasing evidence to show that 'minority groups' are confronted by particular stressors, the result of being "disadvantaged by sociopolitical and economic burdens imposed by a controlling population" (Mino et al. 2000:771). This includes stress due to racism and other forms of discrimination (Krieger et al. 1993; Krieger 1999; Williams et al. 2003). Much of the research on minority group stress, largely conducted in the US, has sought to examine the link between stress and the social and cultural context of individual and families (Dressler 2000). In Australia, there is evidence that the effects of stress are trans-generational (Raphael et al. 1998; Atkinson 2002) but there is a dearth of research on the social and cultural context of stress as experienced by Indigenous Australians.

In addition to identifying causes of and responses to stress, current literature also highlights the importance of coping mechanisms or 'resistance resources' for dealing with stress and its impacts (Dressler 2000). Resistance resources range from personal attributes (such as high self esteem and positiveness) to the availability of community or social networks (Holahan et al. 2000). Research in the United States and elsewhere has suggested that empowerment programs for individuals and communities to develop resistance resources have protected against ill health and chronic diseases in particular (Hetherington & Blechman 1996).

This area of inquiry has also been identified as significant in the local Australian policy context. The landmark 'Royal Commission into Aboriginal Deaths in Custody' (Johnston 1991) emphasised the importance of addressing stress and empowerment to improve the health status of Indigenous Australians. Social and Emotional Wellbeing Centres have been established in 11 Aboriginal Medical Services across Australia, in recognition of the importance of mental health and community wellbeing in determining Indigenous peoples' health. Given the limited documented evidence (particularly in Australia) but the increasing demand for research in this area, it is timely that a review of the current international and national social science and medical literature on stress and chronic disease be conducted.

Section 2: Aims and Methods

This review sought to address two broad research questions:

What evidence is there linking psychosocial stress to the development of chronic disease or the complication of its management for Indigenous peoples?

What psychosocial stress interventions have been attempted and what strategies have been effective for Indigenous peoples?

In accordance with these aims the review had three main objectives:

Describe international and national literature relevant to psychosocial stress and chronic disease for Indigenous peoples.

Identify programs, projects and research that have been proposed and/or trialed to prevent or treat psychosocial stress and management of stress in relevant populations.

Disseminate the results of the review to relevant services, policy makers and other organisations.

The review was conducted primarily by searching available electronic databases using PubMed, Ovid and Silverplatter as well as the World Wide Web, Indigenous Health *Infonet*, Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Library and National Health and Medical Research Council list of projects. Databases searched included CDSR, ACP Journal Club, DARE, CCTR, CINAHL, MEDLINE, SIAL, PsychINFO, ATSIHealth, Web of Science, Art Index, Humanities Index, ILRS, Social Work Abstracts, EconLit, The Philosopher's Index and Cambridge Scientific Abstracts Internet Database. The key words and Boolean operators used in searching these databases were based on a recent review in this area (Bunker et al. 2003) and Medline MeSH terms (see Table 1 below).

Indigenous peoples were defined as fourth world populations.¹ In addition, African-Americans were included in the review as these populations experience similar social contexts within a first world nation, and because considerable research has been conducted with this group. 'Chronic disease' was defined broadly as non-acute illnesses and conditions, including mental illness, drug and alcohol misuse, and chronic infectious diseases.

¹ Defined as situations in which a minority Indigenous population exists in a nation wherein institutionalized power and privilege are held by a colonizing, subordinating majority (O'Neil 1986 quoted in Walters & Simoni 2002)

An iterative process of examining the article titles, abstracts, and full text was conducted whereby articles were excluded if the study:

- population was not Indigenous or African-American²;
- related to physical/ physiological stress or sports science;
- did not directly relate to stress in some form as an exposure;
- did not directly relate to health in some form as an outcome;
- was not available in English.

The review includes published and unpublished items produced until the end of 2003. In total, approximately 4500 journal articles, monographs and conference abstracts were located and examined by the author using the above criteria. The review also included communication with relevant experts in the field, an advertisement on the Australian Public Health Association e-mail distribution list and manual searching of bibliographies.

Table 1: Terms used to search electronic databases

Chronic disease OR coronary heart disease OR coronary artery disease OR acute myocardial infarction OR sudden death OR ventricular fibrillation OR ventricular tachycardia OR mortality OR atherosclerosis OR atherogenesis OR ischaemic heart disease OR acute coronary syndrome OR diabetes OR renal disease OR mental health OR arthritis OR hypertension OR lipids OR HIV OR AIDS OR COPD OR Chronic Obstructive Pulmonary Disease OR emphysema OR Parkinson disease OR Alzheimer's disease OR epilepsy OR inflammatory bowel disease OR cirrhosis OR hepatitis OR leukaemia OR leukemia OR anaemia OR anemia or lupus AND
stress OR social stress OR psychosocial OR psychosocial stress OR psycho-social stress OR psychological stress OR psychological distress OR burnout OR depression OR anxiety OR hostility OR anger OR hopelessness OR helplessness OR vital exhaustion OR work stress OR job control OR Type A behaviour OR Type A behavior OR life events OR stressful events OR PTSD ³ AND
Aborigines OR aboriginal OR Aborigine OR Indigenous OR Indigenous Australians OR australoid OR australoid race OR Indians, north American OR north American Indians OR Eskimos OR maori OR Indians, central American OR central American Indians OR Negroid OR Negroid race OR AFRICAN AMERICANS OR inuit OR cree OR mulatto OR mestizo OR miao OR Indians, south American, OR south American Indians ⁴

The Indigenous Health *Infonet* and Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Library were also searched using the term 'stress' and the

² A number of studies of other ethnic minority groups were excluded from this review. This included studies of Hispanic-/Mexican-Americans (Amaro et al. 1987; Finch et al. 2001; Finch et al. 2001; Finch & Vega 2003; Salgado de Synder 1987), Filipino-Americans (Mossakowski 2003), Bangladeshi (MacCarthy & Craissati 1989), Pakistani (Husain et al. 1997), Samoans (Janes 1986) and Asian-American women (Iyer & Haslam 2003).

³ Terms in this paragraph were adapted from Bunker et al. 2003

⁴ Terms in this paragraph were adapted from Medline MeSH terms for these populations

National Health and Medical Research Council list of projects for 2003 was searched using the terms 'Indigenous' and 'stress' separately.

Section 3: Concepts, Models and Approaches

This section presents an overview of the conceptual, theoretical, and empirical underpinnings of research on stress and health. A comprehensive review of the findings from the stress and health literature more broadly is beyond the scope of this paper (and perhaps any paper) and has not been attempted. Rather the diversity of the relevant literature has been sampled to produce an overview of how research in this field is conducted as well as a discussion of possible directions for future approaches to studying stress and health.

A Brief History of Stress research

During the 17th century 'stress' was synonymous with notions such as "hardship, straits, adversity or affliction". This concept was strongly influenced throughout the 18th and 19th centuries towards the physical and came to mean a sense of "force, pressure, strain or strong effort" (Pollock 1988:384). This notion of 'stress' was adopted and refined in engineering and physics during the late 19th and early 20th centuries (Pollock 1988:384). In the 1920's Cannon carried out research into the physiological responses to emotional arousal. He introduced the concept of 'fight or flight' as an adaptive function of humans and suggested more speculatively that the physiological processes produced by this reaction were influenced by emotional states (Pollock 1988:384).

The first modern notion of stress was proposed by Selye in the 1950's based on the work of Cannon and others (Doublet 2000). The General Adaptation Syndrome (GAS) theory of Selye held that although change is a normal and inexorable feature of social life, all change is potentially harmful because all change requires (re)adjustment (Selye 1956).

This early conceptualisation of 'stress' contended that stress was a 'disease of adaptation'. Stressful events (stressors) were related to the individual's attempts to adjust himself/herself to the changing demands of his/her physical and social environments. There was a discernable relationship between the amount of change imposed on an individual and the extent to which (s)he was exposed to stress. Change per se was significant in the GAS model, not the value the individual places on it (Young 1980:140).

Stress in the GAS model is characterised by: (i) an alarm reaction where natural resistance is lowered, but body defences are mobilised; (ii) a resistance stage which leads to increased resistance and adaptation; and (iii) a final stage where the energy for adaptation is exhausted and collapse ensues (Mulhall 1996). Regardless of the stressor involved, stress itself as manifest in the GAS model is always non-specific in that it produces a particular set of systemic physiological responses as a result of the adaptive demands made upon the organism in every experience of 'stress' (Selye 1956).

Although in the GAS model stress can be good (eustress) or bad (distress), whether the stressors involved are pleasant or unpleasant was immaterial since what is relevant is the intensity of the demand for (re)adjustment and the identical physiological response that was elicited in each case. Therefore what determined whether a particular stressor resulted in eustress or distress, was entirely (and irrelevantly) subjective (Selye 1956).

It is only since the 1960's that the concept of stress, its relationship with ill health, and its ubiquitous presence in the world, have become firmly established in academic and lay discourses (Mulhall 1996; Pollock 1988:381). Stress, it has been suggested, is now a meta-concept which encompasses everything from behavioural events measured under controlled laboratory conditions, to subjective experiences of human unhappiness (Mulhall 1996).

Since the beginnings of stress research there have been four key re-orientations that have resulted in present day conceptualisations of 'stress': (i) from any type of 'stressors' to negative 'stressors'; (ii) from the 'objective' features of a situation to the 'subjective' impact; (iii) the addition of 'chronic stressors' and 'daily hassles' to 'life events' approaches; and (iv) the focus on 'buffers' which could reduce the health-damaging effects of stressors (Bartley et al. 1998:43). These developments and the modern landscape of stress research are discussed below.

Stress Concepts

In the past few decades there have been tens of thousands of articles published on stress and health (Aneshensel 1992:85; Thoits 1995:53). A plethora of disciplines including psychology, psychiatry, nursing, medicine, sociology, ergonomics, anthropology, pharmacology, physiology, and neurobiology have been involved in the study of 'stress' (Mulhall 1996). This has been accompanied by a profusion of different (and at times contradictory) definitions and models relating 'stress' to health.

Several authors contend that currently 'stress' has no agreed upon scientific definition and hence it is difficult to determine when the state of 'stress' exists and how to measure it when it does (Cohen, Kessler, & Gordon 1997; Hinkle 1987:561; Quick et al. 2001:147). The lack of a unifying definition across such diverse fields over several decades is not surprising but is nonetheless problematic given that issues of measurement remain a serious methodological challenge for researchers in this area.

'Stress' in the broadest sense refers to all physical, psychological or social phenomena that tax or exceed an organism in such a way that physical, psychological, or social change results. These changes are usually thought of as damaging, maladaptive or undesirable in some way. The 'stress' that causes heart disease in a physical (biochemical) sense through a constant and heavy dietary intake of saturated fats (Hinkle 1987:564) or the stress caused by running a marathon would be examples that utilise this broader conceptualisation.

However, in modern stress research, the strong physical and biological elements of the original GAS model have been superseded by heavily psychologised notions of stress. The critical factor has become the damage provoked by emotional arousal consequent to the experience of ‘stress’ (defined either ‘objectively’ or ‘subjectively’) (Pollock 1988:387; Aneshensel 1992:16). Although usually implicit, this approach assumes that stress is essentially synonymous with the emotional arousal resulting from a ‘stressor’ through a conscious or unconscious cognitive process (Young 1980:134; Bartley et al. 1998:48).

Domains of the stress process that have been the subject of research include:

- the exposure to, nature and meaning of stressors – defined as internal or external environmental ‘events’ or occurrences that are at least potentially causes of stress (Aneshensel 1992:16);
- the nature and distribution of stress mediators or moderators (buffers or exacerbators) – defined as factors which, under certain conditions, modify the process or relationship between stressors and health outcomes; and
- the physical, psychological, behavioural and sociological effects of, or responses to stress (Pearlin 1989:241).

Two different pathways from stress to ill-health are proposed: a direct effect on somatic health and disease development, and an indirect route, where stress is expressed through health-damaging behaviour(s) (Bartley et al. 1998:41).

In most modern stress research it is not change per se but the quality of change that is potentially damaging to people. Specifically, changes that are undesirable, unscheduled, non-normative, uncontrolled, and unpredictable are considered to be the most harmful (McQueen & Siegrist 1982:355; Pearlin 1989:244). In recent decades the concept of stress has been investigated from a number of disciplinary perspectives that fall broadly across the biomedical, psychological, and sociological domains and several different models (Mulhall 1996) and measurement approaches have been used. These can be summarised as shown in Table 2.

Table 2: Stress Paradigms

Models	Measurement Approaches	Disciplinary Perspectives
Stimulus-based	Life events/traumas	Biomedical
Response-based	Chronic stressors	Psychological
Interactional	Daily hassles/uplifts	Sociological

Models of Stress

Stress has been conceptualised in the literature as either a stimulus, a response or as a process combining both stimulus and response. All three of these models have been utilised in each of the disciplinary approaches whilst there has tended to be matching between particular models and measurement approaches.

Perhaps the most succinct criticism of stress research is that ‘stress in addition to being itself, and the result of itself, is also the cause of itself’ (Mulhall 1996). This confusion occurs when all three models are combined uncritically such that stress is at once a stimulus (the cause), response (the result) and process (itself). This is compounded by the fact that stress is aetiologically ambiguous in the sense that it can legitimately be both an input and an output (e.g. changes in eating or sleeping habits can be both a cause and result of stress) (Young 1980:140).

Examples of stress definitions that implicitly utilise these models are shown below:

- (i) The sum of biological and psychological disturbances (stimuli) caused by any aggression on an organism (Doublet 2000): stimulus-based
- (ii) The response of an organism to a noxious or threatening condition (Doublet 2000): response-based
- (iii) The process in which environmental demands tax or exceed the adaptive capacity of an organism (Cohen, Kessler, & Gordon 1997): interactional

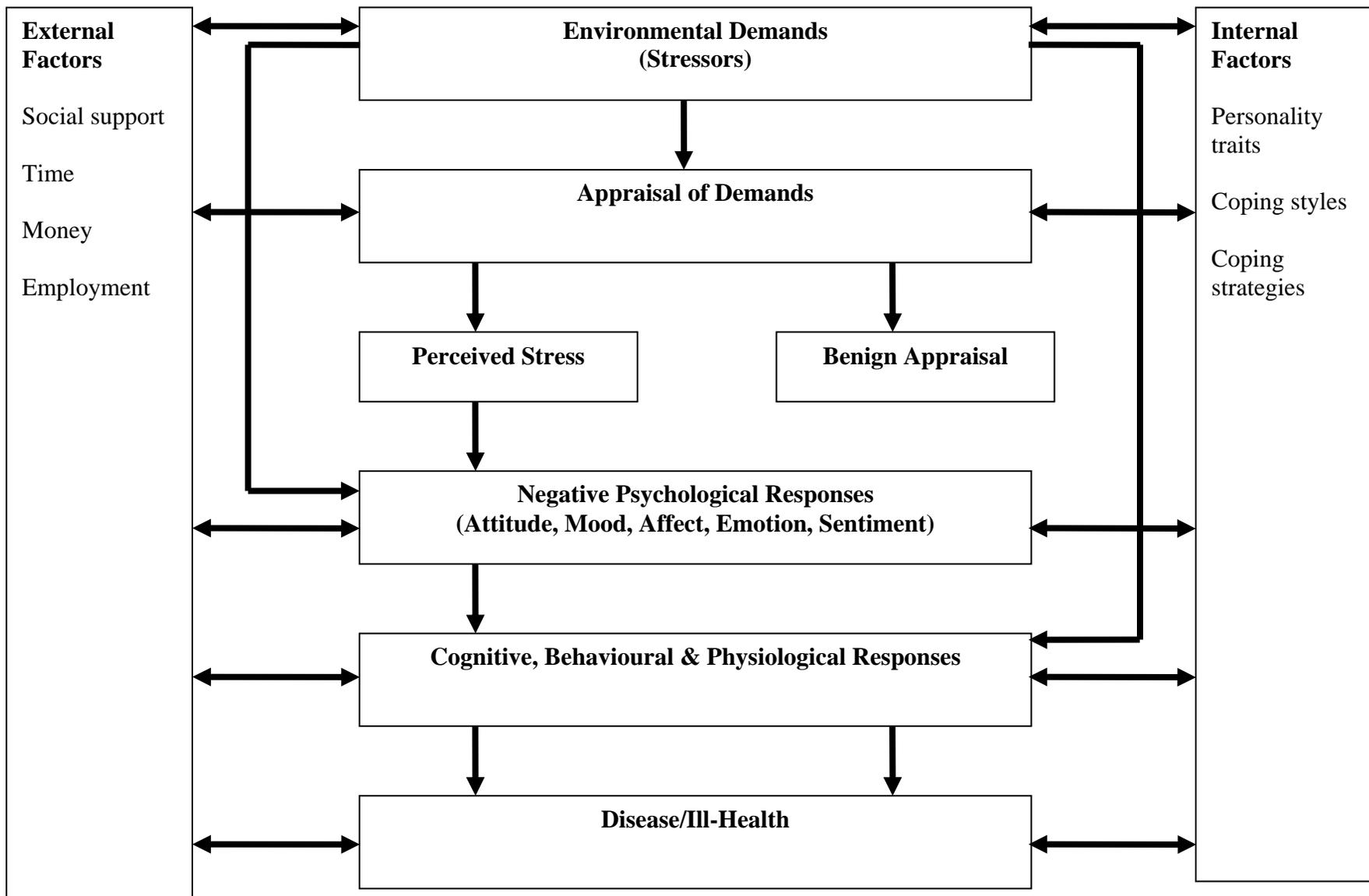
The stimulus-based or ‘objective stress’ model considers stress as an independent variable, that is, in terms of a causative stimulus. Stress is defined in terms of the disturbing environment or external stressors, and the important questions concern which particular conditions are stressful. This model associates stress with engineering where stress can be measured, and even the point of collapse recorded objectively. It shares much with the original GAS model proposed by Selye. The response-based or ‘subjective stress’ model conceptualises stress as a dependent variable realised by a person’s response to adverse effects. Stress here is defined as the response which an individual displays when stimulated by a stressor (Mulhall 1996).

The interactional model conjectures that stress is a lack of fit between the environment and person(s). In these terms stress comes between its antecedent factors and its effects. Stress is a dynamic system of interaction between person and environment that consists of an individual perceptual phenomenon stemming from the imbalance between demand on the individual and his/her ability to cope. Demand arises externally from the environment, and internally from inherent psychological and physiological needs. Central to this thesis are a cognitive appraisal of a putatively stressful situation, and a person’s capacity to cope both psychologically and/or physiologically.

The adoption of an interactional model of stress as a 'dynamic state of imbalance' has avoided many of the pitfalls associated with more reductionist thinking (Mulhall 1996). A recent example of an interactional model is the isomorphic theory of stress which looks for a one-to-one correspondence between the person and environment along the three dimensions of control, uncertainty, and personal relationships (Quick et al. 2001:148).

Figure 1 details a conceptual model of psychosocial stress as it relates to health outcomes, which integrates features of the models discussed above.

Figure 1: Model of Psychosocial Stress



Adapted from Cohen, Kessler, & Gordon 1997 and Taylor & Aspinwall 1996:98. Arrow from environmental demands to 'cognitive, behavioural & physiological responses' are based upon the stimulus or 'objective stress' model which bypasses appraisal and further 'subjective' processes.

Approaches to Stress Research

Different approaches to measuring stress in the literature include life events, chronic stressors, and daily hassles/uplifts. Life events are discrete, acute, observable events which require major behavioural readjustments within a relatively short period of time (e.g. birth of first child, divorce, death of a significant other) and are essentially self-limiting in nature (Wheaton 1999:283). Chronic stressors are relatively enduring, persistent or recurrent demands, conflicts, threats, or problems which require readjustments over prolonged periods of time (e.g. disabling injury, poverty, marital problems) (Aneshensel 1992:21). Hassles and uplifts are mini-events, which require small behavioural (re)adjustments during the course of the day (e.g. traffic jams and having a good meal respectively) (Thoits 1995:54). Most research attention has focused on life events and chronic stressors, with a more limited focus on daily hassles/uplifts (Taylor & Aspinwall 1996:91). There is also a small body of intervention research examining how to reduce stressors, alleviate stress or its effects, or some combination of these approaches.

Life events were among the earliest measures of stress and generally took the form of a checklist of events sampled from various domains across different hierarchies and weighted either by standardised importance of each event, subjectively by respondents or by more extensive contextual methods. The checklist aims to be a representative sample of the major events that occur in people's lives (Cohen et al. 1997). However there is some evidence that the universe of possible 'life events' has not been sampled uniformly (Wheaton 1994), with events occurring to young adults being over-sampled, while those occurring to women, minorities, and the poor being under-sampled. Hence conclusions about ethnic variation in exposure are contingent upon this limited universe of events (Aneshensel 1992:20). Traumatic events are a form of life events which are characterized by their suddenness and their extreme magnitude of impact. Their effects on health also tend to be persistent and responses to traumas may become fixed traits of personality for those exposed to them (Pearlin 1999:401) such as in the condition known as post-traumatic stress disorder.

There are several different types of chronic stressors including (i) frustration of role expectations and role overload; (ii) interpersonal conflicts within role sets; (iii) inter-role conflict; (iv) role captivity; (v) role restructuring; and (vi) ambient stressors (Pearlin 1989:245; Aneshensel 1992:21). Specifically chronic stressors could include barriers in the achievement of life goals; inequity in the form of inadequate rewards relative to invested effort or qualifications; status inconsistency (discrepancy between occupation and income); goal-striving stress (discrepancy between aspirations and achievements); life-style incongruity (consumption patterns and cosmopolitan behaviours inconsistent with social class); disjunction of economic goals and educational means; and social and economic hardship including poverty, crime, violence, overcrowding, noise and chronic disability (Aneshensel 1992:21). Chronic stressors can also include anticipated events which may cause anxiety, whether or not they actually occur (Pollock 1988:384) (see a discussion of 'non-events' below). Although the term 'trauma' is almost always associated with an event, chronic stressors may also be severe enough to be considered

‘traumatic’. It has been suggested, for example, that living in a violent neighbourhood should be considered as a distinct form of stress that could be labeled a ‘chronic traumatic stressor’ (Wheaton 1999:285).

Hassles are the irritating, frustrating, distressing demands that to some degree characterize everyday transactions with the environment (Kanner et al. 1981:3). Uplifts are the daily events that are satisfying, pleasing and relaxing such as receiving good news, the pleasure of a good night’s rest etc (Kanner et al. 1981:6). Both hassles and uplifts are usually measured with a checklist approach in broad domains, such as work, family, financial and personal/relationship, as well as types, such as achievement (e.g. exercise, workload) and interpersonal stressors (e.g. intimacy, social commitments). These items are also usually weighted by self-reported severity of the event. Hassles/uplifts can be considered as an intermediate position between chronic stressors and life events, being in a sense ‘recurrent microevents’ (Wheaton 1999:284) which may even mediate the relationship between these other two measurement approaches (Hewitt & Flett 1993; Weinberger et al. 1987).

Life events have traditionally been equated with objective, discrete events that are not the result of the individual’s psychological function (stimulus-based model) whilst chronic stressors, in contrast, are seen as subjective and influenced by emotional functioning (response-based model) (Aneshensel 1992:22). Although they are conceptually distinct both life events and chronic stressors are interrelated in that: (i) life events can lead to chronic stressors; (ii) chronic stressors can lead to life events; and (iii) chronic stressors and life events provide meaning and context for each other (Pearlin 1989:246).

Some researchers have argued for the concept of ‘operant stress’ which refers to a combination of recent and distal life events as well as chronic stressors that affect an individual at any one point in time (Turner et al. 1995). A similar concept is that of ‘cumulative stress’ which is the amalgamation of current stressors with previous significant traumas that continue to be sources of stress (Turner et al. 1995). A further aspect of the interplay between types of stressor is the notion of ‘stress sequences’ which attempt to place stress in a broader context. Examples of stress sequences that have been studied in relation to health include a chronic stressor followed by a life event in a particular role domain which has been found to increase emotional upset whilst a chronic stressor in a particular role (such as work) followed by role exit or role loss (such as being fired) may decrease emotional upset (Pearlin 1989:247; Thoits 1995:57). A related notion is that of ‘stress proliferation’ in which a ‘primary stressor’ leads to ‘secondary stressors’. For example, the loss of a loved one (a life event) may lead to social isolation (chronic stressor) (Pearlin 1999:403).

Stressors can also have ‘carry over’ effects where stress is translated between people (i.e. from wife to husband), across role domains (from work to home), and across stages of life (from childhood to adulthood) (Thoits 1995:57). It is also possible that some approaches to coping with stress for an individual may exacerbate the stress experienced by others in his/her social sphere (Pearlin 1999:407). There is also evidence to suggest that the relative impact of stressors may vary across the life course (Turner et al.

1995:114; Elder et al. 1996; McQueen & Siegrist 1982:358) and that both resources and adversity can accumulate over a lifetime to affect adult health in complex ways (Kuh & Ben-Shlomo 2004). Stressors may also act as mediators/moderators of the effects of other stressors, can act to mobilize coping resources or to deplete them, and can even deter the occurrence of certain other stressors (e.g. a single parent cannot experience marital conflict) (Wheaton 1996:57).

Some researchers have also considered the notion that ‘non-events’ may be a type of stressor in that the failure of an expected or desired outcome may be a source of stress (Pearlin 1999:401). However, as others have noted (Wheaton 1994), any non-event may just as easily be considered as an event in itself and hence this conceptual distinction would appear to have little analytical utility. A related concept is that of under-demand as a form of stress wherein an experience such as boredom is threatening because it is not stimulating enough (Wheaton 1996:42). Taking this into consideration it can be seen that stressors may constitute the presence of something ‘bad’, the absence of something ‘good’, or both (Aneshensel 1996:133).

Broadly, there are four major approaches to operationalising ‘meaning’ in the stress literature: (i) the process of ‘appraisal’ which determines whether a demand is perceived as a harm/loss, threat, or challenge, and/or controllable or not; (ii) considering a person’s biography, plans and purposes, sequences of events, and other surrounding contextual circumstances; (iii) ‘identity salience’ – the relevance of the role domain in which a stressor occurs, for a particular person; and (iv) ‘belief systems’ – examining how beliefs that individuals hold about the relationships among their roles influence the meanings they derive from role-related stressors (Thoits 1995:59). The process of appraisal can be further differentiated into primary and secondary appraisal. Primary appraisals involves the assessment of an environmental stimulus as stressful whereas secondary appraisal is the evaluation of whether or not the individual believes they can alleviate or eliminate the effects of the stimulus. This process involves the assessment of coping resources (Lazarus & Folkman 1984), which will be discussed below in the part on psychological perspectives.

Finally, stress intervention research has taken two main approaches. The first approach is the ecological stress perspective which focuses on changing the environment to better accommodate and reduce stress in individuals across three relevant dimensions: (i) control; (ii) uncertainty and (iii) social support. The second approach is the stress adaptation perspective which encourages the individual to adapt to the environment to reduce stress and focuses on three factors: (i) generalised expectancies of control; (ii) tolerance for ambiguity and (iii) self-reliance (Quick et al. 2001:148).

Disciplinary perspectives

Stress research has been undertaken from three main disciplinary perspectives – biomedical, psychological and sociological. Each of these approaches will be considered below.

Biomedical

Western biomedicine with its emphasis on the physiological body and disease has tended towards Selye's GAS model based on the physiological response of the body to any demand made upon it (Mulhall 1996). This has resulted in stressors being conceptualised in a broad sense in biomedical research compared to research utilising other disciplinary perspectives – in that concrete and observable phenomena such as microbial infections, trauma, toxins, heat or cold or internal conditions such as stroke, vascular occlusion or hemorrhage can be considered as stressors in addition to psychosocial stressors. In this sense, all manifestations of disease and injury that occur to people may be regarded as adaptations to sources of 'stress' to a greater or lesser extent (Hinkle 1987:562; Bartley et al. 1998).

In the biomedical literature one finds that authors have used the term 'stress' in relation to single organisms, populations of organisms, and even ecosystems (Hinkle 1987:561), although the individual is given predominance in the main, with numerous studies cataloguing changes in physiological variables such as blood cholesterol levels, urinary catecholamine concentrations, corticosteroid levels, heart rate and blood glucose concentration in response to stress (Mulhall 1996). Two new sub-disciplines of physiology – psychoneuroimmunology and psychoneuroendocrinology – focus on the effects of stress on the immune and endocrine systems respectively (Bartley et al. 1998:41).

Two important and related concepts in the biomedical approach to stress research are homeostasis and allostasis. Homeostasis is the process of maintaining a constant internal state within an organism in opposition to stressors that may disrupt this equilibrium (Brunner & Marmot 1999). In allostasis, by contrast, the body does not conserve the same internal state but, rather, establishes a new equilibrium after disruption. The cost of accommodating stress through this process is known as allostatic load (O'Dea & Daniel 2001).

The central nervous system (CNS) as the source of perception and responses to the external world, mediates the effects of stress on health (O'Dea & Daniel 2001). The concept of 'fight-or-flight' as originally proposed by Cannon is utilized in biomedicine to explain the responses to stress in terms of two main pathways of the endocrine system – the Sympathetic-Adrenal Medullary (SAM) system and the Hypothalamic-Pituitary-Adrenocortical (HPA) axis (Brunner & Marmot 1999).

The 'fight' reaction, associated with the SAM system, is activated very rapidly through the sympathetic branch of the autonomic nervous system. Stress-mediated activation of

the SAM system results in increased output of epinephrine (adrenaline) secreted into the bloodstream and norepinephrine (noradrenaline) released at the nerve endings. Activation of this system also leads to release of testosterone, heightened blood pressure, heart and metabolic rate, sweating, and constriction of peripheral blood vessels (Brunner & Marmot 1999; Cohen et al. 1997; O'Dea & Daniel 2001).

The HPA axis is implicated in the stress process through the anterior pituitary gland which secretes adrenocorticotrophic hormone (ACTH), leading to activation of the adrenal cortex and secretion of corticosteroids such as cortisol. A range of other hormones and neurotransmitters may also be stimulated by stress such as prolactin secreted by the pituitary gland, and natural opiates such as beta endorphin and enkephalin which are known to interact with the immune system (Brunner & Marmot 1999; Cohen et al. 1997). Additionally, the HPA axis interacts with and influences the hypothalamus-pituitary-thyroid (HPT) axis, critical to normal metabolism, and the hypothalamus-pituitary-gonadal (HPG) axis, responsible for the regulation of reproduction (Williams & Kurina 2002:1108)

The hormones epinephrine and norepinephrine have been associated with suppression of cellular immune function, abnormal heart rhythms and neurochemical imbalances (Cohen et al. 1997; Cacioppo et al. 1998). Cortisol is an antagonist of insulin and leads to raised blood glucose and fatty acid release as well as increased output of cholesterol-carrying particles from the liver into the blood. (Brunner & Marmot 1999:29; Bartley et al. 1998:41). In acute stress, cortisol is associated with an upregulation of the immune system, in which lymphocytes are mobilized into the bloodstream, but chronic heightened cortisol levels have been shown to depress immunologic function (McEwen 1988). The immune system itself can also directly affect the two major stress pathways through the action of cytokines (immune messengers) on the brain, with cytokines being released in response to non-cognitive stimuli such as infection or tumour growth (Brunner & Marmot 1999).

Stress has also been associated with blood clotting, decrease in plasma volume, the build up of fibrofatty plaques, and arteriosclerosis (Kaplan et al. 1993; Patterson et al. 1995; Patterson et al. 1995) as well as impaired memory (McEwen & Sapolsky 1995). There is also some preliminary evidence of a circadian rhythm underlying the sensitivity of the HPA axis to acute stress (van Eekelen et al. 2003). The biological responses or allostatic load resulting from stress are possible contributors to the development of a number of physiological risk factors for cardiovascular disease, stroke, type 2 diabetes and several cancers (O'Dea & Daniel 2001).

Psychological

The psychological perspective on stress includes the notions that:

- particular personalities may be more vulnerable to stress and/or its effects;
- specific psychological and social states may predispose towards stress and/or its effects; and
- behavioural responses can occur as reactions to stress.

Topics of interest in this approach are the types of external circumstances that provoke psychological stress, the types of mechanisms that connect circumstances to stress, and the contextual and buffering/exacerbating factors that influence these processes (Bartley et al. 1998:45).

Several different conceptual models detail how the relationship between stressors and the experience of stress can be 'buffered'. In the stress-suppression model, stress exposure mobilises a 'resource', which then alleviates stress by affecting its appraisal, responses to the stressor, further stress proliferation and/or the relation between stress and ill-health (Taylor & Aspinwall 1996:72). These factors can be viewed as moderators of the stress process. A variation entails stress depleting the resource as it buffers against stress. The stress-deterrent model portrays resources as causally antecedent to stress – resources reduce the exposure to stress (including stress proliferation), rather than its impact on health (Pearlin 1999:404). These factors can be viewed as mediators of the stress process. In the third model, stress and resources have separate and opposite effects whilst remaining completely independent of one another. Resources counterbalance the stressor, but do not buffer stress because support operates even in the absence of stress (Aneshensel 1992:26). These same models may also be applied to the exacerbation of stress by a variety of factors with the obvious converse effect on health outcomes (i.e. greater disease and ill-health). The resources that have been studied as stress buffers/exacerbators can be grouped into four main categories: (i) personality traits; (ii) coping styles; (iii) coping strategies; and (iv) external resources (Taylor & Aspinwall 1996).

Personality traits which have been found to be buffers against stress include hardiness, optimism, and the related concepts of mastery, control and self-efficacy, self-esteem⁵, ego strength, sense of coherence, competence, purpose, humour and conscientiousness. Traits that have been found to increase vulnerability to stress and its effects include negative affectivity (depression, anger, hostility, anxiety), pessimistic explanatory style (Taylor & Aspinwall 1996), Type A personality, fatalism, external locus of control, and powerlessness (Bartley et al. 1998:45; Wheeler & Frank 1988; Aneshensel 1992:28).

Coping is defined as the cognitive and behavioural efforts made to master, tolerate, or reduce external and internal stressors. Functions of coping include avoiding or eliminating the stressor, containing the proliferation of secondary stressors, altering the meaning of the situation, and managing states of arousal (Aneshensel 1992:18; Pearlin 1989:250). Coping can be a set of general dispositions activated when one is faced with threatening problems, or a more specific response invoked selectively in dealing with specific kinds of problems (Aneshensel 1992:6; Pearlin 1989:250).

'Coping styles' are habitual preferences for approaching problems (Thoits 1995:59). One important aspect of coping styles that has received attention in the literature is the use of avoidant or minimizing coping vs. active/confrontive vigilant coping. The former

⁵ Although findings have been somewhat mixed and contradictory for this personality trait (Kliwer & Sandler 1992; Rector & Roger 1997).

is thought to be most effective for short-term stress and the latter for chronic stress. In general, coping styles appear to mediate the relationship between personality traits and the stress effects (Taylor & Aspinwall 1996:84-6).

‘Coping strategies’ represent more specific phenomena than either personality traits or coping styles. Two general coping strategies that have been distinguished are problem-focused coping and emotion-focus coping (Taylor & Aspinwall 1996:86; Thoits 1995:59). For most stressors, both these strategies are used as responses with the evidence suggesting that situations where something constructive can be done favour the former whereas stressors that must be accepted (e.g. life events such as death of a loved one) are best approached with the latter. Other coping strategies that have been studied include self-control, positive reappraisal, accepting responsibility, and seeking social support (Taylor & Aspinwall 1996:87-8). Social support is a type of ‘external resource’ along with factors such as social background, income, employment, time etc. which have been proposed as buffers of the harmful effects of stressors (Bartley et al. 1998:44). These ‘external resources’ are aspects of the social structure which will be discussed below in the part on sociological perspectives.

Research from the psychological perspective has led to a number of insights including the reciprocal relationship between life events and the stress process, in which life events are heavily influenced by many of the same factors that also affect the appraisal and response to stress itself (Taylor & Aspinwall 1996:82). It appears that various psychological factors can enable people to respond appropriately to stressors, enlist successful coping strategies, stop stressors from intruding on other life domains and mitigate both negative psychological responses and direct health-damaging effects. Perceptions of the controllability of a situation also appear to be an important determinant of the effectiveness of different coping strategies (Taylor & Aspinwall 1996:96).

Sociological

Sociological (or anthropological) approaches to stress research have tended to focus on analysing differences in group vulnerability with particular emphasis on gender, class, race and cultural differences. Those with a more anthropological leaning tend toward an integrative view embedding stress and disease in the complex interplay of social organisation, historical change and cultural context (Bartley et al. 1998; Mulhall 1996). It has been suggested that the stress construct provides a potentially valuable bridge linking large-scale organisation with individual experience and action (Thoits 1995:56) and has the ability to absorb the far-reaching notion of inseparability between the circumstances of social life and individual functioning (Pearlin 1989:252).

The sociological perspective attempts to provide an overall understanding of why health inequalities mirror social inequalities in terms of the social distribution of stress – in that stressors, particularly long term ‘chronic’ stressors are unevenly distributed in society, in line with its structural inequalities (Bartley et al. 1998). Well-being is deeply affected by socially patterned differences in life circumstances, including the relatively enduring problems, conflicts and threats that many people face in their daily lives. Hence, social

roles and socioeconomic position are consequential for health because they signify differential exposure and vulnerability to life stressors (McDonough et al. 2002:768).

The underlying model of the stress process, from a sociological perspective, can be summarised as follows:

Individuals' locations in the social structure reflect inequality in resources, status, and power that differentially expose them to stressors which in turn can damage their physical and/or psychological health; and

This damage is generally moderated or lessened by individuals' psychological resources and coping strategies which are socially patterned in ways which at least partially, leave members of disadvantaged groups more vulnerable to the harmful effects of stress (Pearlin 1989:242; Thoits 1995:68; Turner et al. 1995:106).

While existing research draws attention to the significance of social roles and socioeconomic position for health, its focus on their occupancy tells us only part of the story. That is, a great deal is known about the social patterning of health according to major institutionalised roles and unequal distribution of resources, but much less about why such health patterns exist (McDonough et al. 2002:767). There also remains a large gap in understanding of the effect of social environment on health behaviours (i.e. the adoption, maintenance, and cessation of behaviours) (Yen & Syme 1999:302).

Sociological approaches to stress seek stressors in the organisation of lives and in the structure of experience rather than among unrelated 'risk factors' (Pearlin 1989:254). Two major pathways linking structure with stress are exclusion from full participation in the social system and participation that fails to provide the expected returns (Aneshensel 1992:33). To the extent that social and economic class, race and ethnicity, gender and age are systems that embody the unequal distribution of resources and opportunities, a low status within them may itself be a source of stress (Pearlin 1989:242). Some have suggested that social stress is a predictable, perhaps inevitable, outcome of social organisation, in particular, systemic discrimination and inequity (Thoits 1995:56).

The structural perspective on social causation understands stress both as a consequence of location in the social system and as a determinant of some mediators, most typically psychological distress. The focal relationships are between social position and psychological distress, with stressful life experience as but one pathway linking structure to emotional well-being. Location in the social system influences the risk of encountering stressors, which in turn influences the chances of becoming emotionally distressed (Aneshensel 1992:19).

Another specific approach from this disciplinary perspective is the sociology of emotions which emphasises the link between a person's social, subjective, and corporeal existence and challenges false dichotomies such as mind/body, culture/nature and society/biology (Bartley et al. 1998:47). This approach may be useful in understanding why some social groups are more prone to stress-induced physical illness rather than to psychological

distress (Aneshensel 1992:24). Other approaches contend that societies prescribe a variety of forms of behaviour, conditions and relationships that are proper for its members, variable by social positionality, with the prescribed forms internalised by the individual as guidelines and values, with sanctions for stepping outside these prescriptions acting as a form of stress (Hinkle 1987:562). Inconsistency of social standing itself, such as status inconsistency, goal-striving stress, and life-style incongruity can also be structural sources of stress (Aneshensel 1992:21).

Fundamental to the stress paradigm is the nature of the link between perception, emotional arousal and physiological response (Pollock 1988:387). That the frequency of social disadvantages increases in lower social positions is not contested, rather the question is, are these disadvantages correspondingly associated with emotional responses of a negative character? One alternative hypothesis could be that negative experiences lose their subjective impact when they are common (i.e. you can get used to disadvantage). On the other hand, one may conjecture that the information supply in modern Western societies implies that people's standards and expectations are usually formed with reference to a national level, maybe even to the international level. People will therefore not compare their fates only with common life situations within their own social milieu, but will refer to wider circumstances (Bartley et al. 1998:45) and hence feel 'relative deprivation' in relation to these broader comparisons (Walker & Smith 2001).

Sociological stress research has challenged the view that people are passive respondents to external circumstances (Bartley et al. 1998:45) by highlighting that new strategies may be learnt from stressful experiences, and mobilised to meet subsequent similar, or even differing, events (Mulhall 1996). Individuals are activists on behalf of their own well-being. That is, people, purposefully engage in problem-solving and/or actively reconstruct the meaning of their life experiences in order to sustain their sense of self-worth and alleviate anxiety or tension (Thoits 1995:58). Appreciating the individual as activist provides challenging opportunity to explore more fully the interplay between personal agency and structural constraints (Thoits 1995:59).

Discussion

Empirical Issues

The body of literature on stress and the association between certain kinds of experience and certain forms of illness cannot be dismissed lightly. Although a great deal of the stress literature contains inconsistent, contradictory or inconclusive results and much of the work has been flawed by serious methodological defects (Pollock 1988:390), this criticism could be leveled at many scientific endeavours and does not necessarily invalidate the major findings from this field of study.

However, there are a number of empirical issues in the specification of stress that should be considered. In terms of disciplinary approaches, the key issue in the biomedical approach to stress research is to demonstrate that physiological changes are large enough and long term enough to affect health in a significant way and have importance relative to

known risk factors such as smoking, cholesterol, physical activity etc. For example, it is still to be convincingly demonstrated that situational high blood pressure leads to essential hypertension (Bartley et al. 1998:42; Brunner & Marmot 1999:21; McQueen & Siegrist 1982:363). Many questions also remain about the psychological effects of stress. For instance, it is not clear whether the level of stress (high or low) interacts with the buffering effects of external resources. It is also likely that there is considerable cross cultural variation in the role and type of stress buffers (Mulhall 1996), and considerable research is needed to develop adequate and detailed theoretical explanations of how and why stress-buffering factors, in general, are able to reduce the negative health consequences of exposure to stressors (Thoits 1995:62).

Another significant issue is the categorisation of stressors as acute or chronic (as is usually the case for life events and chronic stressors respectively). Essentially this distinction is artificial, often inaccurate, and generally counterproductive as it refers solely to the duration of exposure to the stressor, not to the length of its effect. In practice, duration of exposure is more often assumed than assessed and many events are not 'eventful' at all, but unfold over long periods of time. Also, life events tend to re-occur over time, reflecting ongoing social, economic, and psychological determinants, and stressors labeled as acute and chronic are often interrelated (Aneshensel 1992:22).

Other challenges in stress research include:

the problem of reflexivity for a concept as ubiquitous as stress - if people believe that stress causes disease this will influence the way they respond in studies and the way in which they perceive health/illness (Mulhall 1996; Pollock 1988:384); determining the aetiologically relevant time period of stress (Mulhall 1996); whether, and in which circumstances, total stress load or the specific characteristics of the stress experiences are important (Wheaton 1999:294); measuring emotions given that they are subjective and often partially subconscious and prelinguistic (Bartley et al. 1998:49), and more generally a heavy dependence on the cognitive processes of individuals as they reflect upon their lives (Pearlin 1999:401).

What appears to be lacking in much of the literature on the social aetiology of illness is not only the awareness of the mutual dependence among theory, measurability and validity, but also the implied necessity to be concerned with it (McQueen & Siegrist 1982:359). Notwithstanding numerous exhortations to researchers to devise and implement further studies capable of specifying "what events influence what illnesses under what conditions through what processes", little effort has been expended to this end (Pollock 1988:386). In addition, existing stress models are commonly assumed to apply equivalently to males and females, and to differing social classes and racial/ethnic groups. It seems imperative to examine the applicability of these models (as well as alternative pathways to distress and poor health) to groups of individuals who hold similar status configurations (Thoits 1995:69).

Theoretical Issues

Stress is not something naturally occurring in the world, but is instead a socially constructed concept which is now a 'social fact' (Pollock 1988:390). This has led some to suggest that the possible role which various social factors play in the production of illness can take place entirely independently of the notion of 'stress', and that the stress concept is perhaps better regarded not as providing an explanation of particular phenomenon and set events in the world, but rather as a means of generating and organising a whole complex of beliefs and ideas about the nature of the social order (Pollock 1988:383).

The success of the 'stress' concept has three aspects: the explanation of misfortune; the political function and the ideological function. There is commonly a search for why a particular affliction strikes a particular individual at a particular time (why me?, why now?). Stress provides an answer to this conundrum of the 'particularity of misfortune'. Stress also serves a political function as a meta-concept that can explain away illness which cannot otherwise be understood and/or treated (Mulhall 1996:464).

Ideologically, the stress discourse tends to locate responsibility and perhaps culpability with either the individual or a "pathogenic social structure" (Pollock 1988:387). Implicit in all versions of the stress theory is the assumption that a 'happy' person is a 'healthy' person (Pollock 1988:389), and often good health is regarded as a kind of 'natural condition', which prevails as long as the environment does not frustrate it (Bartley et al. 1998:47). The concept of stress has attained considerable cultural power and the 'scientific' and the 'lay' conceptions of stress are in many respects similar and overlapping, as well as mutually reinforcing (Pollock 1988:387).

Finally in undertaking stress research it is important to remain aware of an underlying paradox which limits, epistemologically, what can be gleaned from research examining the health effects of stress. Stress is a fundamentally *relativistic* concept linked to social hierarchy; unlike other health outcomes such mortality, stress cannot be compared, absolutely, across time or space. Thus, although stress and the social hierarchy more broadly can readily explain health disparities, these concepts are unable to account for *absolute* changes in health profiles across the social structure as a whole.

An example will illustrate this. The relationship between social class and mortality in Britain has persisted for most of the 20th century despite major changes in the causes of death from infectious to chronic diseases (O'Dea & Daniel 2001:235). However the *absolute* reduction in mortality in Britain over this time has not been accompanied by improved social support and social networks. Happiness, life satisfaction, and job satisfaction in Britain have changed little over the past 30 years, while death rates have continued to plummet. Therefore, it is unlikely that direct psychological mechanisms are *absolute* causes of mortality trends for *populations as a whole* although they are manifestations of *fundamental causes* (Link & Phelan 1995) of *relative* health distributions within populations (Smith 1996:1585).

Section 4: Studies of Stress & Chronic Disease in Indigenous and African American Populations

The first part of this review sought to describe the modern landscape of stress research. In this section we consider what evidence exists linking stress and health for Indigenous people and African Americans. This is followed by examination of interventions that have been implemented to treat or manage psychosocial stress for these populations.

It should be stated at the outset that reducing stress for Indigenous peoples and African Americans fundamentally requires the elimination of social disadvantage for these groups. This necessitates social change to dismantle oppressive structures, institutions and individual practices and to reverse generations of disadvantage and oppression. Whilst efforts towards this end should continue, in the meantime there is a place for activities at the individual level designed to reduce stress and/or its health effects within these populations (Dressler 1987:216). These individual-level approaches are most prevalent in the intervention literature and are discussed below.

Studies of Association

A number of studies have examined the effects of various forms of psychosocial stress on health outcomes, including chronic disease, among Indigenous peoples and African Americans. This review identified 47 such studies which met the inclusion criteria described above in Section 2. Of these, 13 were conducted with Indigenous populations and the remaining 34 with African Americans. Only six of these studies were in relation to Indigenous Australians. Ten of the studies used ethnographic or interview methods with the majority utilising quantitative cross-sectional (30 studies) and longitudinal methods (7 studies). Fifteen of the studies involved only women whilst four involved men only and another four were in relation to adolescents. Summary details of association studies included in this review are shown in Table 3.

Several of the studies specifically considered the effect of stress on the management of chronic diseases including hypertension (Boutain 2001; Thompson et al. 2002), HIV/AIDS (Byrnes et al. 1998; Catz et al. 2002; Kimerling et al. 1999; Owens 2003; Simoni & Cooperman 2000), sickle cell disease (Thompson, Jr. et al. 1992), mental illness (Ford 2002), substance misuse problems (Utsey & Payne 2000), and myocardial infarction (Ong & Weeramanthri 2002).

Findings from the 47 studies of association indicated that a range of poor health outcomes were associated with elevated levels of stress (variously measured). Mental health outcomes related to stress include psychological distress (Ellison et al. 2001; Lincoln et al. 2003; Taylor et al. 1997), depression (George & Lynch 2003; Gore & Aseltine 2003; Whitbeck et al. 2002), reduced psychological well-being (Ellison et al. 2001) and psychological functioning (Murry et al. 2001), poor mental health (Utsey et al. 2002; Swan & Fagan 1991 in Raphael & Swan 1997), increased anxiety (Utsey & Payne

2000), suicidal ideation (Dinges & Duong-Tran 1992; Radford et al. 1990 in Raphael & Swan 1997) and reduced self-esteem (Gee 2002).

Physical health outcomes related to stress included elevated blood pressure (Boutain 2001; Din-Dzietham et al. 2004; Stancil et al. 2000; Thompson et al. 2002), hypertension (Din-Dzietham et al. 2004), self-reported illness (Williams & Lawler 2001), immune function (Kimerling et al. 1999), diabetes (Skinner & Silverman-Peach 1989; Garro 1995; Sunday et al. 2001), hyperglycemia (Skinner & Silverman-Peach 1989), heart disease (Ong & Weeramanthri 2002; Thompson 1997), dyslipidemia (Johnson et al. 1992), pre-term birth (Dole et al. 2003) and increased carotid artery intima-media thickness (Troxel et al. 2003). In addition, health damaging behaviours such as drug misuse (Dinges & Duong-Tran 1992) and cigarette smoking (Guthrie et al. 2002) have also been found to have an association with stress.

There is also some indication that African-Americans have different pathophysiological mechanisms involved in the development of hypertension. Studies of laboratory stressors have shown greater cardiovascular reactivity in African Americans compared to White Americans. There is evidence of heightened alpha-adrenergic sensitivity⁶ (Clark 2000:220; Sherwood et al. 1995) and relatively less beta-adrenergic activity⁷ during stress (Myers et al. 1998:228) in African Americans, leading to increased blood pressure via the release of norepinephrine, peripheral vasoconstriction and increased total peripheral resistance (Anderson et al. 1987; Fredrikson 1986) rather than by cardiac output, stroke volume or heart rate (Anderson et al. 1992; Myers et al. 1998:230). This hypothesis is also supported by evidence that African Americans excrete less sodium and potassium, have lower circulating plasma renin levels and higher plasma volume than European Americans (Anderson 1989:96; Anderson et al. 1992; Myers et al. 1998:212; Wyatt et al. 2003:323). Several studies have also found high levels of stress reactivity in hypertensive Africans (Markovic et al. 1995) and African-American adults (Knox et al. 2002).

A recent study found that this increased sympathetic nervous system activity, in comparison to Whites, occurs in Black men but not Black women (Suarez et al. 2004). This gender variation within race is an example of the limitations of assuming a genetic basis to such racial differences in pathophysiology. Recent advances in genomics have highlighted the fact that genetic variation *between* races accounts for, at most, 6% of total genetic variation in humans. Hence, these physiological variations are very unlikely to indicate underlying genotypical variation but are much more likely to reflect phenotypical differences acquired throughout the life course as a result of the biological expression of socially differential life circumstances to which racialised groups are exposed (Anderson et al. 1992:129; Krieger 2001; Myers et al. 1998:216).

There have also been a handful of studies indicating that Indigenous people have adversely high levels of several different biomarkers related to the development of

⁶ Neurotransmitter receptor sites throughout the vasculature that when stimulated result in constriction of the blood vessels and hence increased blood pressure (Myers et al. 1998:234).

⁷ Neurotransmitter receptor sites throughout the vasculature that when stimulated result in expansion of the blood vessels and hence decreased blood pressure (Myers et al. 1998:234).

chronic disease. This has included elevated HbA1c in Indigenous Australians and Native Canadians (Daniel et al. 1999) as well as urinary catecholamine excretion in relation to Westernisation in young Samoan men (James et al. 1987a; Pearson et al. 1990), Tokelauans (Jenner et al. 1987), and Aboriginal Australians (Schmitt et al. 1995; Schmitt et al. 1998). These studies are not included in this review as they do not consider stress directly as an exposure but only infer it indirectly.

A number of factors were also found to buffer or exacerbate the health-damaging effects of stress including coping strategies (Dressler 1987; Littrell & Beck 2001), social support (Dressler 1987; Lincoln et al. 2003), personal control (Lincoln et al. 2003), hardiness (Williams & Lawler 2001), racism (Murry et al. 2001), religiosity (Ellison et al. 2001), and substance misuse (Utsey & Payne 2000). Relationships among factors are complex but several general patterns have emerged regarding factors effective in protecting or buffering individuals from adverse health effects of stress. Taken together, these 47 studies suggest that active problem-focused responses to stress (Dressler 1987; Littrell & Beck 2001; Stancil et al. 2000), social support (Dressler 1987; Strogatz et al. 1997), hardiness (Williams & Lawler 2001) and religiosity (Ellison et al. 2001) are stress-buffers in these study populations. Factors that were found to amplify the health-damaging effects of stress include neuroticism (Lincoln et al. 2003), racism (Murry et al. 2001), and substance misuse (Utsey & Payne 2000).

However, there is also evidence to support the context-dependency of the coping strategies discussed above, whereby active coping is most appropriate when something 'constructive' can be done, and passive coping where 'acceptance' is necessary. This is evident in the active coping style of 'John Henryism' which is the "tendency for some African Americans to work extremely hard to disprove the stereotype of laziness and inability" (James et al. 1984).⁸ A number of studies have suggested that African-Americans with high levels of 'John Henryism' are at increased risk from the detrimental effects of stress on their health (Dressler 1987; James et al. 1984; James et al. 1987b; James et al. 1992).⁹ This effect does not appear to exist for Whites (James et al. 1987b) and may be due to the barriers created by institutional racism for African-Americans which active coping cannot overcome effectively (Dressler 1987).

One study that examined racism from other African Americans vs. racism from non-African Americans found that the magnitude of blood pressure change was greater for stress originating from intra-group racism than from inter-group racism, and that passive coping was associated with stress from intra-group racism but not from inter-group racism. This study suggests that racism-mediated stress has differential effects on blood

⁸ The term 'John Henryism' derives from a well-known legend in the United States of an African American railroad steel-driver in the late 19th century who, after winning a celebrated race against a mechanical steel drill, dropped dead from exhaustion.

⁹ This relationship appears to be mediated by socioeconomic position (SEP) whereby high levels of stress occur in lower SEP groups more than in high SEP groups (James et al. 1992) but there are also contradictory findings such as an association between John Henryism and lower levels of stress in women (Williams & Lawler 2001) and no association between John Henryism and blood pressure (Jackson & Adams-Campbell 1994).

pressure dependent on the source of the racism, and suggests that more studies in this area are required (Din-Dzietham et al. 2004).

Although there have been relatively few studies of stress and chronic disease in Indigenous and African American populations, there is evidence that stress can lead to a range of adverse mental and physical health outcomes, many of which are chronic mental health conditions in themselves, or are implicated in the causal pathway for chronic physical health conditions such as coronary heart disease, stroke, diabetes and cancer.

Intervention studies

This review identified a total of 16 studies relating to the treatment/management of psychosocial stress in Indigenous or African American populations. Of these, six were randomized controlled trials (Alexander et al. 1996; Barnes et al. 2001; Castillo-Richmond et al. 2000; Gaylord et al. 1989; Kondwani & Lollis 2001; Schneider et al. 1995; Webb et al. 2000), one was a retrospective cohort study (Schneider et al. 2001), and the remaining nine were demonstration studies of programs or activities without control groups over periods ranging from a day to almost a year (Brave Heart 1999; Haber 1986; Harrison & Rao 1979; Lee et al. 1999; Mays 1995; McGrady & Roberts 1992; Moshinsky et al. 2000; Tsey & Every 2000; Healthy Lifestyle Unit of North Sydney Health, unpublished). Of these identified activities, 11 involved African Americans, four involved Indigenous Australians and one involved Native Americans. Summary details of intervention studies included in this review are shown in Table 4. A study of effective stress coping techniques for Aboriginal Australians will also be discussed below, although it is not an intervention study as such (Vino et al. 1996).

The types of interventions implemented include transcendental meditation (Alexander et al. 1996; Barnes et al. 2001; Castillo-Richmond et al. 2000; Gaylord et al. 1989; Kondwani & Lollis 2001; Schneider et al. 1995; Schneider et al. 2001), progressive muscle relaxation (Alexander et al. 1996; Gaylord et al. 1989; Schneider et al. 1995; Schneider et al. 2001; Webb et al. 2000), focused support group (Mays 1995), an empowerment program (Tsey & Every 2000), yoga and aerobics (Haber 1986), biofeedback relaxation (Harrison & Rao 1979; McGrady & Roberts 1992), psychoeducational group experience (Brave Heart 1999) and workshops that taught stress reduction and management techniques (Lee et al. 1999; Moshinsky et al. 2000; Healthy Lifestyle Unit of North Sydney Health, unpublished).

Transcendental Meditation, biofeedback and progressive muscle relaxation

Transcendental meditation (TM) has been investigated in several quantitative meta-analyses of first world populations, and there is evidence of its effectiveness in reducing physiological arousal, anxiety, smoking, alcohol and drug misuse, and improving psychological health (Schneider et al. 1995). In a meta-analysis of 146 studies, anxiety measures decreased more in the groups that practiced TM compared to those using other forms of meditation or relaxation. Individuals who practice TM show decreased illicit

drug use, depression and increased self-actualisation and positive health habits (Kondwani & Lollis 2001). Progressive muscle and biofeedback relaxation as well as related activities have been shown to have beneficial effects on mood and well-being as well as reducing distress, anxiety, coping ability, fatigue, tension, depression, obsessive compulsive behaviour and bodily symptoms of anxiety and increasing energy and calmness (Gruzelier 2002).

Six randomized controlled trials involving African Americans used TM as the intervention, with progressive muscle relaxation (PMR) also used as a secondary intervention arm in several of the studies. These studies were conducted with both hypertensive and normotensive African Americans. Compared with the control group, those in the TM intervention group had decreased carotid intima-media thickness (Castillo-Richmond et al. 2000), systolic blood pressure (Alexander et al. 1996; Barnes et al. 2001; Schneider et al. 1995) and diastolic blood pressure (Alexander et al. 1996; Schneider et al. 1995), heart rate and cardiac output (Barnes et al. 2001), anxiety (Gaylord et al. 1989; Kondwani & Lollis 2001), depression (Kondwani & Lollis 2001), neuroticism (Gaylord et al. 1989) and sleep dysfunction (Kondwani & Lollis 2001) as well as increased energy (Kondwani & Lollis 2001), general mental health (Gaylord et al. 1989) and health locus of control (Kondwani & Lollis 2001). In these studies, TM was found to be more effective than PMR although both had statistically significant effects in most cases. An 8 year follow-up of 530 African American participants in three of these trials which used a TM intervention, found all-cause mortality was reduced by 63% and heart disease mortality by 82% in the intervention group compared to the control groups (Schneider et al. 2001).

Focused Support Groups

The Focused Support Group (FSG) model aims to:

- build and enhance group bonding and group cohesion in a short period of time;
- present participants with a model of facilitation that they can easily execute; and
- change patterns of coping through increased awareness of behaviours, and reduce maladaptive response strategies in the resulting situations.

The FSG model also seeks to alleviate or buffer the effects of stress through the provision of positive support networks and by increasing knowledge of gender and ethnic discrimination that may be significant sources of stress (Mays 1995). The study considered in this review which utilised the FSG model found that, according to participant self-reports, it reduced stress and increased personal and professional support networks for the 65 African American women participants (Mays 1995).

Empowerment Programs

An empowerment program conducted in Alice Springs involving Indigenous Australians enhanced participants' awareness, resilience and problem solving ability, according to the post intervention evaluation (Tsey & Every 2000). This program was based on the

principles of psychosynthesis, analytical skills, mastery training, transformation and meditation and has since been delivered in a number of Indigenous communities in South Australia, Western Australian and the Northern Territory. A trial of stage 1 of the 4-stage program has been underway in north Queensland since 2001. This trial has so far confirmed earlier findings that the program is able to equip Indigenous Australians with greater analytical and problem-solving skills, provide space for self-reflection and growth, encourage confidence, improve communication skills, promote empathy and an ability to help others, as well as a greater understanding of root causes of problems (Tsey et al. 2003). A similar program conducted in the United States used a psycho-educational group experience based on notions of group sharing and support which incorporated Native American cultural traditions. Self-report data after the intervention suggest that it was effective in promoting positive emotions and reducing negative emotions (Brave Heart 1999).

Coping

A study in Australia involving focus groups and interviews with Gunai/Kurnai people from Gippsland, Victoria sought to determine effective coping techniques for dealing with stress. This qualitative study found that those who coped best with stress were good problem solvers and planners who were able to compartmentalize, maintain an emotional distance from their problems, had high self-efficacy and good communication skills, consulted with elders, exercised (including team sports), meditated, and avoided substance misuse as a response to stress (Vino et al. 1996).

Workshops

Several stress reduction/management workshops have been conducted in Australia with Indigenous people and have used techniques such as identifying signs of stress and strategies to promote wellbeing, stress management techniques, balancing stress, problem-solving skills, simple relaxation techniques and dealing with anger (Lee et. al. 1999; Moshinsky et. al. 2000; Healthy Lifestyle Unit of North Sydney Health, unpublished). Only one has been evaluated in relation to health outcomes and appears to have show a reduction in the incidence of diabetes and complications for diabetics (Lee et. al. 1999).

Table 3: Studies of Psychosocial Stress and Chronic Disease in Indigenous and African American Populations

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 549 African Americans aged 18 to 54 in the U.S. National Comorbidity Survey (Lincoln et al. 2003)	10-item Traumatic events	4-item Psychological distress	PA*
	2-item Financial strain	4-item Psychological distress	No A
2-year longitudinal study of 279 African American high school seniors in the Boston area (132 male and 147 female) (Gore & Aseltine 2003)	1-item conflict with parents 1-item conflict with peers	Depressed mood (as measured by a 12-item version of the CES-D)	PA* PA*
6-year longitudinal study of 1,060 African Americans aged 65 years and over in from 5 counties in North Carolina (321 men and 739 women) (George & Lynch 2003)		4-items life events: death of a spouse, child, friend or other family member and serious illness or injury of a close friend or family member	Depressive symptoms (CES-D)

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 50 low-income African American women in the U.S. (Williams & Lawler 2001)	126-item social readjustment rating scale in last 12 months for: Self Significant other Community stress (social problems, violence, & fear in their community)	Illness as measured using a self-report checklist of disease Adjusted for the basis of prognosis, threat to life, duration, degree of disability, and degree of discomfort	PA* PA* No A* .
Cross-sectional study of 90 African American women employed in a health care facility (Webb & Beckstead 2002)	The Personal Strain Inventory which has four 10-item scales measuring vocational, interpersonal, psychological and physical strain Stress	Hypertensive status Adjusted for age, waist/hip ratio and pack-years stress	No A
Cross-sectional study of 126 non-obese normotensive or mildly hypertensive African Americans (97 male and 29 female) in Pennsylvania (Thompson et al. 2002)	14-item Perceived Stress scale Adjusted for sex, age, BMI & alcohol consumption	Resting SBP Resting DBP Daytime ambulatory SBP Daytime ambulatory DBP	PA* PA# PA* No A

Study	Exposure Measure	Outcome Measure	Findings
Longitudinal study of 204 African Americans adults (88 men and 116 women) aged 20-33 years (Knox et al. 2002)	<p>Stress reactivity using a video game and mirror star-tracing task</p> <p>Adjusted for age, baseline SBP, family history of hypertension, BMI, physical activity, smoking status & alcohol consumption</p>	<p>SBP at 3 years follow-up</p> <p>DBP at 3 years follow-up</p> <p>Ambulatory heart rate at 3 years follow-up</p>	<p>PA* for men and women</p> <p>PA* for women</p> <p>PA*</p>
Cross-sectional study of 90 African-American homeless men in the U.S. (Littrell & Beck 2001)	A list of 20 hassles/stressors in the week prior to the survey	CES-D scale in the week prior to the survey	PA*
Cross-sectional study of 285 African-Americans aged 17 and over in a southern U.S. city (101 male and 184 female) (Dressler 1987)	<p>8-item measure of economic stress</p> <p>Adjusted for age, SES and marital status</p>	Depression sub-scale of the Hopkins Symptom Checklist	PA* for men, women & total sample

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 112 African American male workers aged 17 to 60 years in rural North Carolina (James et al. 1984)	<p>1-item job security</p> <p>1-item race as a hindrance to job success</p> <p>1-item unfair wages</p> <p>Adjusted for age, smoking, Quetelet index and time of day of the interview</p>	<p>SBP DBP</p> <p>SBP DBP</p> <p>SBP DBP</p>	<p>NA*</p> <p>No A</p> <p>PA# PA#</p> <p>No A No A</p>
Cross-sectional study of 25-1, 784 African Americans aged 50 years in Pitt County, North Carolina (Strogatz et al. 1997)	8-item adaptation of The Perceived Stress Scale	SBP DBP	PA* for women only PA* for women only
Cross-sectional study of 36 HIV+ African American women in Miami (Byrnes et al. 1998)	10-item version of the Life Experiences Survey measuring stress over past 12 months including impact of each event from negative to positive	Natural killer cell cytotoxicity Adjusted for presence of human papillomavirus, antiretroviral use, # of current sex partners, smoking and pessimistic attitude	No A
Cross-sectional study of 109 African American adults with sickle cell disease (SCD) in the U.S. (Thompson, Jr. et al. 1992)	Daily stress measured using the 17-item Hassles Scale Adjusted for SCD type, complications, pain frequency, gender, SES and age	Depression Anxiety Global Severity Index Using the Symptom Checklist-90 (revised)	PA* PA* PA*

Study	Exposure Measure	Outcome Measure	Findings
1-year longitudinal study of 67 HIV+ African American women aged 18 to 45 years in New Orleans (Kimerling et al.1999)	Traumatic life events measured by the 22-item Life Stressor Checklist Post Traumatic Stress Disorder (DSM-IV) measured by the 22-item Impact of Events Scale-Revised	Lower CD4 to CD8 ratio Lower CD4 to CD8 ratio	PA* PA*
Cross-sectional study of 373 women with HIV/AIDS in New York city (44% were African American) (Simoni & Cooperman 2000)	Stress as measured by frequency of both physical and sexual abuse	Depression (20-item CES-D)	PA*
Qualitative cross-sectional study of 18 African American women aged 31 to 49 years with HIV/AIDS in New Jersey (Owens 2003)	Open-ended interviews	Major concerns or problems with your experience of living with HIV/AIDS	The women identified family as a source of stress in terms of difficulty in communicating, family availability, endurance, and resources, other problems in the family and over-estimation of their ability to cope by family members
Cross-sectional study of 100 women with HIV/AIDS receiving medical care in Louisiana (84% African American) (Catz et al. 2002)	43-item Social Readjustment Rating Scale	Depression (20-item CES-D)	PA*

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 296 African Americans aged 20 years older who were both born and currently living in the U.S Virgin Islands (97 men and 199 women) (Tull et al. 2003) ¹⁰	<p>Psychosocial stress as measured by sub-scales of the Roger's Life Attitude Inventory</p> <p>Adjusted for age, education, gender, family history of diabetes, waist circumference, and BMI</p>	Insulin resistance as measured by fasting serum insulin using the homeostasis model assessment method	No A
Cross-sectional study of 55 African American women with severe and persistent mental illness aged 18 to 68 years in Pennsylvania who were mental health service outpatients (Ford 2002)	Violence and trauma exposure measured using the 49-item self-report Posttraumatic Diagnostic Scale (PDS)	<p>Well-being as measured by the SF-36</p> <p>No. of psychiatric disorders</p> <p>Adjusted for age, education and marital status</p>	<p>No A</p> <p>PA#</p>
5-year longitudinal study of 555 African American students in ninth-grade at the outset in the U.S. (301 females and 254 males) (Sellers et al. 2003)	12-item version of the Perceived Stress Scale	Psychological distress as measured by the 6-item depression subscale and 6-item anxiety sub-scale of the Brief Symptom Inventory	PA*

¹⁰ It should be noted that that 78% of U.S Virgin Islands population are African-American (<http://www.cia.gov/cia/publications/factbook/geos/vq.html>) and hence this population is neither a minority nor Indigenous and although they still fit the inclusion criteria the applicability of these findings to Indigenous Australians is uncertain.

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 356 African Americans, aged 21 years and over, in Atlanta, Georgia (196 men and 160 women) (Din-Dzietham et al. 2004)	Perceived stress from race-based discrimination at work (RBDW) from non-African Americans (inter-RBDW) and from other African Americans (intra-RBDW)	Self-reported physical diagnosed hypertension SBP DBP Adjusted for age, gender, BMI & coping ability	Perceived stress by: Intra- Inter-RBDW No A PA* PA* PA* No A No A
Cross-sectional study of 94 pregnant African American women from the Pittsburg area who did not have hypertension or diabetes and hadn't had any previous adverse pregnancy outcomes (Stancil et al. 2000)	Life Events Scale Perceived Stress Scale Life Events Inventory	SBP SBP SBP	No A PA* No A
A 4-year longitudinal study of 1,962 pregnant women (36% African American) in North Carolina aged over 16 years who spoke English without multiple gestation (Dole et al. 2003)	39-item Life Experiences Survey including weighting by perception of life impact Pregnancy-related anxiety	Preterm birth (<37 weeks)	No A with all life events PA* with life events assigned a negative impact PA*
A cross-sectional study of 105 African American girls aged between 11 and 19 years in the U.S. who were not pregnant (Guthrie et al. 2002)	26-item Daily Hassles for Adolescents Inventory including the extent to which each item was a hassle	Ever smoked	PA*

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 334 women (225 non-Hispanic Caucasians and 109 African Americans) aged between 42 and 52 years who were pre-menopausal (Troxel et al. 2003)	Life events Ongoing stressors Economic hardship Adjusted for SBP, HDL-c and waist-hip ratio	Carotid artery intima-media thickness (IMT) as measured by ultrasound Plaque (discrete focal protrusion into the vessel lumen with at least 50% greater thickness than the surrounding normal areas)	PA* with composite stress score PA# with life events PA# with ongoing stressors PA# with economic hardships No A
Cross-sectional study of 897 caregivers (93% women) of African American children (10-11 years old) (Murry et al. 2001)	29-item negative life events, chronic financial stressors and job stress	Psychological functioning measured using the 5-item distress-depression and 3-item distress-anxiety subscales of the Mini-Mood and Anxiety Symptom Questionnaire	NA*
Longitudinal study of 1150 pregnant women (16-28 weeks) over 17 years of age from six ethnic groups in New York and Chicago (30% African American) (Shiono et al. 1997)	Material hardships in food, housing, and medical care as a result of a lack of money Negative stressful life events (loss of a loved one, legal problems etc.)	Mean birth weight Mean birth weight Adjusted for ethnicity, age, marital status, education, poverty level, type of medical insurance, body mass index and smoking	No A No A

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 79 African American mothers of adolescents attending high school (Taylor et al. 1997)	Stressful life events measured using the 35-item PERI Life Events Scale Adjusted for age, education, income and family structure	Psychological distress measured using the 20-item CES-D Self-esteem measured using the Rosenberg Self-Esteem Scale	PA* NA*
Cross-sectional study of 1,139 African American adults (Ellison et al. 2001)	1-item work problems 2-item financial problems 4-item family problems	6-item psychological distress index 2-item psychological well-being	PA* for all three stress measures PA* for financial and family stress
Ecological cross-sectional study of all the census tracts in Detroit using a sample (stratified by sex, race, stress and area) of 487 married African Americans aged 25 to 60 years who had relatives in the area (Harburg et al. 1973)	Stress as determined by a composite of economic deprivation, residential and family instability, crime and density	SBP DBP Adjusted for age, overweight, ponderal index, season of the year, time of interview, hours since last meal and rated tension at reading	PA* for men No A for women PA* for men No A for women

Study	Exposure Measure	Outcome Measure	Findings
Ecological cross-sectional study of all 45-54 year-old males residing in 86 counties in North Carolina (James & Kleinbaum 1976)	Stress as determined by a composite of divorce, delinquency, correction school admissions, incarceration and murder rates as well as children not living at home with both parents	Hypertension, hypertensive heart disease and stroke related mortality rates	PA* for non-whites in the difference between mortality rates for high and low stress groups
Cross-sectional study of 127 African aged 55 to 93 years Americans (87 women and 26 men, 14 missing sex) in the U.S. (Utsey et al. 2002)	46-item Index of Race-Related Stress with four subscales: (1) Individual; (2) Institutional; (3) Collective and; (4) Cultural Adjusted for age, sex, income and education	5-item Satisfaction with Life Scale Mental Component Scale of the SF-36 Physical Component Scale of the SF-36	No A NA* with institutional subscale No A
Cross-sectional study of 126 African American men, 56 from a residential substance abuse treatment program (clinical sub-sample) and 70 undergraduate college students (non-clinical sub-sample) (Utsey & Payne 2000)	22-item Index of Race-Related Stress using the Global Racism overall scale	21-item Beck Depression Inventory II 21-item Beck Anxiety Inventory Adjusted for age, education and annual income	No A for either sub-sample PA* for the clinical sub-sample only
Qualitative study of 314 African American women with diagnosed hypertension in south Louisiana (Boutain 2001)	Worry and stress	High blood pressure	Participants discussed how just 'making ends meet' financially caused them to have elevated blood pressure

Study	Exposure Measure	Outcome Measure	Findings
Qualitative description of four case histories of Native Americans (Skinner & Silverman-Peach 1989)	Stress caused by socio-cultural change	Diabetes Hyperglycemia	Positive associations between abrupt lifestyle changes/extreme stress and the two outcome factors
Cross-sectional study of 287 Native American adults (96 men and 191 women) in the upper Midwest (Whitbeck et al. 2002)	6-item financial strain scale (alpha =0.86) 12-item negative life events scale	Depression as measured using the CES-D Depression as measured using the CES-D Adjusted for gender, age, education and household income per capita, parenting influences, warmth and support, childhood events and behaviours, social support, participation in traditional activities, alcohol use and discrimination	No A PA*
Ethnographic study of 12 Inuit men aged 15 to 30 years in the Arctic (O'Neil 1986)	Various coping styles of forms of stress including the stress of definition, isolation, transition, timing and consolidation	Health status in general	The experience of stress was found to be a risk factor for (i) increased contact with the health care system; and (ii) Suicidal outcomes
Cross-sectional study of 93 Mississippi Choctaw aged 21 years or older (43 men and 50 women) (Dressler et al. 1996)	10-item psychological stress scale combining the domains of mood, chronic stress and acute stress	Blood glucose SBP DBP	No A No A No A

Study	Exposure Measure	Outcome Measure	Findings
Cross-sectional study of 124 American Indian and Alaskan Native adolescents aged 14 to 18 years in boarding schools in Alaska (60 male and 64 female) (Dinges & Duong-Tran 1992)	Life events including family/parental conflicts, marital/pregnancy fears, school environment, interpersonal conflicts/tensions/ loss of culture supports/ academic demands, social rejections and death in family/friends	Suicide ideation Suicide attempt Drug misuse	PA* PA* PA*
Qualitative cross-sectional study of 34 Anishnaabe (Ojibway), 26 women and 8 men with a mean age of 49 years, from a community near Manitoba (Garro 1995).	Open-ended interviews	Explanations for the cause of diabetes	Worry and stress were mentioned by several individuals and the group as a whole had a consensus for the statement that worrying too much could raise one's sugar level
Qualitative cross-sectional study of 28 Anishnaabe (Ojibway) in Canada (Sunday et al. 2001).	Open-ended interviews	Explanations for the cause of diabetes	stress was identified as causative of diabetes by 14 of 28 participants
Qualitative cross-sectional study of 14 Aboriginal adults (11 with Type 2 diabetes) aged 31 to 63 in a remote Aboriginal community in Australia (3 men and 11 women) (London & Guthridge 1998)	Group discussions, semi-structured interviews and informal conversations	Explanations for the cause of diabetes	Many participants, particularly middle-aged women, considered worry about family & social problems to be the primary cause of their diabetes
Qualitative cross-sectional study of 14 Indigenous adults from an urban and three rural areas in Australia who had suffered a heart attack (10 men and 4 women) (Ong & Weeramanthri 2002)	Open-ended unstructured interviews	Personal beliefs about the causes of heart attacks and heart disease in general	Many participants said that a stressful lifestyle was the main cause of their heart attacks

Study	Exposure Measure	Outcome Measure	Findings
Qualitative study of Aboriginal Community Elders Service and Victorian Aboriginal Health Service in Melbourne (Thompson 1997)	29 months of participant observation, 38 in-depth interviews, 2 focus groups and 2 small group discussions Pilot questionnaire with 31 Aboriginal respondents (18 with diabetes and 13 age and sex matched controls without diabetes)	Financial/material and emotional worries associated with diabetes prevalence Worries included physical distance, separation, conflict, illness and death in families, young people and elders, role fulfillment and social support in the community.	# of worries 0 1-4 5+ Cases 28% 33% 39% Cont. 15% 38% 46% Diabetes in the family Yes 29% 29% 43% No 10% 60% 30%
Ethnographic study of an urban Indigenous community in Australia (Sibthorpe 1988)	Participant observation with a focus on dietary factors	Health status in general	High levels of stress were evident in the community and were considered a more important factor than diet in the health status of the community
88 low SES Aboriginal heads of households in Adelaide (72 women and 16 men) (Radford et al. 1990 in Raphael & Swan 1997)	Stress	Suicide ideation Suicide attempt	PA* PA*
Patients presenting at an Aboriginal Medical Service (Swan & Fagan 1991 in Raphael & Swan 1997)	Current stressful life events	Mental health	NA*

PA = Positive Association/Proportional; NA = Negative Association/Inversely proportional; No A = No statistically significant association.

* p < 0.05, # p < 0.10. Confidence intervals are 2-tailed 95% unless otherwise indicated. CES-D - The Center for Epidemiological Studies-Depression, SBP – Systolic Blood Pressure, DBP – Diastolic Blood Pressure, CD4 – White blood cell with CD4 receptor, CD8 – White blood cell with CD8 receptor

Table 4: Studies of Psychosocial Stress Interventions in Indigenous and African American populations

Study	Trialed Intervention	Outcome Measure	Findings
6-9 month single-blind RCT of 60 hypertensive African Americans (19 men and 41 women) aged over 20 years (Castillo-Richmond et al. 2000)	Transcendental Meditation (T), n =31 (9 men, 22 women) Health education (HE), n = 29 (10 men, 19 women) Both groups instructed by African American practitioners	Blood pressure Carotid intima-media thickness	NA* (for both T & HE) NA* (for T only) Adjusted for antihypertensive medication and smoking status
1 year RCT of African Americans with hypertension (Kondwani & Lollis 2001)	Transcendental Meditation Health education	Left ventricular mass Anxiety Depression Sleep dysfunction Energy Health locus of control	NA* (for both T & HE) NA* (for T only) NA* (for T only) NA* (for T only) PA* (for T only) PA* (for T only)
3 month single-blind RCT of 127 hypertensive African Americans aged 55 to 85 years in a primary care health centre (half of the participants were taking antihypertensive medications) (Alexander et al. 1996; Schneider et al. 1995)	Transcendental Meditation Progressive muscle relaxation (P) Lifestyle modification (nutrition and physical activity) (control)	SBP DBP Heart rate Adjusted baseline BP and age. Associations hold for participants with high and low stress levels	NA* (T) NA# (P) NA* (T & P) No A T was approximately twice as effective as P overall

Study	Trialed Intervention	Outcome Measure	Findings
A 8-week RCT of 43 African American women employed in an health service in the southeastern U.S. (Webb et al. 2000)	Progressive muscle, relaxation n=22 30 minutes of relaxation (R), n=21 (control)	Physical strain Interpersonal strain Psychological strain Vocational strain Blood pressure	NA* (for P only) NA* (for P only) NA* (for both P & R) No A (for both P & R) No A (for both P & R)
A 2 month RCT of 34 African Americans and 1 Caucasian American aged 15-18 years with resting SBP between the 85 and 95 th percentile for their age and gender (Barnes et al. 2001)	Transcendental meditation, n= 17 (8 female, 9 male) Health education control, n = 18 (8 female, 10 male) All reported associations in comparison to control group	Resting SBP In response to (i) a simulated car driving stressor; (ii) an interpersonal social stressor: SBP Heart rate Cardiac output	NA* (i) NA* (ii) NA* NA* No A NA* No A
Eight year follow-up of a total of 530 African Americans in three studies (Schneider et al. 2001).	Transcendental Meditation Progressive muscle relaxation Lifestyle modification program	All-cause mortality Heart disease mortality	63% reduction 82% reduction T group compared to P+L groups
88 low-income elderly African-Americans (Haber 1986)	10-week health promotion program including yoga and aerobics	Blood pressure	No A
22 African-American hypertensive patients (Harrison & Rao 1979)	Biofeedback relaxation	Blood pressure	No A
Unspecified number of African American hypertensives (McGrady & Roberts 1992)	Biofeedback relaxation	DBP SBP Forehead muscle tension Finger temperature	NA No A NA No A

Study	Trialed Intervention	Outcome Measure	Findings
Aboriginal women aged 40-60 years in Boroondara, Victoria participated in a workshop called 'Finding a balance: the next step' held in May 2000 (Moshinsky et al. 2000)	Included identifying signs of stress and strategies to promote wellbeing and discussions in small groups. A feminist approach and community development framework was utilised.	Evaluation of the program	Women were extremely enthusiastic and appreciative of being able to explore these issues in a secure place
Three to four day diabetes camps, available to both Aboriginal people with diabetes and family members in NSW as part of the Macleay Hastings Valley's diabetes pilot developed by the Durri Aboriginal Corporation Medical Service and Port Macquarie Division of General Practice (Lee et al. 1999:35-6)	Stress management techniques	Diabetes incidence Hospital admissions for diabetics	Decrease in incidence among non-diabetic family members 15% reduction in the number of Aboriginal diabetics being admitted to hospital
'Learn to Relax' is a program specifically designed to meet the needs of Indigenous people by the Healthy Lifestyle Unit of North Sydney Health in conjunction with Tranby Aboriginal College in Glebe and Indigenous health workers (Healthy Lifestyle Unit of North Sydney Health, unpublished)	A teaching resource for Indigenous educators as well as health and community workers that covers topics such as balancing stress, improving problem-solving abilities, simple relaxation techniques, dealing with anger and changing negative thinking patterns	Not applicable	Not applicable

PA = Positive Association/Proportional; NA = Negative Association/Inversely proportional; No A = No statistically significant association. * $p < 0.05$, # $p < 0.10$. Confidence intervals are 2-tailed 95% unless otherwise indicated.

Conclusion

This review has demonstrated that there are clear links between stress and a range of chronic diseases for Indigenous peoples in a number of first world nations, as well as for African-Americans. The interventions identified in this review appear to warrant further investigation, particularly Transcendental Meditation and empowerment programs. This review has also highlighted the need to consider the theoretical issues in stress conceptualisation and measurement in both analytical and intervention studies.

Further research is required with Indigenous populations, particularly in Australia, as there is currently a dearth of literature on this population in comparison to that available for African Americans. This should include small-scale research by academic institutions as well as more ambitious longitudinal studies which are being considered by organizations such as the Cooperative Research Centre for Aboriginal Health. There is also scope for data development in collections such as the National Health Survey and National Aboriginal and Torres Strait Islander Social Survey, both of which are conducted regularly by the Australian Bureau of Statistics. Further research on appropriate interventions would also be especially fruitful amongst children and adolescents given that chronic disease susceptibility starts early in the life course.¹¹

Despite the small body of existing research, it is clear that there are a number of promising interventions appropriate for the Australian context based on the results of studies conducted among African Americans. Existing programs designed specifically for Indigenous Australians (Lee et. al. 1999; Moshinsky, et. al. 2000; Tsey & Every 2000; Healthy Lifestyle Unit of North Sydney Health, unpublished) should be adapted to include transcendental meditation techniques (in culturally-appropriate formats) as well as group-oriented stress management in which the participants are taught to match particular kinds of coping responses with particular kinds of stressful circumstances in the context of social support (Dressler 1987). These programs should be provided through both existing mainstream providers (such as those conducted by North Sydney Health) as well as through Aboriginal community-controlled health services.

In 1996, eleven Social & Emotional Well-being (SEWB) centres were set up in Australia through funding from the Commonwealth Office for Aboriginal and Torres Strait Islander Health (OATSIH). A 2001 evaluation report suggested that it was too early to expect an improvement in the health of Indigenous peoples from these centres, as they are still in the capacity-building stage (Urbis Keys Young 2001:iv). However the latest draft plan released by OATSIH recommended an increase in funding to the SEWB regional centres (Social Health Reference Group 2003:38). These centres would appear to be highly appropriate avenues through which to provide stress-reduction programs, as these programs could be embedded in a much broader structure capable of providing a variety of other support

¹¹ One proposal in line with this has been to teach cognitive development skills to Aboriginal children in remote communities (Morrison 2001).

services. These programs have the potential to help reduce the high burden of chronic disease suffered by Indigenous Australians.

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