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The relationship of hostility, negative affect and ethnicity to cardiovascular responses: an ambulatory study in Singapore

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Abstract

This study tested the hypotheses that ambulatory heart rate and blood pressure would be higher for individuals high but not low in hostility when they experienced negative affect or social stress and that this interaction would be stronger for Indians compared with other Singapore ethnic groups. Ambulatory blood pressure monitoring was done on 108 male Singapore patrol officers as they went about their daily duties. After each BP measurement participants completed a computerized questionnaire including items on emotional experience. Individuals high in hostility showed higher systolic blood pressure when reporting negative affect whereas this was not true for those low in hostility. Ethnic differences were obtained such that Indians showed an increase in mean arterial pressure when angered whereas MAP was negatively related to anger for Malays and unrelated for Chinese. Also a three-way interaction between ethnicity, hostility, and social stress indicated that hostility and social stress interacted in their effects on DBP for Indian participants but not for Chinese or Malays. Finally, a three-way interaction was obtained between ethnicity, hostility and negative affect for heart rate in which heart rate increased with increasing levels of negative affect for Chinese high in hostility and Malays low in hostility but decreased with increasing negative affect for all other participants. These data are consistent with higher CHD rates among individuals high in hostility and also provide additional evidence on ethnic differences in cardiovascular reactivity in Singapore.

Keywords: Ambulatory monitoring; Cardiovascular responses; Emotion; Hostility; Ethnic differences; Singapore

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1. Introduction

Over the past two decades evidence of a strong association between CHD and hostility has accumulated (Barefoot et al., 1983; Miller et al., 1996; Shekelle et al., 1983; Williams et al., 1980). For example, Barefoot and his colleagues (Barefoot et al., 1983) found a seven-fold increase in CHD over a 25 year period for men scoring high on the Cook and Medley (1954) Hostility (Ho) Scale as compared with those scoring low. Similar findings have been obtained in other studies and a meta-analysis has found that this relationship remains strong even when other risk factors for CHD are controlled for (Miller et al., 1996).

The psychophysiological reactivity model (Smith, 1992) hypothesizes that hostility contributes to the development of CHD through its association with heightened reactivity to stress on the part of highly hostile individuals. Such individuals are believed to show greater increases in heart rate (HR), blood pressure (BP) and the secretion of stress-related hormones when faced with certain types of stressors, in particular those that involve interpersonal challenge or social stress. Individuals high in hostility are expected to experience anger more frequently and intensely and this greater experience of anger is believed to produce greater physiological reactivity which is, in turn, hypothesized to accelerate the development of coronary artery disease and eventually CHD (Smith, 1992; Williams, 1994).

There is little evidence for heightened reactivity as a general response across all tasks or situations on the part of high hostile individuals. However, heightened reactivity has been found when individuals high in hostility are exposed to situations that can be considered social threatening (Smith, 1992; Suls and Wan, 1993) such as when research participants are harassed, involved in a social interaction task involving a high level of self-disclosure, or engaged in debate. Greater physiological reactivity has, in turn, been associated with later development of atherosclerosis and CHD (Kamarck et al., 1997; Manuck, 1994).

Although there is growing evidence for the relationship of anger/hostility to cardiovascular reactivity (CVR) and CHD, the cross-cultural validity of this relationship has only recently begun to be explored. Evidence for this relationship comes primarily from studies in the United States and other Western countries and most studies have involved Caucasians (Everson et al., 1995; Suarez et al., 1998; Suarez and Williams, 1990) with a few done among African-Americans (Durel et al., 1989). To date only a handful of studies have examined this relationship in Asia or with Asian populations. The few existing studies suggest that the relationship between anger/hostility and CVR may well differ by ethnic group. For example, a recent study comparing CVR among Chinese and Indian males (Bishop and Robinson, 2000) found significant differences between these groups in responses to harassment. Among Chinese the pattern obtained was similar to that found in North America, with high anger individuals showing increased CVR to harassment as compared with tasks with no harassment but no differences in CVR between harassment and no harassment for those low in anger. However, low anger Indians showed increases in CVR in response to harassment that were parallel to those for high anger Chinese whereas high anger Indians showed high levels of CVR regardless of harassment. Another study (Why et al., 2003) found evidence for different patterns of hemodynamic response between Chinese, Indians, and Malays. For Indians cardiac output was a positive function of hostility whereas vascular resistance was negatively associated with hostility, suggesting that Indians high in hostility may be cardiac reactors (Kasprowicz et al., 1990), a pattern not found among Chinese or Malays.

These differences in CVR between Indians and other ethnic groups in Singapore are particularly interesting in light of the fact that Indian Singaporeans die of heart disease at much higher rates than do Chinese or Malay Singaporeans. Hughes and his colleagues (Hughes et al., 1990) found that for males aged 30 to 69 the CHD death rates for Indians were 3.8 times those for Chinese and 1.9 times those for Malays. A similar but less marked pattern was observed for females. This pattern of high CHD rates among Indians has also been found in other countries such as the United Kingdom (Marmot et al., 1984), Canada (Anand et al., 2000), South Africa (Walker, 1980), and Trinidad (Miller et al., 1982). Since CVR has been shown to be associated with atherosclerosis and CHD, the differential pattern of CVR among Indians described above would appear to be consistent with their higher CHD rates.