

LETTERS TO THE EDITOR

Measuring demographic group differences in cardiovascular reactivity to stress using a mental challenge in the laboratory: problems of interpretation

EDITOR.—In their recent paper Carroll *et al*¹ showed that men and women in non-manual occupations exhibited greater diastolic blood pressure and heart rate responses to a mental arithmetic test than did people in manual occupations, a finding that they contrasted with known socioeconomic patterning of cardiovascular disease. They also demonstrated lower systolic blood pressure and heart rate reactivity to the test in women, which they considered more consistent with sex differences in cardiovascular disease. It does indeed seem likely that lower catecholamine and blood pressure reactivity to stress in women is one of the explanations for their lower rates of cardiovascular disease, an effect that has been ascribed largely to the effects of oestrogen.²

However, I suggest that Carroll *et al* cannot claim to have tested cardiovascular reactivity to stress, but only cardiovascular reactivity to a mental arithmetic test. Presumably the authors' aim was to use a mental arithmetic task to cause feelings of stress among participants, but they provide no information on whether this was indeed the effect of the task, and, most crucially, whether its effects were the same in all the demographic groups tested. Girdler and Light³ showed that women reported greater feelings of helplessness than men in response to a variety of laboratory stressors, but particularly after a mental arithmetic task, as well as reporting being less calm after all tasks, despite being more satisfied with their performance. In a different sample, Girdler *et al*⁴ showed that women reported significantly more tension during a mental arithmetic task than did men. It is certainly possible that similar effects may have occurred in the experiments conducted by Carroll *et al*, in which case we might be even more impressed by the fact that women showed less cardiovascular response, and more likely to ascribe this to biological differences between men and women.

It seems equally probable that the non-manual and manual groups may have experienced the stressor in very different ways. Thus, for example, the lower reactivity in the manual group could easily reflect lesser engagement with the task in this group. Indeed, in the absence of any plausible biological mechanism to suggest that higher socioeconomic groups should show more cardiovascular reactivity to stress, an explanation based on differing subjective reactions to the arithmetic task seems far more probable. Without data on subjective experience of the test, I suggest that general conclusions about demographically defined differences in cardiovascular reactivity to stress are difficult to justify from the data presented; the conclusions should be limited to a description of responses to a mental arithmetic test.

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- 1 Carroll D, Harrison LK, Johnston DW, *et al*. Cardiovascular reactions to psychological stress; the influence of demographic variables. *J Epidemiol Community Health* 2000;54:876–7.
- 2 Stoney CM, Davis M, Matthews KA. Sex differences in physiological responses to stress and in coronary heart disease. *Psychophysiology* 1987;24:127–31.
- 3 Girdler SS, Light KC. Hemodynamic stress responses in men and women examined as a function of female menstrual cycle phase. *Int J Psychophysiol* 1994;17:233–48.
- 4 Girdler SS, Jamner LD, Jarvik M, *et al*. Smoking status and nicotine administration differentially modify hemodynamic stress reactivity in men and women. *Psychosom Med* 1997;59:294–306.

Author's reply

EDITOR.—In analyses of three large age cohorts of men and women, we found that women showed lower cardiovascular reactions to a mental arithmetic challenge than men and manual lower reactions than non-manual social class groups.¹ We concluded that differences in cardiovascular disease among men and women could be mediated by variations in cardiovascular reactivity, but that this sort of mechanism was unlikely to underlie differences in the prevalence of cardiovascular disease among different social class groups. Dr Pollard challenges these conclusions, largely on the basis of our use of mental arithmetic as a stress task. She cites scattered findings by Girdler and colleagues^{2,3} that women feel more helpless after but tenser during mental arithmetic, and argues that our study may have, if anything,

underestimated sex differences in reactivity. She also speculates that the low reactivity in the non-manual group might have reflected disengagement from the task.

We have no information on the subjective impact of mental arithmetic in our study, but given the general tendency for men to be less declarative than women when it comes to negative affect,⁴ one can guess that women might respond more negatively. It remains to be determined, however, what impact such reporting tendencies have on cardiovascular reactivity. It would be rash to assume, as Dr Pollard does, that they have a substantial impact. I have spent a number of years exploring cardiovascular reactions to challenges such as mental arithmetic and have yet to find inter-individual correlations between subjective report and magnitude of reaction. My experience is far from unique.

We do have data on performance; women did less well in mental arithmetic than men, and manual did less well than non-manual groups. If the latter finding is considered consistent with the disengagement hypothesis, so must the former. Dr Pollard cannot have it both ways. Indeed, controlling for performance variations attenuated the sex differences in reactivity. I am not unsympathetic to the notion that social class differences in reactivity stem, at least in part, from differences in task engagement, even though they survived adjustment for performance in the present analyses. However, at the very least, our data suggest that could we equate engagement, by using a task that is less likely to privilege higher social class participants, lower social class participants would still not show higher reactions and, thus, our conclusion remains appropriate. Finally, it is worth pointing out that cardiovascular reactions to mental arithmetic are correlated with reactions to other commonly used stress challenges,⁵ and that our participants were tested at home and not “in the laboratory”.

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- 1 Carroll D, Harrison LK, Johnston DW, *et al*. Cardiovascular reactions to psychological stress: the influence of demographic variables. *J Epidemiol Community Health* 2000;54:876–7.
- 2 Girdler SS, Light KC. Hemodynamic stress responses in men and women examined as a function of female menstrual cycle phase. *Int J Psychophysiol* 1994;17:233–48.
- 3 Girdler SS, Jamner LD, Jarvik M, *et al*. Smoking status and nicotine administration differentially modify hemodynamic stress reactivity in men and women. *Psychosom Med* 1997;59:294–306.
- 4 Niven CA, Carroll D, eds. *The health psychology of women*. Reading: Harwood, 1993.
- 5 Turner JR. Inter-task consistency: An integrative review. *Psychophysiology* 1988;25:235–8.