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The Effects of the Spontaneous Presence of a Spouse/Partner and Others on Cardiovascular Reactions to an Acute Psychological Challenge

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Running head: Others' presence and reactivity

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Abstract

The presence of supportive others has been associated with attenuated cardiovascular reactivity in the laboratory. The effects of the presence of a spouse and others in a more naturalistic setting have received little attention. Blood pressure and heart rate reactions to mental stress were recorded at home in 1028 married/partnered individuals. For 112 participants, their spouse/partner was present; for 78, at least one other person was present. Women tested with a spouse/partner present showed lower magnitude systolic blood pressure and heart rate reactivity than those tested without. Individuals tested with at least one non-spousal other present also displayed attenuated reactivity. This extends the results of laboratory studies and indicates that the spontaneous presence of others is associated with a reduction in cardiovascular reactivity in an everyday environment; spouse/partner presence would appear to be especially effective for women.

Key words: acute stress, blood pressure, presence of spouse/partner, pulse rate, reactivity, social support

Exaggerated cardiovascular reactions to acute psychological challenge are considered a risk factor for cardiovascular pathology (Lovallo & Gerin, 2003; Schwartz et al., 2003) and several prospective studies have now shown consistently that high reactivity confers a modest additional risk for elevated blood pressure and other cardiovascular outcomes (e.g. Carroll, Ring, Hunt, Ford, & Macintyre, 2003; Markovitz, Raczynski, Wallace, Chettur, & Chesney, 1998; Treiber et al., 2003). In addition, a number of epidemiological studies have shown that social support is negatively associated with morbidity and mortality (e.g. Berkman & Syme, 1979; House, Robbins, & Metzner, 1982; Orth-Gomer & Johnson, 1987; Rosengren, Orth-Gomer, Wedel, & Wilhelmsen, 1993); marriage, strong social ties, and emotional support from others have all been linked to better general, including cardiovascular, health outcomes (e.g. Gordon & Rosenthal, 1995; Marmot et al., 1975; Orth-Gomer, Rosengren, & Wilhelmsen, 1993; Robles & Kiecolt-Glaser, 2003; Verbrugge, 1979). It has been hypothesised that social support may enhance cardiovascular health, at least in part, by attenuating the cardiovascular reactions to stress exposure (Kamarck, Peterman, & Raynor, 1998; Smith & Gerin, 1998).

A number of studies have now tested the proposition that the presence of supportive others attenuates cardiovascular reactivity (Lepore, 1998). A range of paradigms have been employed, but virtually all studies, for convenience, have tested student samples, particularly female students. For the most part, studies that have examined the effects of active social support have had students give a speech, usually on a controversial topic, and compared cardiovascular reactions to this task in different social contexts: alone, with challenging or non-supportive others present, with actively supportive others present. In general, those with supportive others present exhibited lower reactivity than those tested in other conditions (Christenfeld et al., 1997; Gerin, Pieper, Levy, & Pickering, 1992; Lepore, Allen, & Evans, 1993). A larger number of studies have examined the effects of the mere presence of others on cardiovascular reactions to an acute psychological challenge, most commonly mental arithmetic. Although there are exceptions (Allen, Boquet, & Shelley, 1991; Sheffield & Carroll, 1996; Snydersmith & Cacioppo, 1992), people tested with a friend present have been observed to show lower reactivity than those tested alone (Fontana, Diegnan, Villeneuve,

& Lepore, 1999; Gerin, Milner, Chawla, & Pickering, 1995; Kamarck, Annunziato, & Amateau, 1995; Kamarck, Manuck, & Jennings, 1990; Kors, Linden, & Gerin, 1997). However, those tested with a stranger present have been found to show relatively large cardiovascular reactions compared to those tested alone or with a friend (Edens, Larkin, & Abel, 1992; Snydersmith & Cacioppo, 1992).

Considered together, the data indicate that the social context influences cardiovascular reactions to acute stress exposure; reactivity is attenuated when participants are tested with intimates or individuals who are actively supportive. However, in these studies, either 'confederates' are employed to play explicit supportive and non-supportive roles or participants bring a friend to the laboratory or have a stranger allocated. It is important to inquire what the effects are of the spontaneous presence of others, i.e., initiated by other and not the researchers, during acute stress exposure in more familiar, everyday environments. It is also important to examine the effects of others' presence on reactivity in less homogeneous samples. Further, little attention has been paid to the impact of spousal/partner presence on reactivity. This is surprising given the predominance of marriage or long term partnership as a potential source of social support in non-student populations (e.g. Berkman, 1984; Phillips et al., 2006) and that marital status is associated with mortality (Burman & Margolin, 1992; Fox, Goldblatt, & Adelstein, 1982; Helsing & Szklo, 1981; Stroebe & Stroebe, 1983). An exception here is a study, conducted in participants' homes, in which the impact of spousal presence and others was determined. Participants tested with their spouse or friend present showed higher reactivity to serial subtraction but attenuated reactivity to the cold pressor test compared to when tested alone (Allen, Blascovich, & Mendes, 2002).

The present study examined the effects of the spontaneous presence of a spouse/partner, as well as the presence of others, on cardiovascular reactions to an acute psychological challenge. Participants were from a substantial and demographically diverse sample comprising three distinct age cohorts. They were tested in the familiar environment of their own homes.

Methods

Participants

Data were collected as part of the West of Scotland Twenty-07 Study. Participants were all from Glasgow and the surrounding areas in Scotland and have been followed up at regular intervals since the baseline survey in 1987 (Ford, Ecob, Hunt, Macintyre, & West, 1994). The data reported here are from the third follow-up when cardiovascular reactions to an acute psychological challenge were measured (Carroll et al., 2000; Carroll et al., 2003). Reactivity data were available for 1647 participants and marital/partner status known for 1636 of them. Of these, 1033 were married/partnered and the presence or absence of their spouse/partner at the testing session known for 1028, the effective sample[1]. They comprised three distinct age cohorts: 195 (19%) 24-year olds, 530 (52%) 44-year olds, and 303 (29%) 63-year olds, 549 (53%) were women and 479 (47%) men, and 501 (49%) were from manual and 527 (51%) non-manual occupation households. Overall mean age was 45.8 (standard deviation = 13.50) years. The mean ages of the youngest, middle, and eldest cohorts were 23.8 (standard deviation = 0.56), 44.1 (standard deviation = 0.78), and 63.1 (standard deviation = 0.68) years respectively. There were proportionally more women ($\chi^2(2) = 21.34$, $p < 0.001$) and proportionally more participants from manual occupational households ($\chi^2(2) = 12.28$, $p = 0.002$) in the youngest age cohort. Data were also available on the presence of others at the testing session for 986 of these participants. The characteristics of this slightly reduced sample were virtually identical to those of the overall sample of 1028[2].

Apparatus and procedure

Participants were tested in a quiet room in their own homes by trained nurses. Demographic information, including marital/partner status, was obtained by interview. Household occupational status was classified as manual or non-manual from the occupational status of the head of household, using the Registrar General's (1980) Classification of Occupations. For the youngest of the three cohorts, head of household was either the participant, if working and living independently, or the parent, if the participant was a student or lived with their parents. For the other two cohorts, head of household was either the participant or his/her spouse/partner, depending on which of the two held or had held the highest occupational status; this was usually the man. Height and weight were measured and body mass index computed. The mean body mass index for the sample of 1028 was 26.07 (standard deviation = 4.29) kg/m^2. The presence of a

spouse/partner during the session was noted, as was the number of others present. Participants were not given instructions regarding whether or not their spouse/partner or others could be present during testing; neither were they offered an explicit choice regarding the presence of others. As such, the presence of a spouse/partner and/or others was 'happenstance' rather than the result of an instruction from the nurse nor did it arise from a specific request from the participant. Presence refers to another person being in the same room as the participant throughout testing, within both visual and auditory contact. However, if a spouse/partner or other person was present, it was made clear by the nurses that the participant was not to be interrupted or distracted in any way during the testing. Participants were also shown seven cartoon faces, varying in expression from very happy to very unhappy, and asked to select the face that best characterised their feelings about their marriage/relationship (Andrews & Withey, 1976). In addition, they were asked to indicate on a 5-point scale from strongly agree to strongly disagree whether their spouse/partner loved and valued them, paid attention to them, upset them, argued with them, and whether they could rely on their spouse/partner. Their spouse/partner was not able to scrutinize participants' responses.

Participants undertook an acute psychological challenge: the paced auditory serial addition test (PASAT), which has been shown in numerous studies to reliably perturb the cardiovascular system (Ring, Burns, & Carroll, 2002; Ring et al., 1999; Winzer et al., 1999) and to demonstrate good test-retest reliability (Willemsen et al., 1998). Participants were presented with a series of single digit numbers by audiotape and requested to add sequential number pairs while retaining the second of the pair in memory for addition to the next number presented, and so on throughout the series. Answers were given orally and, if participants faltered, they were instructed to recommence with the next number pair. The correctness of answers was recorded as a measure of performance. The first sequence of 30 numbers was presented at a rate of one every four seconds, and the second sequence of 30 at one every two seconds. The whole task took three minutes, two minutes for the slower sequence and one minute for the faster sequence. Although no formal instructions were given to their spouse/partner if present, the stated demanding nature of the task ('a difficult mental arithmetic task'), illustrated by a brief practice session, and its brevity, meant that participants were task

focussed. In addition, only participants who registered a score on the PASAT were included in the analyses. Out of a possible score of 60, the median score was 45 (Inter-quartile range = 11).

Systolic blood pressure, diastolic blood pressure and heart rate were determined by an Omron (model 705CP) sphygmomanometer. This is one of the semi-automatic blood pressure measuring devices recommended by the European Society of Hypertension (O'Brien, Waeber, Parati, Staessen, & Myers, 2001). Following interview, (at least an hour), there was then a formal 5-minute period of relaxed sitting, at the end of which a resting baseline reading of systolic blood pressure, diastolic blood pressure, and heart rate was taken. Task instructions were then given and the participant allowed a brief practice to ensure that they understood task requirements. Two further systolic blood pressure, diastolic blood pressure, and heart rate readings were taken during the task, the first initiated 20 seconds into the task (during the slower sequence of numbers), and the second initiated 110 seconds later (at the same point during the fast sequence). For all readings, the nurses ensured that the participant's elbow and forearm rested comfortably on a table at heart level. The two task readings were averaged and the resting baseline value subsequently subtracted from the resultant average task value to yield reactivity measures for systolic blood pressure, diastolic blood pressure, and heart rate for each participant.

Statistical analyses

Analysis was largely by analysis of variance (ANOVA) and covariance (ANCOVA), with η^2 used as a measure of effect size. Initially, ANOVA was applied to establish that the PASAT perturbed cardiovascular activity. Subsequently, ANOVA was used to test the effects of the presence of spouse/partner and others on reactivity. For the latter, given the distribution, a binary, others not present versus others present, variable was constructed. Models without and with sex as an independent variable were tested; the latter were informed by results suggesting that women's reactivity may be particularly susceptible to the presence of a supportive other (Christenfeld et al., 1997; Gerin et al., 1992; Kamarck et al., 1990). Finally, ANCOVA allowed us to examine whether any effects that emerged from these primary analyses withstood adjustment for potential

confounding variables. The assumptions of ANOVA and ANCOVA in terms of homogeneity of variance and, in the latter, homogeneity of regression were met.

Results

Presence of spouse/partner and others

For 112 participants, their spouse/partner was present during the testing session. Proportionally more men (19%) than women (4%) had their partner present (χ^2 (1) = 57.58, p <0.001). This would be expected on the basis of sex differences in employment outside the home. Participants from the eldest cohort were more likely to have their spouse/partners present (χ^2 (2) = 6.93, p = 0.03), but there was no difference between manual and non-manual household occupational groups in this regard. Only 16 (1.6%) of the sample had same sex partners; these participants are included in the analysis but not analysed separately because of small numbers. Of the 986 participants with information available, 78 had at least one other, non-spousal, person present during the session. Men and women did not differ significantly in the likelihood of such another being present. However, the presence of other people was more likely for manual than non-manual household occupation participants (χ^2 (1) = 10.84, p = 0.001), and for the youngest and middle cohorts than the eldest cohort (χ^2 (2) = 9.88, p = 0.007). Finally, those with a spouse/partner present (35%) were much more likely than those without a spouse/partner present (5%) to have at least one other person there (χ^2 (1) =117.01, p <0.001).

Marriage/relationship quality

Almost uniformly**,** those tested with spouse/partner present reported that their marriage/relationship was a happy one. On the faces test, 110 (98%) selected one of the three happy faces to depict their feelings about their marriage/relationship; 96% of those tested without their spouse/partner made similar selections. Participants tested with their spouse/partner present were significantly more likely than those tested without to feel they were valued by (χ^2(1) = 3.89, p = 0.05) and could rely on their spouse/ partner (χ^2(1) = 4.03, p = 0.05), and were less likely to report that they received insufficient attention (χ^2(1) = 4.44, p = 0.04). There were no other significant differences between those tested with and without spouse/partner present.

Cardiovascular reactions to acute psychological challenge

Table 1 presents the means and standard deviations for the key cardiovascular variables. The increases from baseline to task in systolic blood pressure ($F(1,1027) = 1028.01$, $p < 0.001$, $\eta^2 = .500$), diastolic blood pressure ($F(1,1027) = 714.06$, $p < 0.001$, $\eta^2 = .410$), and heart rate ($F(1,1027) = 701.20$, $p < 0.001$, $\eta^2 = .406$) were statistically significant. Systolic blood pressure ($F(2,1025) = 6.23$, $p = 0.002$, $\eta^2 = .012$) and heart rate ($F(2,1025) = 6.82$, $p = 0.001$, $\eta^2 = .013$), but not diastolic blood pressure, reactivity varied by age cohort. The youngest cohort (mean = 9.33 mmHg, mean = 9.47 beats per minute) exhibited significantly smaller systolic blood pressure (mean = 9.33 mmHg) and larger heart rate (mean = 9.47 beats per minute) reactions that the middle (mean = 12.64 mmHg, mean = 7.84 beats per minute) and eldest cohorts (mean = 12.06 mmHg, mean = 6.35 beats per minute). Systolic blood pressure, but not diastolic blood pressure and heart rate, reactions differed between sexes ($F(1,1026) = 14.73$, $p < 0.001$, $\eta^2 = .014$); men (mean = 13.59 mmHg) reacted more than women (mean = 10.72 mmHg). Household occupational status was not related to blood pressure reactivity, but those from non-manual occupational households (mean = 8.73 beats per minute) showed higher heart rate reactions ($F(1,1026) = 13.31$, $p < 0.001$, $\eta^2 = .013$) than those from manual households (mean = 6.63 beats per minute).

[Insert Table 1 about here]

Cardiovascular reactivity and spouse/partner presence

ANOVA revealed no simple effects of spouse/partner presence of cardiovascular reactivity. However, subsequent analyses uncovered significant spousal presence x sex interaction effects for both systolic blood pressure ($F(1,1024) = 4.59$, $p = 0.03$, $\eta^2 = .004$) and heart rate ($F(1,1024) = 4.67$, $p = 0.001$, $\eta^2 = .005$) reactivity. For women, but not men, systolic blood pressure and heart rate reactions to acute psychological challenge were markedly attenuated in the presence of their spouse. The summary data are presented in Figure 1. Spousal presence also affected performance on the PASAT ($F(1,1026) = 4.70$, $p = 0.03$, $\eta^2 = .005$); participants with spouse/partner present performed more poorly (mean = 41.74, standard deviation = 9.83) than those without their spouse/partner present (mean = 43.69, standard deviation = 8.89). There was, however, no spouse/partner presence x sex interaction ($F(1,1024) = 0.60$).

[Insert Figure 1 about here]

Cardiovascular reactivity and spouse/partner presence controlling for possible confounding variables

The previous interaction effects were revisited using ANCOVA with PASAT performance entered as a covariate. The effects remained statistically significant: for systolic blood pressure reactivity ($F(1,1023) = 4.26$, $p = 0.04$, $\eta^2 = .004$); and for heart rate reactivity ($F(1,1023) = 4.16$, $p = 0.04$, $\eta^2 = .004$). Further, in analyses that, in addition to PASAT score, entered resting baseline levels, body mass index, age, cohort, household occupational status, and marital quality, from the faces test, as covariates, spouse/partner presence still significantly attenuated systolic blood pressure reactivity for women but not for men: ($F(1,1014) = 5.20$, $p = 0.02$, $\eta^2 = .005$); and heart rate reactivity ($F(1,1014) = 3.96$, $p = 0.04$, $\eta^2 = .004$). Summary statistics for all the potential confounding variables by spouse/partner present/not present are shown in Table 2.

[Insert Table 2 about here]

Cardiovascular reactivity and presence of others

ANOVA revealed that the presence of others, who were not the participant's spouse/partner, during the testing session also attenuated systolic blood pressure reactions to acute psychological challenge irrespective of sex ($F(1,983) = 3.71$, $p = 0.05$, $\eta^2 = .004$). The relevant means are displayed in Figure 2. In addition, subsequent analyses indicated that there was no presence of others x sex interaction effect. The presence of others had no significant effect on PASAT performance score (M = 42.17, standard deviation = 9.39 and mean = 43.60, standard deviation = 9.00 for those with and without others present). Finally, the effect of others present on systolic blood pressure reactivity withstood adjustment for the previous potential confounders ($F(1,976) = 4.42$, $p = 0.04$, $\eta^2 = .005$).

[Insert Figure 2 about here]

Cardiovascular reactivity and spouse/partner presence, controlling for presence of others

Participants tested with a spouse/partner present (35%) were much more likely than those tested without (5%) to have at least one other person present as well, ($\chi^2(1) = 117.01$, $p < 0.001$). Thus, the impact of spouse/partner on cardiovascular reactivity was re-visited, using ANCOVA and adjusting for the presence of others. These analyses again yielded spousal presence x sex interaction effects for systolic blood pressure reactivity ($F(1,980)$

= 4.43, p = 0.04, η^2 = .004) and heart rate reactivity (F(1,980) = 4.86, p = 0.03, η^2 = .005). The adjusted means are presented in Figure 3. Similarly, the main effect of others present on systolic blood pressure reactivity remained significant following adjustment for spouse/partner presence (F(1,982) = 3.80, p = 0.05, η^2 = .004).

[Insert Figure 3 about here]

Discussion

Women tested with a spouse/partner present showed lower magnitude systolic blood pressure and heart rate reactions to acute psychological challenge than those tested without. There was no such effect for men. Although spousal/partner presence was associated with impaired performance on the stress task, the reactivity dampening effect observed for women was not attributable to differences in performance. Thus, a parsimonious explanation for the present results in terms of spousal presence fostering distraction or task disengagement seems unlikely. In addition, the association also survived adjustment for other possible confounders, such as age, cohort, marital quality, household occupational status, body mass index, and resting cardiovascular activity, as well as adjustment for whether any others were also present. Consequently, the effect of spouse presence for women would not appear to be explainable by any obvious variable likely to affect reactivity or influence the likelihood of a spouse being present.

The only other study to address the issue of whether spousal presence alters cardiovascular reactivity reported results that, in part, differ from the present findings. Individuals were observed to display higher reactivity to serial subtraction when their spouse or a friend was present relative to being tested alone (Allen et al., 2002). Although it is possible that the discrepancy in results reflects the absence of random allocation to testing conditions in the present study, this seems unlikely, given that in the context of a cold pressor test, Allen et al. (2002) found that those tested with their spouse or friend were characterised by attenuated reactivity. Allen et al. (2002) instructed spouses and friends to be actively supportive, and they "cheered the participants on....making encouraging gestures" (p737). It is possible that such active encouragement affected the participants' performance, possibly causing them to 'overreach' in what, in contrast to the present challenge, was a self-paced task. There is support for this contention in the performance data of Allen et al (2002); participants tested with spouse

present attempted significantly more answers and made more errors than in the alone condition. In contrast to the present study, these performance variations were not adjusted for in the analyses. Further, where the effects of spouse or friend presence were unlikely to be influenced by performance variation, in their fixed time cold pressor test, the direction of effect matches that observed in the present study.

Research has tended to show that men benefit more from social support than women (e.g. Shumaker & Hill, 1991). However, previous laboratory studies revealing attenuated reactivity in participants tested with a friend present have all been conducted women, particularly female college students (Fontana et al., 1999; Gerin et al., 1995; Kamarck et al., 1995; Kamarck et al., 1990; Kors et al., 1997). Accordingly, it remains possible that the buffering effects of the presence of an intimate during acute stress exposure are manifest mainly for women. Why this might be the case is not clear. It has been argued that whether or not the presence of another attenuates reactivity may reflect the extent to which the other is regarded as evaluative (Kors et al., 1997); only where others are perceived as non-evaluative would attenuation of reactivity be expected. It has also been observed that as the social evaluative component of stress exposures increase, so too does cardiovascular reactivity (Smith, Nealey, Kircher, & Limon, 1997; Veldhuijzen van Zanten et al., 2004; Wright, Dill, Geen, & Anderson, 1998; Wright, Turstrall, Williams, Goodwinn, & Harmon-Jones, 1995). It is possible that women see their spouses/partners as less evaluative. However, we have no direct evidence for this suggestion. A few studies have now examined the effects of the sex of supportive other on cardiovascular reactions to challenge. Their findings are far from consistent. Supportive females have been found to attenuate reactions to a speech task whereas supportive men had no such effect; this occurred irrespective of the sex of the participant (Glynn, Christenfeld, & Gerin, 1999). In contrast, the sex of the participant has been observed to be more important than the sex of the supporter in the context of an emotional disclosure procedure; women benefited more than men, in terms of lower reactivity, from emotional support provided by men (Fritz, Nagurney, & Hegelson, 2003). Finally, during a speech challenge, no main effects of sex of supporter have been reported, although women who interacted with a female friend regarded as an ambivalent network member showed higher reactivity than women who interacted with an

ambivalent male network member or a supportive female network member (Uno, Uchino, & Smith, 2002). These latter two studies would appear to suggest that supportive men, and most of the women in the present study would seem to have regarded their male partners as generally supportive, can effect a reduction in women's cardiovascular reactions to acute psychological challenge.

In the present study, irrespective of sex, those tested with at least one non-spousal other present also displayed attenuated systolic blood pressure reactivity, an outcome that again survived adjustment for a range of possible confounders. The effects of spouse/partner and others' presence appeared to be independent of one another. Although we only have information on the numbers of others present and not on their relationship to the participant, it is extremely unlikely they were strangers. Informal reports from those conducting the testing sessions indicated that they were invariably co-resident family, other relatives, or friends. Accordingly, the attenuation of reactivity is what would be expected. However, in contrast to the associations between reactivity and the presence/absence of a spouse/partner, those for presence/absence of others were not sex specific. Thus, it possible that the precise way in which the presence of others is associated with reactivity depends on the closeness and intimacy of the other person present to the participant. For example, it has been observed that those who were tested with a friend regarded as a supportive network member as opposed to an ambivalent network member showed attenuated reactivity (Uno et al., 2002). This is certainly an area worthy of further inquiry, and fits broadly with the data from ambulatory studies of daily stress and social support, where higher quality of social support buffered the impact of stress on blood pressure and heart rate (Steptoe, 2000). Indeed, higher contact with spouse along with greater marital satisfaction was found to be associated with lower ambulatory blood pressure over three years (Baker, Szalai, Paquette, & Tobe, 2003). Workplace support has also been found to be negatively related to ambulatory blood pressure (Carels, Blumenthal, & Sherwood, 1998; Evans & Steptoe, 2001; Karlin, Brondolo, & Schwartz, 2003).

The present study suffers from a number of limitations and must be regarded as preliminary. First, although a large sample, there was still insufficient power to properly explore possible marital quality effects. Only 22 women were tested with their

spouse/partner present, and analyses were limited to adjusting for overall marital quality. In addition, measures of the level of engagement between participants and others present were not available, although spouse/partners and others present were not allowed to interfere with the participant during the testing session. Studies measuring cardiovascular reactivity in spousal conflict interactions have observed complex effects reflecting relative hostility (Broadwell & Light, 2005; Ewart, Taylor, Kraemer, & Agras, 1991) and relative dominance (Brown, Smith, & Benjamin, 1998). Thus, marital quality, particularly for women, would seem to be worth further exploration in this context. Second, participants were not randomly allocated to the spouse or others presence or absence conditions. This does diminish the internal validity of the study and it remains possible that some unmeasured psychosocial factors determined spousal presence or absence. However, statistical adjustment was made for many potential confounding variables, and the observed associations persisted. It should be conceded, however, that confidence in the present results would have benefited from a fuller and more accurate measurement of potential confounders. Nevertheless, the spontaneity of spousal presence can be regarded as lending the present study greater external validity than a true randomized controlled trial of support. Given that social support is not something that is randomly allocated in life, it could be argued that this study provides a realistic and generalisable test of its influence on cardiovascular reactivity. Third, no formal data were collected on the relationship to the participant of others present. However, the circumstances of the interview and the informal testimony of those carrying out the testing indicated that the others present were most likely to be family or friends and were definitely not strangers; nevertheless, data on closeness of their relationship to the participant would have enriched the current analyses. Fourth, although performance on the stress task seems a reasonable proxy for task engagement, in hindsight it would have been useful to have self-report measures of task impact and the possible distraction contingent on the presence of spouse/partner or others. Finally, only blood pressure and heart rate were measured. Although, it would have been useful to have a more comprehensive assessment of haemodynamics of the sort afforded by impedance cardiography, the large sample and the decision to test participants in their homes precluded this. In addition, it is worth noting that virtually all the previous laboratory

studies of social support have similarly restricted their focus to blood pressure and heart rate.

In summary, the present analyses provide preliminary evidence that for women, the presence of spouse/partner during testing was associated with attenuated systolic blood pressure and heart rate reactions to an acute psychological challenge. Both women and men tested in the presence of non-spousal others showed lower systolic blood pressure reactivity than those without others present. Considered together, the present results extend the findings of previous laboratory studies of social support in a number of ways. First, the current findings indicate that the spontaneous presence of spouse/partner or other people are associated with reduced reactivity, in a more everyday environment. Second, this is also the first evidence of such relationships with social support in a diverse sample, varying in age and occupational status.

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Footnotes

[1] Those for whom spouse/partner presence data were available did not differ from the remainder of the sample in terms of age, sex, cohort, BMI, household occupational status, baseline cardiovascular levels, reactivity, or paced auditory serial addition test performance score.

[2] Those for whom presence of others was known did not differ from the remainder of the sample with the exception of baseline heart rate which was significantly higher in those for whom the presence of others was known (mean difference = 11 bpm, $t(110) = 2.59$, $p = .01$).

Table 1. Mean (standard deviation) cardiovascular activity at baseline and during the PASAT, and mean (standard deviation) cardiovascular reactivity.

	Baseline	During PASAT	Reactivity
Systolic blood pressure (mmHg)	130.9 (20.76)	143.0 (22.10)	12.1 (12.06)
Diastolic blood pressure (mmHg)	80.2 (11.48)	87.3 (12.40)	7.1 (8.48)
Heart rate (beats per minute)	66.3 (10.78)	74.0 (11.97)	7.7 (9.32)

Table 2. Summary Statistics (Means and standard deviations where applicable) of Potential Confounders by Spouse/Partner Present and Not Present Group.

	Spouse/partner Present		Spouse/partner Not Present	
	Male	Female	Male	Female
PASAT score	42.4 (9.58)	39.0 (10.54)	44.7 (8.83)	42.9 (8.87)
Age	49.9 (13.71)	45.1 (13.99)	48.0 (12.67)	44.5 (13.77)
Cohort - % Young Cohort	14	23	13	24
- % Middle Cohort	42	50	54	52
- % Older Cohort	44	27	33	24
Body Mass Index	27.5 (3.88)	26.7 (5.54)	26.2 (3.50)	25.7 (4.50)
Occupational Status (% manual)	50	68	50	46
Baseline systolic blood pressure	139.6 (20.44)	126.5 (18.83)	136.0 (18.08)	125.8 (21.37)
Baseline heart rate	65.9 (10.01)	71.2 (9.63)	64.0 (10.51)	67.9 (10.85)
Marital Quality*	1.49 (0.71)	1.36 (0.49)	1.71 (0.85)	1.69 (0.92)

* Scored on a 7-point scale, 1 = very happy, 7 = very unhappy

Fig. 1. Mean (SE) systolic blood pressure and heart rate reactions to acute psychological challenge for women and men tested with (N = 22 and 90 respectively) and without (N = 526 and 387 respectively) their spouse/partner present

Fig. 2. Mean (SE) systolic blood pressure reactions to acute psychological challenge for participants tested with (N = 78) and without (N = 908) at least one other non-spousal person present

Fig. 3. Adjusted mean (SE) systolic blood pressure and heart rate reactions to acute psychological challenge for women and men tested with (N = 21 and 86 respectively) and without (N = 504 and 374 respectively) their spouse/partner present, controlling for the presence of non-spousal others.