Association of hypotension with positive and negative affect and depressive symptoms in the elderly

ANTHONY F. JORM

Background Previous research associating hypotension with depression has produced inconsistent results. A possible reason is that depressive symptom scales reflect both high negative affect and low positive affect.

Aims To examine the association of hypotension with depressive symptoms, negative affect and positive affect.

Method Community survey of 340 elderly persons aged 77–99 years.

Results Diastolic hypotension had a weak association with depression, no association with negative affect and a strong inverse association with positive affect. Systolic hypertension was associated with positive affect. Use of antihypertensive medication was independently associated with lower positive affect.

Conclusions Diastolic hypotension shows a specific association with low positive affect. This association may explain the weak and inconsistent results of earlier studies relating hypotension to depression.

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A number of studies have reported associations of hypotension with depressive symptoms (Pilgrim et al., 1992; Barrett-Connor & Palinkas, 1994; Henderson et al., 1997; Stroup-Benham et al., 2000), fatigue (Wessely et al., 1990) or lower well-being (Rosengren et al., 1993). A longitudinal study found that low blood pressure at baseline predicted later depression scores, whereas high depression scores at baseline did not predict later hypotension (Paterniti et al., 2000). However, the associations reported have been weak and inconsistent (Gilmore et al., 1995; Donner-Banzhoff et al., 1997).

Depression and affective systems

One interpretation is that the positive associations in the literature are simply due to selective reporting of Type I errors (Donner-Banzhoff et al., 1997). However, another possibility is that depression scales are only weakly tapping the psychological characteristics associated with hypotension. Research into the psychology of emotion has distinguished two independent affective systems, involving positive and negative affect. Whereas anxiety involves the negative affect system, depression involves both high negative affect and (to a lesser degree) low positive affect (Watson et al., 1988; Clark et al., 1994). According to Watson et al. (1988), high positive affect is “a state of high energy, full concentration, and pleasurable engagement, whereas low [positive affect] is characterized by sadness and lethargy” (p. 1063). The same authors describe negative affect as “a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness, with low [negative affect] being a state of calmness and serenity” (p. 1063). The present study assessed the association of hypotension with measures of depression, anxiety, positive affect and negative affect.

METHOD

Participants were 340 community-dwelling persons aged 77–99 years from the third wave of a longitudinal study based in Canberra and Queanbeyan, Australia (Henderson et al., 1997; Korsten et al., 1999). Blood pressure was measured twice in the interview using an Omron automatic digital blood pressure/pulse monitor (Model HEM-703C) and the results were averaged. Following Barrett-Connor & Palinkas (1994), normal systolic pressure was defined as 120–139 mmHg and normal diastolic pressure as 75–84 mmHg. Participants also were given anxiety and depression symptom scales (Goldberg et al., 1988; Mackinnon et al., 1994) and a range of physical health measures (Korsten et al., 1999). On Wave 3 only, participants were asked to self-complete the Positive and Negative Affect Scales (PANAS; Watson et al., 1988). The PANAS consist of 20 words describing emotions: 10 positive and 10 negative. Participants were asked to rate each word to indicate ‘to what extent you feel this way in general’. There was a five-point rating scale ranging from ‘very slightly’ to ‘not at all’ to ‘extremely’.

Multiple linear regression analyses were carried out to predict the affect score from hypotension and hypertension (dichotomous variables). To control for potential confounders, additional regression analyses were carried out with the confounders entered as simultaneous predictors.

RESULTS

Table 1 shows the mean scores on depression, anxiety and affect measures for the blood pressure groups. Diastolic hypotension was weakly associated with higher depression (unstandardised \(\beta=0.55, P=0.031\)), was not associated with negative affect and was strongly associated with lower positive affect (\(\beta=-3.21, P=0.0002\)). The association with positive affect was found separately in males and females and when those taking anti-hypertensive medication were excluded (not shown). Systolic hypertension was associated with higher positive affect (\(\beta=2.12, P=0.015\)), but the number of participants with systolic hypotension was too small to evaluate adequately its association with
positive affect. When individual PANAS items were examined for associations with hypotension, significant differences ($P < 0.05$) were found for Interested, Strong, Enthusiastic, Inspired, Determined and Attentive between subjects with diastolic hypotension and those with normal diastolic blood pressure.

To control for possible confounders, a multiple linear regression analysis was carried out to predict the positive affect from hypotension, hypertension, use of antihypertensive medication, age, gender, education, marital status and a range of physical health and cognitive measures (see Korten et al., 1999, for details). Controlling for these factors, positive affect was related to diastolic hypotension (unstandardised $\beta = -2.18$, $P = 0.031$) and the use of antihypertensive medication ($\beta = -2.61$, $P = 0.004$). Antihypertensive medication was being taken by 39% of the sample. Among those on medication, 24% had diastolic hypotension and 5% had systolic hypotension.

**DISCUSSION**

Diastolic hypotension was associated with lower positive affect but not with higher negative affect. The weak and inconsistent associations of hypotension with depression in the literature could be because depression measures are correlated more strongly with negative affect than with low positive affect.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Diastolic hypertensive ($n$)</th>
<th>Diastolic normotensive ($n$)</th>
<th>Diastolic hypertensive ($n$)</th>
<th>$P^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>2.35 (1.98–2.71)</td>
<td>1.89 (1.44–2.16)</td>
<td>1.99 (1.65–2.32)</td>
<td>0.087</td>
</tr>
<tr>
<td>Anxiety</td>
<td>2.39 (2.02–2.76)</td>
<td>2.20 (1.81–2.59)</td>
<td>2.21 (1.82–2.60)</td>
<td>0.738</td>
</tr>
<tr>
<td>Positive affect</td>
<td>29.90 (28.65–31.16)</td>
<td>33.12 (31.96–34.27)</td>
<td>32.75 (31.54–33.96)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Negative affect</td>
<td>17.19 (15.94–18.45)</td>
<td>16.95 (15.70–18.21)</td>
<td>18.19 (16.74–19.63)</td>
<td>0.389</td>
</tr>
</tbody>
</table>

Effect of antihypertensive medication

Diastolic hypotension was found in a quarter of users of antihypertensive medication, suggesting that treatment might lead to hypotension in some cases. Furthermore, the use of antihypertensive medication was found to be associated with low positive affect when blood pressure status was statistically controlled. As previous studies have done, we defined hypotension based on a single measurement occasion (although measured twice), which would have involved some unreliability. Whether or not a participant uses antihypertensive medication may be an independent predictor because it gives additional reliable information about blood pressure status. Unfortunately, we did not collect data on type of medication, so we could not explore whether the association is a general one or specific to particular classes of medication.

**Limitations**

Other limitations of this study must be acknowledged. A cross-sectional study such as this one cannot distinguish whether hypotension is a cause or effect of low positive affect, or whether there is a common cause of both. Although the present study had longitudinal data on blood pressure, positive affect was measured only at Wave 3. Another limitation is that the use of psychotropic medication, which is another potential confounding variable, was not measured. The association of hypotension with lower positive affect requires further research in
longitudinal studies and in controlled trials of antihypertensive treatment.

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