Reply to Sauder and Ray

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TO THE EDITOR: Ray’s group (see Ref. 5) has performed elegant experiments that demonstrate a potential interaction between the vestibulosympathetic reflex and the baroreflex in humans. In their experiments, head-down rotation (HDR) was performed to stimulate the vestibulosympathetic reflex, and response of muscle sympathetic nerve activity (MSNA) was evaluated during unloading of the cardiopulmonary and arterial baroreceptors with lower body negative pressure or sodium nitroprusside infusion in the prone position (2, 3). Under these conditions, HDR elicited further increases in MSNA. Furthermore, the HDR-induced increase in MSNA was greater in the 60° head-up tilt (HUT) position than in the prone position (4). These results indicate that the sensitivity of the vestibulosympathetic reflex is enhanced by an interaction with the baroreflex, and strongly suggest that the role of the vestibulosympathetic reflex in controlling arterial pressure (AP) becomes more important with a change in posture from recumbent to upright.

We also recently reported an interaction between the vestibulosympathetic reflex and the carotid sinus baroreflex (1). In our study, we conducted open-loop baroreflex analysis on anesthetized rats with intact or lesioned vestibular organs, with the rats placed in the prone or HUT position. HUT shifted the neural arc [carotid sinus pressure-sympathetic nerve activity (SNA) relationship] to a higher SNA and shifted the peripheral arc (SNA-AP relationship) to a lower AP, consequently moving the operating point to a higher SNA while maintaining AP. In rats with vestibular lesions, HUT-induced neural arc shift was completely abolished and the lower shift of the peripheral arc was larger, indicating that the vestibular system elicits sympathoexcitation, shifting the baroreflex neural arc to a higher SNA and maintaining AP during HUT.

Although both our study and that of Ray et al. demonstrated interaction between the vestibulosympathetic reflex and the baroreflex, the modality of interaction is different in the two cases. In the study of Ray et al., the baroreflex enhanced the sensitivity of the vestibulosympathetic reflex; whereas in our study, the vestibulosympathetic reflex modulated the neural arc and the peripheral arc of the baroreflex, which is important for maintaining the maximum gain of the baroreflex, because both arcs are serially connected to determine the total baroreflex functional curve. Otherwise, the maximum gain decreases during HUT. On the basis of these interactions, the vestibulosympathetic reflex and the baroreflex may cooperate to maintain AP during the transition in posture from recumbent to upright.

DISCLOSURES
No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS
Author contributions: H.M. conception and design of research; H.M. and C.A. performed experiments; H.M. and C.A. analyzed data; H.M. and C.A. interpreted results of experiments; H.M. and C.A. prepared figures; H.M. edited and revised manuscript; H.M. and C.A. approved final version of manuscript.

REFERENCES