

worry-prone participants exhibited slowed transfer of angry-face information from the left to the right hemisphere. These individual differences are consistent with earlier behavioral evidence of altered interhemispheric communication of angry faces in anxiety, and may be interpreted within a threat-avoidance model of worry. Together, the findings suggest that hemispheric correlates of emotion extend beyond regional activation asymmetries to include alteration in communication between the hemispheres.

doi:10.1016/j.bandc.2008.02.113

Effects of emotion on brain organization for language processing

Gina M. Grimshaw^a, Amy Ramos^b, Colby Carter^c, Julie-Anne Séguin^a, Hazel K. Godfrey^a

^a School of Psychology, Victoria University of Wellington, P.O. Box 600, Wellington, New Zealand

^b Department of Psychology, Willamette University, 900 State Street, Salem, OR, 97301, USA

^c Psychology Department, California State University San Marco, 333 S. Twin Oaks Valley Road, San Marcos, CA 92096-0001, USA

Left hemisphere specialization for linguistic processing is a central tenet of neuropsychology. However, this specialization is relative and not absolute, and shifts dynamically with a number of variables. One important factor that influences brain organization for language processing is emotional tone of voice, which relies primarily on a distributed network of right hemisphere systems. In this talk I will consider how emotional prosody influences hemispheric specialization for language processing. Much of this research is informed by Heller's neuropsychological model of emotional processing, which considers both valence (associated with a left/right frontal asymmetry) and arousal (associated with right parietal activity), as independent dimensions.

In a series of dichotic listening experiments, participants listened for a target word (a linguistic task). The emotional prosody of the voice could be happy, angry, sad or neutral, although the tone of voice was irrelevant to the task. When the words were spoken in a neutral, happy, or angry tone of voice, the typical right ear advantage (REA; reflecting left hemisphere specialization for linguistic processing) was observed. However, when the words were spoken in a sad tone of voice, the REA was eliminated (in Experiment 1) or reduced (in Experiment 2). These findings are consistent with Heller's neuropsychological model of emotional processing, and suggest that the sad tone of voice activated right frontal networks associated with sadness. Alternatively, the psychoacoustic properties of sad prosody may facilitate right hemisphere linguistic competence. An understanding of the interactions between left and right

hemisphere processes is essential for any complete neuropsychological model of language processing.

doi:10.1016/j.bandc.2008.02.114

Specificity of regional brain activity in anxiety types during emotion processing

Wendy Heller^a, Anna S. Engels^a, Aprajita Mohanty^b, John D. Herrington^c, Marie T. Banich^d, Gregory A. Miller^a

^a Psychology Department, University of Illinois at Urbana-Champaign, 603 East Daniel St., Champaign, IL 61820, USA

^b Department of Psychology, Northwestern University, 2029 Sheridan Road, Evanston, IL 60208, USA

^c Department of Psychology, Yale University, P.O. Box 298205, New Haven CT 06520-8205, USA

^d Department of Psychology, University of Colorado at Boulder, Muenzinger Building, Room D244, 345 UCB, Boulder, CO 80309-0345, USA

In the course of investigating a neuropsychological model of emotion that drew upon the circumplex model of emotion and hypothesized that the psychological dimensions of valence and arousal were associated with distinct neural systems, it became clear to us that it was critical to distinguish not only between depression and anxiety, but between two types of anxiety. Based on the computations involved, the model based on the circumplex would apply only to anxious arousal (i.e., panic or fear). Specifically, the hypothesized dependence of the arousal dimension on asymmetric right hemisphere activity would predict such a pattern in this type of anxiety. In contrast, anxious apprehension (i.e., worry) might be expected to involve more left hemisphere activity, in keeping with the emphasis on verbal rumination. Although there is evidence to support the psychological and physiological distinction between these two types of anxiety and the neural systems that are associated with them, it has been difficult to reconcile the left hemisphere bias in anxious apprehension with the predicted left hemisphere bias in pleasant emotion. In the research reported here, we tested the hypothesis that anxious apprehension involves more left- than right-hemisphere activity and that anxious arousal is associated with the opposite pattern. Behavioral and fMRI responses to threat stimuli in an emotional Stroop task were examined in nonpatient groups reporting anxious apprehension, anxious arousal, or neither. As predicted, brain activation distinguished anxious groups. The anxious apprehension group showed more left-hemisphere activation in inferior frontal gyrus (IFG: Broca's area), consistent with a more verbally mediated response to threatening cues. In contrast, the anxious arousal group showed more right-hemisphere temporoparietal activity. These results are consistent with hypotheses that the right hemisphere houses an integrated system for responding to immediate threat, promoting sympathetic nervous system activity,

spatial attention, visual scanning of the environment, and sensitivity to meaningful nonverbal cues. Addressing the apparent contradiction regarding left-frontal involvement in emotion, distinct left frontal regions were associated with anxious apprehension vs. processing of positive information. Whereas left IFG was more active for the anxious apprehension group for negative than for neutral words and was sensitive to group differences, an anatomically and functionally distinct region in left dorsolateral prefron-

tal cortex (DLPFC) was more active when a stimulus contained positive emotional content and showed no group differentiation. Results support the proposed distinction between the two types of anxiety and resolve an inconsistency about the role of left-frontal activation in emotion and psychopathology.

doi:10.1016/j.bandc.2008.02.115
