Visual Speed Sensitivity in the Drum Corps Color Guard

Nestor Matthews[1], Leslie Welch[2], F. Daniel Coplin[3], Allison Murphy[1], & Megan Puritz[1]

[1] Department of Psychology, Denison University

[2] Cognitive, Linguistic & Psychological Sciences, Brown University

[3]Department of Psychology & Neuroscience Program, The College of Wooster

Introduction: Drum corps color guard experts spend years developing skills in spinning rifles, sabers, and flags. Their expertise provides a unique window into factors that govern sensitivity to the speed of rotational and radial motion. Rotational and radial motion register in the Medial Superior Temporal (MST) region of the primate visual system, according to prior neurophysiological research (Tanaka & Saito, 1989; Duffy & Wurtz, 1991). To the extent that shared neural events govern rotational and radial speed sensitivity, one would expect expertise on either task to transfer to the other. One similarly would expect shared neural events to generate correlations between rotational and radial speed sensitivity. We psychophysically evaluated these predictions via visual speed sensitivity tests on drum corps color guard experts and controls.

Method: Drum corps color guard experts (n=26), drum corps low brass experts (n=29), and age-matched controls with no drum corps experience (n=24) viewed displays containing bilaterally presented dynamic plaid stimuli. The "standard" plaid either expanded / contracted at two octaves per second (radial task), or completed two rotations per second (rotational task). The "test" plaid moved slower than the standard by various amounts. The standard and test sides varied randomly across trials. Participants reported which side contained faster motion.

Results: A modest but statistically significant group-by-task interaction indicated that, relative to low brass experts, color guard experts exhibited greater rotational speed sensitivity but worse radial speed sensitivity ($F(1,53)=8.806$, $p=0.004$, ${}_p\eta^2=0.142$, power=0.83). This pattern replicated three weeks later among the same participants, and also when controls who had no drum corps experience replaced low brass experts. Additionally, radial speed sensitivity and rotational speed sensitivity each exhibited significant test / retest reliability ($p<0.001$), but near-zero between-task correlations (n.s.).

Conclusion: The findings match predictions that follow from a dissociation between the neural events governing rotational and radial speed sensitivity.

Word Count: 300