FACES OF EMOTION IN PARKINSON’S DISEASE: Micro-expressivity and Bradykinesia during Voluntary Emotions

D. Bowers¹,4, W. Bosch¹,4, C. Peden²,4, W. Triggs³,4, and D. Gokcay¹,5

¹Clinical & Health Psychology, ²Neuroscience, ³Neurology, and the ⁴Cognitive Neuroscience Lab at the McKnight Brain Institute, University of Florida and the ⁵Swarz Center for Computational Neuroscience at the Salk Institute

ABSTRACT

Previous investigators have has suggested that the “masked faces” of Parkinson’s disease involves spontaneous, but not voluntarily expressed emotions. In contrast, we hypothesized that even voluntary expressions are affected due to decreased dopaminergic innervation of frontal motor systems in PD. To test this hypothesis, we used sophisticated computer imaging techniques to quantify dynamic facial expressions that were voluntarily produced by PD patients and normal controls. Neither group was demented nor clinically depressed. Relative to controls, Parkinson patients had reduced facial mobility (micro-expressivity) and were significantly slowed in reaching a peak expression (bradykinesia). These findings add to the literature in two ways: First, the masked faces of PD is not limited to spontaneous facial emotions, but also involves voluntary or posed facial expressions. Second, the use of PD as a model system for the neuroanatomic dissociation between voluntary and spontaneous expressions is unjustified. Both systems appear detrimentally influenced by depleted dopamine innervation of the brain.

RESULTS

Analyses:
Overall entropy and the time to reach a peak expression were obtained for each expression. These dependent variables were independently analyzed using repeated measures Group (PD, NC) X Affect ANOVAs.

Results

1. Micro-Expressivity: PD patients displayed significantly less facial movement as indexed by Entropy (p < 0.0001)

2. Bradykinesia: PD patients took longer to reach the peak facial expression (p < 0.01)

CONCLUSION

We used sophisticated computer imaging techniques to quantify dynamic facial expressions that were voluntarily produced. Relative to controls, Parkinson patients had reduced facial mobility (micro-expressivity) and were significantly slowed in reaching a peak expression (bradykinesia) relative to controls. These parameters correspond to what is observed in other aspects of the motor behavior (e.g., hypometria, micrographia) associated with PD.

Our findings add to the current literature on facial expressivity in two ways. First, the “masked faces” of Parkinson disease is not limited to spontaneous facial emotions, but also involves voluntary or posed facial expressions. Second, the use of PD as a model system for the neuroanatomic dissociation between voluntary and spontaneous expressions is unjustified. Both systems appear detrimentally affected by depleted dopamine innervation of the brain.