to investigate if there is an association between infecting P.a. variants (nonmucoid, mucoid, or mixed populations), the lung lobes in which these variants are found, and regional proinflammatory cytokine production. METHODS/ STUDY POPULATION: We performed BAL on 16 CF patients with clinically stable disease. For each patient, we obtained BAL fluid from the right upper lobe, right middle lobe, right lower lobe, left upper lobe, lingula, and left lower lobe. We plated BAL fluid on nonselective and P.a.-selective medium to quantitate bacteria and to identify P.a. colony subtypes (nonmucoid, mucoid, or mixed). We further used a V-PLEX human cytokine array to quantitate inflammatory cytokine concentrations (IL-1β, TNF-α, IL-6, IL-8, and IL-10) within BAL fluid specimens. Our specimen collection was approved by the local IRB with informed consent and assent obtained from patient volunteers. RESULTS/ANTICIPATED RESULTS: Based on microbiological analysis, each lobar BAL specimen was classified as uninfected with P. a. or infected with nonmucoid, mucoid, or mixed (both nonmucoid and mucoid) P.a. variants. There was no observed propensity of mucoid or nonmucoid variants to be confined to certain lung lobes in our cohort. However, infection with mucoid P.a. variants was associated with higher concentrations of IL-1β ($p < 0.001$), TNF-α ($p < 0.001$), IL-8 ($p < 0.001$), and IL-10 ($p < 0.001$) within lobar BAL fluid compared with P.a.-free specimens. Specimens with mucoid variants also had greater concentrations of TNF-α ($p < 0.01$), IL-8 ($p < 0.001$), and IL-10 ($p < 0.05$) compared with specimens with only nonmucoid P.a. variants. Patients infected with mixed mucoid and nonmucoid variants showed higher concentrations of TNF-α and IL-10 ($p < 0.05$) as well as nonsignificant trends for higher concentrations of IL-1β and IL-6 compared to P.a.-free samples. Interestingly, the presence of nonmucoid P.a. variants was inversely correlated with IL-6 ($p < 0.05$). Total bacterial burden (both P.a. and non-P. a. species) within BAL fluids was positively correlated with higher proinflammatory cytokine concentrations. Additionally, independent of bacterial colonization, the upper lobes (right upper lobe and left upper lobe) of the lungs showed trends towards higher proinflammatory cytokine concentrations compared with the lower lobes (right lower lobe and left lower lobe). DISCUSSION/SIGNIFICANCE OF IMPACT: Our results demonstrate that P.a. variants (mucoid or nonmucoid) appear not to be geographically restricted in ability to colonize any lobe of the CF lung. Moreover, infection with mucoid P.a. (either alone or in mixed populations with nonmucoid variants) is associated with higher inflammatory cytokine concentrations in the CF lung. Given that infection with mucoid P.a. predicts deterioration in pulmonary function, this study provides a rationale for further investigation of cytokines as diagnostic/prognostic correlates of infection and lung disease in CF.

Multivariate air pollutant exposure prediction in South Carolina

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Ray Boaz, Andrew Lawson and John Pearce

Department of Public Health Sciences, Medical University of South Carolina

OBJECTIVES/SPECIFIC AIMS: The objective of this project is the application of complex fusion models, which combine observed and modeled data, to areas with sparse monitoring networks with multiple chemical components is under-developed. Such models could provide improved accuracy and coverage for air quality measurement predictions, an area greatly limited by the amount of missing data. METHODS/STUDY POPULATION: This project focuses on the development of methods for improved estimation of pollutant concentrations when only sparse monitor networks are found. Sparse monitoring networks are defined as areas where fewer than three criteria air pollutants (based on EPA standards) are monitored. Particularly, a multivariate air pollutant statistical model to predict spatio-temporally resolved concentration fields for multiple pollutants simultaneously is developed and evaluated. The multivariate predictions allow monitored pollutants to inform the prediction of nonmonitored pollutants in sparse networks. RESULTS/ANTICIPATED RESULTS: Daily, ZIP code level pollutant concentration estimates will be provided for 8 pollutants across South Carolina, and goodness of fit metrics for model variants and previously established methods will be compared. DISCUSSION/SIGNIFICANCE OF IMPACT: These methods utilize only widely available data resources, meaning that the improved predictive accuracy of sparsely monitored pollutant concentrations can benefit future studies in any US area by improving estimation of health effects and saving resources needed for supplemental air pollutant monitoring campaigns. Our method for estimation attempts to improve predictive accuracy and data availability for sparsely monitored pollutants and areas.

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Neural correlates of externally Versus internally guided dance-based therapies for people with Parkinson's disease

Amrit Kashyap[1], Madeleine Hackney[1], Venkatagiri Krishnamurthy[1], Lisa Krishnamurthy[1], Krish Sathian[2], Bruce Crosson[2], Steve Wolf[1], Daniel Corcos[1], Jonathan Drucker[1], Marian Evatt[1], Gopi Kaundinya[1], Aaron Bozzorg[1] and Ariel Hart[1]
[1] Department of Radiology & Imaging Sciences, Emory University;
[2] Department of Neurology, Emory University

OBJECTIVES/SPECIFIC AIMS: Parkinson's disease (PD) is a condition that affects over a million Americans, and despite current medical therapies, the progression of the disease results in impaired generation of internally timed or guided (IG) movements. To address this loss of motor function, previous rehabilitation therapies have focused on remediating the affected striatal-thalamic-cortical circuits (STC), primarily thought to be responsible in generating timed motor patterns. However, given the disease leads to the cell death of dopaminergic cells that are essential for proper STC function, we propose a motor therapy aimed at utilizing a compensatory parallel cerebellar-thalamic-cortical (CTC) pathway, recruited to perform externally guided (EG) movements, in which gait initiation is driven from sensory input. Our previous study has shown efficacy in our novel argentine tango therapy and improves behavioral measures above the relevant MCID threshold, but it has not been established that the CTC are in the causal pathway that are responsible for these changes. Using neural measures from task fMRI, we have begun to characterize networks that have changed and quantify any associations with behavioral metrics. METHODS/STUDY POPULATION: Patients were randomly assigned to an IG (n = 18), EG (n = 18), or education contact control (n = 14). Participants were assessed preintervention and postintervention for behavioral motor and cognitive measures and neurophysiologically with task based fMRI. In the task, participants performed a foot tapping task under both IG (tap their foot in previously learned rhythm) or EG (tap immediately after receiving a tactile cue on their hand) conditions. The fMRI data were preprocessed using AFNI and registered to MNI standard space. The brainnetome atlas was applied and the average time series of each region of interest (ROI) was used to increase the signal to noise ratio. The activation of these ROI with respect to the stimulus was modeled using GLM, and we estimated the area under the curve during the task blocks. A 1-way ANOVA analysis on these betas were performed between the pre and the post intervention time points and the ROIs that were above a significance of 0.95 were identified and corrected for multiple comparisons. The change in beta in all ROIs for each individual were calculated and then correlated with the changes in the behavioral data, to see which changes in ROI areas matched the best with the behavioral changes. RESULTS/ANTICIPATED RESULTS: The EG group showed significant changes only in the EG task in 2 areas—inferior frontal gyrus and inferior temporal sulcus. Correlating to the cognitive behavioral measures show reduced error from the Inferior frontal gyrus (corr > 0.5) best reflect changes in observed. There were no changes to either the STC or the CTC pathways. The IG group showed no changes behaviorally and showed no changes neurally as well. The control group showed no changes behaviorally, but neuronally certain DMN nodes, such as the precuneus and inferior temporal regions showed a significant change for both tasks. DISCUSSION/SIGNIFICANCE OF IMPACT: Addressing the damaged STC pathway directly through IG therapy may not be effective. The EG therapy may not be able to enhance the STC pathway. However, the therapy appears to utilize new areas in the frontal regions and correlates with positively with changes in spatial memory and balance tasks. Contrary to our hypothesis the CTC circuit was not upregulated for performance of the IG or EG task, but therapy may have enhanced recruitment of other cognitively engaged areas. The educational control group interestingly showed changes in the DMN network, which has been shown to be linked to attention during tasks blocks.

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Neural correlates of face processing in autism spectrum disorder: A quantitative meta-analysis of current literature and future directions

Carla J. Ammons[1], Mary-Elizabeth Winslett[2] and Rajesh K. Kana[2]
[1] University of Alabama, Birmingham, AL, USA; [2] Department of Psychology, University of Alabama, Birmingham, AL, USA

OBJECTIVES/SPECIFIC AIMS: Autism spectrum disorder (ASD) affects 1 in 68 people and includes restricted, repetitive behavior, and social communication deficits. Aspects of face processing (i.e., identity, emotion perception) are impaired in some with ASD. Neuroimaging studies have shown aberrant