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23 Musical Training May Not Enhance Cognitive-Motor Integration in Healthy Young Adults.

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Objective: Hand and arm functions have been associated with cognition in healthy young and older adults (Vasylenko et al., 2018) and in patients with Parkinson's disease (Bezdicek et al., 2014). Music training has been proposed to integrate motor and cognitive functions by engaging motoric, sensory, perceptual, and various cognitive domains (Wan & Schlaug, 2010). In this study, we examined if performance on fine and gross motor tasks is predicted by cognitive measures of memory, attention, and executive functions, and whether this relationship varies by the extent of musical training in healthy young participants.
Participants and Methods: Forty five healthy young participants were recruited (*M* = 22.32, *SD* = 4.10; 78% female). Participants completed fine (Grooved pegboard) and gross motor (Box and Blocks) measures as well as cognitive measures (Rey auditory verbal learning test, Stroop, Trail making, and D2 cancellation), and the musical training subscale of the Goldsmith Musical Sophistication Index. Two multiple regression models were conducted assessing cognitive measures as predictors of fine and gross motor functions, with musical training as a covariate in both models.
Results: Musical training was normally distributed across participants (*M* = 23.47, *SD* = 10.28). The results of the first model assessing the role of cognitive measures as predictors of fine motor function indicate a moderate fit ($F(5,36) = 3.32$, $R = 0.55$, explaining .32 of variance, $p < .05$), with memory ($B = 2.75$, $SE = 0.82$, $p < .005$) and sustained attention ($B = 0.09$, $SE = 0.03$, $p < .01$) as moderate predictors. These cognitive measures were also found to predict gross motor function ($F(5,36) = 3.06$, $p < .05$, $R = 0.55$, explaining .30 of the variance), with memory retention ($B = 2.49$, $SE = 0.83$, $p < .001$) and sustained attention ($B = 0.07$, $SE = 0.03$, $p < .05$) as moderate predictors. In both models, musical training was not a significant predictor.
Conclusions: We found that both fine and gross hand motor functions are predicted by cognitive measures of memory retention and sustained attention. Our results support previous findings associating cognition and motor function, with attention being relevant in young adults and memory a predictor in older adults (Vasylenko et al., 2018). We corroborate these findings for hand function, but did not find executive functions to be implicated, which were previously reported as a predictor only for older adults. While musical training has been suggested to enhance the cognitive-motor relationship as it involves motor skills as well as engages various cognitive domains (Wan & Schlaug, 2010), prior musical training was not found to affect this relationship. While music background did not predict better hand motor function, it did account for more interpersonal variance. The results suggest that for most amateur musicians, including those with years of experience, musical training may not affect the association between cognition and both fine and gross hand motor skill. The current findings indicate that while musical training can be an enriching experience, it may not (exclusively) enhance motor-cognitive integration. Different outcomes may be found with more extreme levels of music training, or a different age group.

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24 Functional Distinctions in Metabolic Network Patterns in Parkinson's Disease

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Objective: Cognitive decline is a common non-motor feature of Parkinson's disease (PD). However, the underlying mechanisms of

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cognitive impairment in PD require further elucidation. FDG PET imaging data analyses have revealed distinct brain metabolic patterns associated with the cognitive features of PD. The PD cognition-related pattern (PDCP) and default mode network (DMN) are two overlapping, but topographically distinct, networks that may serve as biomarkers of cognitive decline in PD. Decreased activity of the resting-state DMN and increased expression of the PDCP are associated with cognitive impairment in PD. Studies have consistently demonstrated the association between neuropsychological memory test performance and PDCP expression. Thus, we examined whether memory performance could offer additional value in predicting PDCP expression in PD patients. We hypothesized that DMN and memory performance would predict greater variance in PDCP expression than the DMN alone.
Participants and Methods: Participants included 48 PD patients ages 46-80 (mean (SD) Age: 61.9 (8.1), Education: 15.0 (2.8), IQ: 112.5 (14.9), DRS total: 136.7 (5.8)). All participants completed the FDG PET and neuropsychological evaluation 8-12 hours after their last dose of Levodopa. Neuropsychological memory testing included the California Verbal Learning Test (CVLT) z score of sum of learning trials. PDCP and DMN values were z scores generated from normal controls in previous studies. Data were analyzed using linear regression analyses.
Results: A hierarchical regression was performed to predict PDCP as a function of DMN and CVLT learning performance. Variables were entered in two separate blocks. The first block included DMN as a predictor, and the overall regression was significant ($R^2 = 0.55$, $F(1, 39)= 47.0$, $p < 0.001$). As hypothesized, DMN significantly predicted PCDP expression ($\beta= -0.74$, $p < 0.001$). The second block of the regression included CVLT learning memory performance. Both DMN and CVLT performance explained a significant amount of variance in PDCP (R^2 change = 0.05, $F(2, 39)= 27.6$, $p < 0.001$). CVLT performance significantly predicted PDCP ($\beta= -0.22$, $p =0.048$). The final model accounted for 60.0% of the variance in PDCP.
Conclusions: Disruptions in functional connectivity within brain networks have become increasingly recognized as mechanisms responsible for cognitive impairment in patients. As demonstrated in previous studies, our results indicated that DMN loss is a strong predictor of PDCP expression, likely due to the networks' overlapping spatial regions. However, we found that the addition of memory performance to the model could explain a small amount of variance (5%) over and above DMN expression. Overall, the current findings demonstrate a functional (i.e., learning) distinction between population-specific (PDCP) and more general brain networks (DMN).

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25 Delayed Cerebrovascular Response in Parkinson's Disease

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Objective: Cardiovascular risk factors and white matter hyperintensities predict the progression and severity of cognitive symptoms in PD. While controversial, emerging evidence suggests that cerebrovascular dysfunction is an etiological driver of protein aggregation in neurodegenerative conditions, highlighting a need to understand how cerebrovascular function impacts cognitive function in PD. MRI cerebrovascular reactivity (CVR) paradigms provide an opportunity to measure the ability of the cerebral vessels to dilate or constrict in response to challenges. The current study evaluates whether whole brain CVR measures, degree of response (fit) and delay differ in PD with normal cognition (PD-NC) and PD with mild cognitive impairment (PD-MCI) relative to healthy controls (HC). Additionally, we evaluate if these metrics are associated with cognitive performance.
Participants and Methods: 8 PD-NC, 11 PD-MCI and 11 age and sex-matched healthy

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