The effectiveness of screening tools for assessing impairment in Parkinson's

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Introduction

Parkinson's disease is a neurological disorder which occurs largely because of cell impairment or death in cells of the midbrain that project to the basal ganglia. The disease is characterized by a triad of symptoms including tremor, rigidity, and bradykinesia, as well as difficulty with balance and coordination. In the latter progression of the disease, there may be cognitive and behavioral changes, fatigue, and trouble with walking and talking.

Question:
How does the performance of Parkinson's patients on the MoCA, SDMT, and KD tests compare to the performance of healthy controls?

Hypothesis:
Because Parkinson's disease disrupts the amount of dopamine in the brain and causes impairment in the basal ganglia, we hypothesize that the Parkinson's patients will perform worse on the tests than healthy controls

Methods

Three tests were administered to both groups, the Montreal Cognitive Assessment (MoCA), the Symbol Digit Modalities Test (SDMT), and the King-Devick (K-D) Test. The MoCA screens for mild cognitive impairment in functions such as memory, calculations, language, and concentration. The SDMT is an assessment of information processing speed, visuospatial processing, and attention. Often used in concussion testing, the K-D test is an assessment of rapid eye movements, known as saccades, as well as language and attention.

Tests

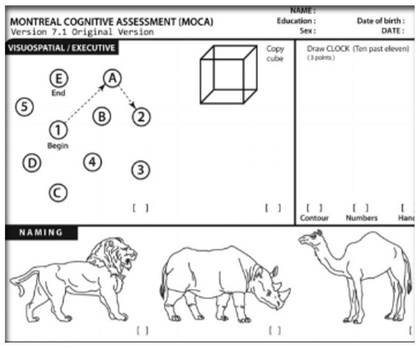

Figure 1. Montreal Cognitive Assessment

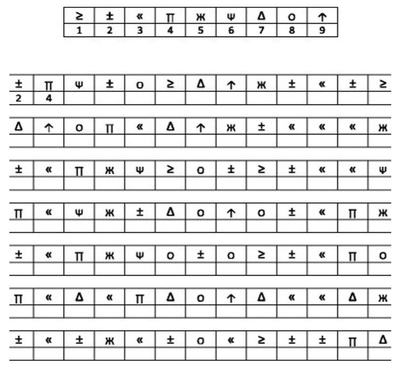

Figure 2. Symbol Digit Modalities Test

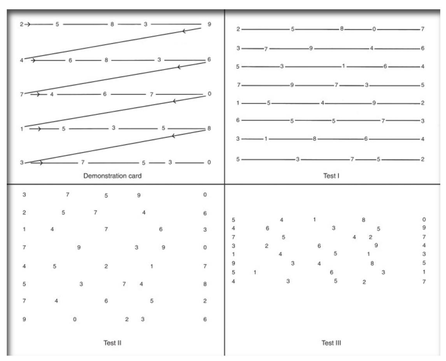

Figure 3. King-Devick Test

Demographics

Sex	**PD**	20 men	12 women
	Control	26 men	32 women

		Mean	Standard Deviation
Highest Education Level	**PD**	14.63	2.446
	Control	14.74	2.953
	Total	14.7	2.77
Age	**PD**	67.06	9.638
	Control	63.22	8.373
	Total	64.59	8.982

Using analysis of variance (ANOVA) testing, we determined that the groups did not differ on baseline characteristics including sex and highest level of education (P>0.05), but the PD group was somewhat older, though it was not statistically significant (p=0.052)

Results

		Mean	Std. Deviation	F	Sig.
MoCA	**PD**	23.69	3.524	7.61	0.007
	control	25.74	3.301		
SDMT	**PD**	35.84	12.864	24.616	0
	control	48.5	10.824		
K-D	**PD**	68.4188	17.31947	3.727	0.057
	control	61.1052	17.14029		

As we anticipated, the patients with Parkinsons (PD) (mean=23.7±3.5) performed worse than the healthy control group on the MoCA (mean=25.7±3.3, p=0.007). The performance of the Parkinson's group (mean=35.8±12.9) was also significantly worse than the control group (mean4 8.5±10.8, p<0.001). However, the groups did not perform differently on the KD test, Parkinson's (mean=68.4±17.3) versus comparison group ~~(mean61.1±17.1, p=0.057)~~.

Conclusion

The performance of the Parkinson's group on the SDMT and MoCA indicates the expected cognitive impairment. We would, however, expect the Parkinson's group to score lower on the K-D test than the control group. Our results indicate that the K-D test is not as sensitive a predictor of cognitive problems. The K-D is intended to screen for impairment in saccadic eye movements. Past studies have shown that Parkinson's causes impairment in saccades, which should be reflected in the performance of the Parkinson's patients (Srivastava et al., 2014). Our results indicate that the K-D test is not a sensitive screening tool for measuring saccadic impairment.

References:
Srivastava, A., Sharma, R., Sood, S. K., Shukla, G., Goyal, V., & Behari, M. (2014). Saccadic eye movements in Parkinson's disease. *Indian journal of ophthalmology*, *62*(5), 538–544. ~~https://doi.org/10.4103/0301-4738.133482~~

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