Implementation of Miyake task in psychopathic forensic sample: an exploratory research

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Executive function assessment in psychopathic forensic sample
Implementation of Miyake task: an exploratory research

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Introduction

Much research has been conducted on the associations between the concept of psychopathy and executive functions (Bagshaw, Gray, & Snowden, 2014; Blair & al., 2006 ; Mol, & al., 2009 ; Pham, & al., 2003). Psychopathic patients have difficulties on attentional management, behavioral inhibition and planning (Arnett, Smith, & Newman, 1997; Kosson and Newman, 1986 ; Newman, Patterson, Howland, & Nichols, 1990). However, no study has yet assess the executive function tasks in psychopathy using Miyake Task.

Method

Instruments

The ***Psychopathy Checklist – Revised*** (PCL-R; Hare, 2003) is a 20-item scale composed of two factors. The factor 1 evaluates personality traits including emotional aspects and interpersonal tendency. The factor 2 evaluates chronic antisocial tendency. Both factors may each be divided into two facets: factor 1 is divided in the Interpersonal facet (facet 1) and the affect deficit (facet 2) and factor 2 is composed of the impulsivity and parasitic lifestyle (facet 3) and chronic antisocial behavior (facet 4)

The ***Computerized Miyake Task*** assess three executive functions, precisely: mental set shifting, information updating and monitoring, and inhibition of prepotent responses (Miyake, Emerson, Witzki, Howerter, & Wager, 2000). Each function is assessed by three subtests .

Sample

Our sample included 20 males forensic inpatients from the secure psychiatric hospital of the C.R.P. « Les Marronniers » in Belgium. The mean age is 45.92 years (SD = 12.02). The mean length of stay is 6.11 years (SD = 5.33). The mean total IQ score is 67.3 (SD = 10.67).

Procedure

We excluded patients in acute phase. Each participant signed an informed consent sheet.

Data analysis

Because of non normality (Shapiro-Wilk test), we performed Spearman nonparametric correlations between the PCL-R factors and performances at the computerized Miyake task.

Results

			Descriptives statistics		Correlation with PCL scores: Total score	Factors F1	Factors F2	Facets f1	Facets f2	Facets f3	Facets f4
			M	SD							
SHIFTING	Plus Minus	µTR Plus	1183.53	440.28	.042	-.401	.311	-.414	-.455	.368	.532
		µTR Minus	1356.91	441.63	-.297	-.729*	-.036	-.735*	-.714*	.050	.312
		µTR Shift	1293.90	381.46	-.261	-.590	-.120	-.661*	-.609	.025	.219
		%C Plus	85.55	15.80	-.425	-.490	-.464	-.050	.153	-.428	-.528
		%C Minus	68.87	23.03	-.479	-.328	-.623	-.309	-.222	-.276	-.717*
		%C Shift	60.37	25.20	-.239	-.006	-.693	-.106	.156	-.349	-.852**
	Number-Letter	µTR Number	1173.04	374.82	-.350	-.276	-.393	-.513	-.017	-.429	-.061
		µTR Letter	1172.02	483.61	-.400	-.653	-.679	-.787*	-.525	-.405	-.182
		µTR Shift	1559.45	496.24	-.133	-.126	-.179	-.120	-.017	.095	-.303
		%C Number	83.07	16.85	-.617	-.494	-.857*	-.479	-.458	-.452	-.691
		%C Letter	75.13	25.70	-.683*	-.301	-.821*	-.333	-.153	-.619	-.861**
		%C Shift	73.57	17.54	-.667*	-.427	-.893**	-.436	-.356	-.595	-.776*
	Local - Global	µTR Local	952.76	231.94	-.327	-.726*	-.092	-.642*	-.704*	-.036	.226
		µTR Global	974.75	178.22	-.091	-.525	.285	-.453	-.648*	.267	.343
		µTR Shift	1339.71	415.44	.027	-.256	-159	-.139	-.445	.298	.080
		%C Local	83.64	20.53	-.155	-.653*	-050	-.564	-.602	-.024	.367
		%C Global	82.24	22.98	-.212	-.614*	-.127	-.514	-.595	-.089	.183
		%C Shift	67.72	20.18	-.209	-.507	-.285	-.559	-.426	-.097	.006
UPDATING	Keep Track	µTR Red	76.79	17.00	.098	.144	-.277	.315	.075	-.050	-.295
		µTR First	55.02	20.37	-.449	-.340	-.084	-.088	-.453	-.238	-.251
		µTR Latest	52.15	13.42	-.622	-.444	-.578	-.364	-.447	-.563	-.522
	Tone monitoring	µTR Oddball	475.35	167.84	-.283	-.100	-.383	-.204	.162	-.209	-.325
		µTR One	741.46	240.66	-.167	-.192	-.335	-.060	-.298	-.234	-.289
		µTR Three	975.17	344.08	-.393	-.259	-.192	.026	-.247	-.301	-.217
	Letter Memory	Rappel	30.16	23.34	-.642*	-.413	-.167	-.413	-.311	-.517	-.150
INHIBITION	Anitisaccade	µTR SI	745.16	216.76	-.564	-.516	-.410	-.536	-.389	-.657*	-.092
		µTR IC	755.68	223.94	-.382	-.575	-.343	-.582	-.565	-.377	-.043
		µTR II	704.52	203.37	-.297	-.712*	.050	-.568	-.796**	-.036	.410
		%C SI	71.44	21.26	-.193	-.737**	.111	-.657**	-.776**	.018	.390
		%C IC	81.97	16.94	-.356	-.821**	-.084	-.754**	-.777**	-.122	.215
		%C II	52.30	20.36	-.073	-.595	.042	-.664*	-.594	.018	.387
	Stop signal	µTR Part I	871.26	145.55	-.067	-.092	.190	-.077	-.017	-.084	.145
		µTR Part II	813.19	174.86	-.533	-.226	-.452	-.349	-.051	-.417	-.410
		%C Part I	87.73	11.49	-.025	.177	.072	.446	.176	.059	-.097
		%C Part II	70.48	15.32	.050	.437	-.167	.274	.530	.157	-.434
	Stroop	µTR Reading	585.92	126.25	-.467	-.851**	-.238	-.778**	-.819**	-.333	.169
		µTR Deno	740.67	169.48	-.648*	-.900**	-.357	-.784**	-.800**	-.500	-.008
		µTR Inhibition	978.45	273.58	-.515	-.766**	-.310	-.654*	-.745	-.333	-.042
		%C Reading	99.21	1.40	-.247	-.271	-.592	-.549	-.091	-.159	-.485
		%C Deno	98.51	2.53	-.496	-.167	-.417	-.393	.080	-.498	-.224
		%C inhibition	93.23	6.49	-.018	-.255	-.143	-.290	-.148	.183	-.118

* p<.05 ; ** p<.01 Legend : µTR = mean of reaction time - %C : percentage/success rate

Discussion

- ✓ Results show significant negative correlations between the PCL-R scores, Factor 1 (and facets 1 and 2) and the performances at the Stroop, particularly, the reaction time. These results suggest that the higher the Factor 1, the lower the reaction time, which did not a Impair the success rate. In term of inhibition, this factor allows the patient to be functional.
- ✓ On the other hand, significant negative correlations for the subtest Number-Letter (Shifting) indicate that the higher the score on Factor 2, especially in the facet 4, the lower are the success rate at this subtest.

Clinical implications

- ✓ In contract to most studies concerning executive function deficits in psychopathy, this study implemented a more specific measure of executive function among a forensic population testing the equipment in clinical conditions. These first observations highlight several difficulties with the computerized Miyake Task: the length of the administration (several sessions) and the difficulty of several tasks caused a loss of motivation among patients. Moreover, several tasks require alphabet knowledge or reading abilities, which are not accessible to some patients.

Conclusion

- ✓ The results suggest some Inhibition and Shifting response specificities. These findings encourage further research on the executive functioning in psychopathy through the implementation of specific measures of executive functions. The results need to be considered with caution. Indeed, we conducted an exploratory research, with a small sample size. We did not control psychiatric comorbidities, which may alter cognitive tests performances.

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