

Interpreting humorous cartoons in Parkinson's Disease

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Humour perception is dependent upon resolving incongruities between punch-lines and storyline expectations (Suls, 1979). The mesolimbic dopaminergic reward system has been implicated in humor appreciation and the positive affect that results from understanding the joke. Thus perception and appreciation of humor are dependent both on intact cognitive functions; logic, attention, working memory, mental flexibility, and verbal abstraction and on a functioning reward system, all of which have been proven impaired in Parkinson's disease (PD).

Structures and systems underlying humour perception are distributed throughout the brain, including regions in the neocortex, basal ganglia, diencephalon, limbic system, and brainstem, which are also areas affected by PD. As a progressive degenerative disease, characterized by motor symptoms and cognitive decline, it is reasonable to assume that mechanisms involved in PD could influence both detection and appreciation of humour. Furthermore, PD patients have deficits in the production of emotional responses and are impaired in facial recognition of emotions. They also experience problems when interpreting intended meaning of language as defined by its social context and in processing metaphorical expressions. These difficulties could directly influence what is generally referred to as a sense of humour as suggested by Thaler (2012) utilizing audio methods of presentation in a PD population. However the few previous studies on humour in a PD and healthy population raised on some questions.

Are PD patients impaired, compared to controls, in humorous sentence and cartoons judgement? Which variables are crucial for humour comprehension in PD patients? Age? Cognitive flexibility? Experience (Cognitive Reserve Index)?

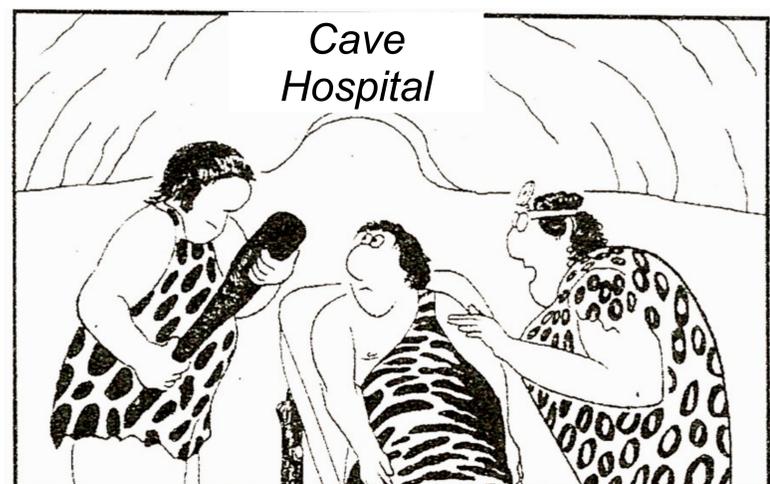
MATERIALS AND METHODS:

This preliminary study was performed in the Neuropsychology Unit of the Diagnostic and Rehabilitative Veneto Group Centre. Twenty PD patients and 40 healthy controls were recruited. All participants were between 59 and 88 years of age. PD patients were diagnosed by a movement disorder specialist based on international criteria. Exclusion criteria for the subjects included additional neurological diseases, dementia, perceptual and psychiatric disorders, aphasia or other language disorders.

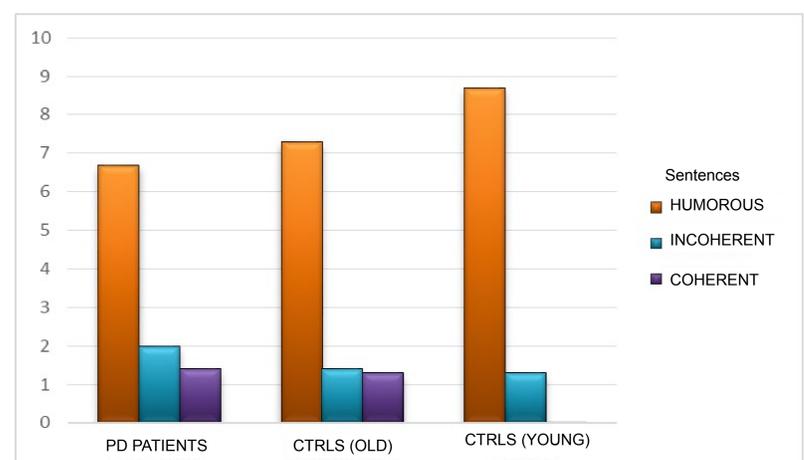
All subjects underwent a neuropsychological screening (Mini Mental State Examination -MMSE- (Folstein, et al., 1975) and Montreal Cognitive Assessment -MoCA- (Nasreddine, et al., 2006), a language assessment (Esame Neuropsicologico per l'Afasia (ENPA) (Capasso and Miceli, 2001), and the Cognitive Reserve Index Questionnaire (CRI-q) (Nucci et al, 2012) .

All patients were examined in "on" condition. Humour was assessed using 10 pictorial cartoons. Each cartoon was paired with three sentences (see figure): one sentence gave "humorous" meaning to the cartoon (punch-line), one described the scene represented in the cartoon (story-line) and the third sentence was a sentence incoherent with the context of the cartoon (or non-sense). Subjects were required to pair each cartoon with a sentence giving humorous meaning to the cartoon

N	PD patients		Controls (old)		Controls (young)
	M	DS	M	DS	M
AGE	73,4	6,5	75,6	9,0	24,8
EDUCATION (years)	9,9	5,3	11,9	3,5	15,0
MMSE	27,9	2,7	28,7	1,6	30,0
MoCA	25,5	4,1	26,4	2,0	30,0
CRI-q TOTAL	97,5	19,3	117,0	14,0	100,6



- 1) He is Thog, he has a new cudgel
- 2) He is Thog, our anesthetist ←
- 3) He is Thog, our chef



RESULTS

No significant differences have been found between PD group and healthy age matched group. The difference was significant if older subjects were compared with young sample: in fact a negative correlation was observed between age and "humorous sentence" (the target / punch-line) [$r(18) = -.501$; $p < .05$], and a positive correlation between age (older subjects) and "coherent" sentence (story-line) [$r(18) = .508$; $p < .05$], while a significant difference between controls and PD patients was registered if subjects with low CRIq, both controls and PD, were compared ($p < 0.5$).

Considering the cognitive status as variable, a positive correlations have been found between the MoCA and MMSE score and "target sentences" [$r(18) = .710$; $p < .01$; $r(18) = .482$; $p < .05$], and a negative correlation between MoCA score and "incoherent sentences" [$r(18) = -.470$; $p < .05$], while a negative correlation emerged between MMSE score and "coherent sentence" [$r(18) = .494$; $p < .05$].

The healthy (older) control group, on the other hand, in comparison with PD sample, presented different performance if the CRIq is considered. Years of education appeared to be positively related to the preference for the "humorous/target sentence" [$r(18) = .609$; $p < .01$], and negatively correlated with "coherent sentence" [$r(18) = -.573$; $p < .01$].

CONCLUSIONS

Interpreting humorous cartoons and sentences appeared to be principally related to the age and the integrity of the frontal functions (working memory, abstraction, cognitive flexibility) and to the quality of experiences during the live span (education, working activity and , in particular the leisure time index). Parkinson Disease in absence of Dementia don't result to affect this ability in subjects with high level of cognitive reserve, and the lower scores showed by older sample (PD and older healthy subjects) if compared to younger subjects may be attributed to the physiological frontal functions decline. The cognitive reserve appeared to be the main factor discriminating between perception of humorous contests (pairing cartoons with the correct humorous sentence) and pairing cartoons with "coherent" but no humorous sentences. The association of the cartoons with incoherent sentences was, instead, more related to the cognitive decline.