

The Interpersonal Reactivity Index (IRI) scale in Greek patients with dementia.

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Abstract

Background: Empathy, which refers to a cognitive and emotional process of continuously detecting the changing intentions of others, differs in the behavioral variant frontotemporal degeneration (bvFTD) compared with other dementia types. Interpersonal Reactivity Index scale (IRI) could help in understanding their differential patterns of empathy. We suggested that both emotional and cognitive aspects of empathy would be significantly decreased in bvFTD patients compared to other dementia groups in the Greek population.

Methods: We examined 162 subjects with dementia of various types and normal control. (normal control: 61; Alzheimer's disease (AD): 61; bvFTD 19; semantic variant of Primary Progressive Aphasia: 14; nonfluent variant of Primary Progressive Aphasia: 7). Two subscales of IRI, Empathic Concern and Perspective-Taking, used to measure the cognitive and emotional components of empathy.

Results: Patients with bvFTD showed extreme deficits in both empathic concern and perspective taking compared to the other patient groups. AD patients showed greater impairment in empathic concern but not in perspective taking than has previously been seen.

Conclusions: In the Greek population, patients with different types of dementia and different patterns of anatomical lesions show a reduction in distinct aspects of empathy. Thus, IRI is a cross-cultural useful tool for immediate neuropsychological examination regarding the evaluation of empathy.

Keywords: empathic concern; perspective taking; behavioral variant frontotemporal degeneration; social cognition

Introduction

Empathy is the ability to understand and participate in the internal mental life of others. Empathy refers to a cognitive and an emotional process which is detecting the continuously changing intentions of others, overt and hidden, and the attempt to influence or exploit them. The model of empathy used by Davis [1] suggests that there are four specific aspects of empathy (cognitive and emotional). Perspective taking and fantasy are the cognitive aspects while empathic concern and personal distress are the emotional. Perspective taking is the tendency to spontaneously imagine the cognitive perspective of another person. Fantasy refers to the tendency to project oneself into the place of fictional characters in books and movies. Empathic concern is the other-centered emotional response resulting from the perception of another's emotional state and personal distress is a self-centered emotional response involving fear or distress that results from witnessing another's stressful circumstances or negative emotional state. [1]

Recent efforts to measure empathy in patient samples show divergent patterns of emotional versus cognitive empathy [2]. This dissociation likely arises from diverse patterns of damage that arise from various clinical syndromes, and multiple studies have demonstrated that this can have diagnostic value.

Cognitive and emotional aspects of empathy differ in behavioral variant frontotemporal degeneration (bvFTD) and Alzheimer's disease (AD) patients. In general, bvFTD patients show less empathy than AD patients. More specifically, bvFTD patients present with impairment in both cognitive and emotional aspects of empathy, likely due to the early involvement of emotion generating structures in the salience network of the brain [3,4] while AD patients preserve emotional aspects, but are often impaired in cognitive aspects of empathy [2,5]. Sturm et al [6] suggest that in patients AD, neurodegeneration of ventrolateral temporal lobe structures is associated with up-regulation of emotion-generating mechanisms, corresponding to greater personal distress.

FTD is a common syndrome of dementia, especially in presenile cases, but its diagnosis remains particularly challenging.

Not only is there continued difficulties in differentiating bvFTD from AD diagnostically, but patients with AD and bvFTD are frequently misdiagnosed as having a psychiatric disorder early in their disease. [7,8] Thus, understanding their differential patterns of empathy, particularly with respect to how they present in a cultural setting other than the US or the UK, could help with differential diagnosis.

While patients with any of the subtypes of frontotemporal degeneration (FTD) can show changes in behavior and personality, those with bvFTD show significant deficits in empathy, including early loss of insight, disinhibition, social inappropriateness and emotional alterations. [5,9]

Previous studies have shown that the diagnosis of bvFTD may vary depending on the cultural environment in which it takes place. [10] As socioeconomic status (SES) could be a critical differentiating factor and these differences have been seen in clinical samples only in the US, UK, it is unclear whether these patterns will continue to be seen in patients in other sociocultural settings and particularly in the Greek population.

The aim of the study was to investigate if the patterns of empathy that have been seen in the US and UK samples will also appear in a Greek sample. Furthermore, we examine if bvFTD patients will present divergent patterns of empathy compared to other dementia forms.

Methods

Subjects

This study recruited 162 subjects, 61 of whom were healthy older controls (NC). Normal controls were recruited from the community during information campaigns for dementia through the Memory Clinic at the G. Gennimatas Hospital, Neurology department, Athens, Greece and the Third Age Centre "IASIS" also in Athens. The patients were recruited through the same structures as above, first having been identified in the clinic subject pool through diagnosis and then recruited as potential study participants. These subjects and their caregivers signed an institutional review board-approved research consent form including an agreement to fill out questionnaires for research purposes. Patients seen at this dementia clinic varied

according to sex, education level, and socioeconomic status. Patient diagnosis was derived by a multidisciplinary team of neurologists, neuropsychologists, psychiatrists, and nurses. The study was conducted in compliance with the regulations of the local ethics committee and in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Among the patients, 61 patients were diagnosed as meeting core clinical criteria for AD according to the McKhann criteria [11,12]; Forty patients were diagnosed with one of the FTD syndromes, including 19 with the bvFTD [13], 14 with the semantic variant of Primary Progressive Aphasia (svPPA), 7 with the nonfluent variant of Primary Progressive Aphasia (nfvPPA). [14]

Neuropsychological procedures

Neuropsychological Testing

All participants were administered a battery of tests in the Greek language. Mini-Mental State Examination (MMSE) [15], was used in the exploration of global cognition. Addenbrook's Cognitive Examination (ACE-R) is a brief battery that provides an evaluation of six cognitive domains (orientation, attention, memory, verbal fluency, language, and visuospatial ability) [16]. We used ACE-R to detect dementia and for differentiating subtypes of dementia, [17] In an exploration of their ability to generate verbal and non-verbal material the test of words and animals reported in absolute numbers per minute was administered (phonemic and semantic fluency, respectively). We also used the Frontal Assessment Battery (FAB) [18], in the exploration of the executive functions, a brief battery of six neuropsychological tasks designed to assess frontal lobe function at the bedside. (Similarities-conceptualization, motor series-programming, conflicting, instructions-sensitivity to interference, inhibitory control, prehension behavior-environmental autonomy)

Empathy Testing

The Interpersonal Reactivity Index (IRI) is a measure of both cognitive and emotional components of empathy that is ad-

ministered in questionnaire form. It includes two seven-item subscales measuring cognitive empathy: Perspective Taking, (PT) and Fantasy (FS), as well as two seven-item subscales measuring emotional empathy: Empathic Concern (EC) and Personal Distress (PD). An informant (a close relative) was asked to rate on a 5-point Likert scale ("Does not describe me well" to "Describe me very well) how well each of the 28 statements described the participant [1]. We used only the Perspective Taking (PT) and Empathic Concern (EC) sub-scales of IRI as previous studies have shown that only these sub-scales are useful for depicting empathy differences in patients with dementia syndromes and demonstrate a strong correlation with underlying atrophy. Fantasy (FS) and Personal Distress (PD) sub-scales were not used in our research as previous studies have shown that these two subscales of the IRI are not useful for depicting empathy differences in patients with dementia.[1,19,20] In particular, FS has demonstrated problems with construct and criterion validity while PD has shown little predictive utility in the differential diagnosis of dementia.[1,2,19,20]

Neuropsychiatric Assessment

Participants were administered the Geriatric Depression Scale (GDS) [21] for subjects older than 65 years and the Zung Depression Scale [22] for younger subjects to evaluate depression. In order to compare scores from subjects of different age groups, scores on each of the depression questionnaires were divided into three levels of severity (0-3; GDS: 0-9 = 0, 10-16 = 1, 17-23 = 2, 24-30 = 3; Zung: 20-50 = 0, 51-60 = 1, 61-70 = 2, 71-80 = 3).

Statistical Analysis

Statistical analyses were performed using SPSS. Before statistical analysis, all variables were tested for normality using the Kolmogorov-Smirnov criterion. Numerical data are expressed as mean \pm SD. Independent sample t-test (age and years of education) and χ^2 statistics (sex) were used to investigate possible differences in age, education, and sex between the groups. As age and education variables showing differences were included in the later analysis as potential confounds. Analysis of covariance (ANCOVA) was used to determine differences between dementia groups in empathy, controlling for age and

education, followed by the Bonferroni test. Statistical analyses were performed setting the threshold of statistical significance at $p < 0.05$.

Results

Demographic data

Normal controls were significantly younger than patients with AD ($p < 0.001$). They also had more years of education compared with AD, bvFTD and svPPA groups ($p < 0.001$, $p < 0.001$ and $p < 0.05$ respectively). There were no sex differences or differences in severity of disease across patient groups. (Table 1). Thus, age and years of education were included in all statistical models.

Table 1: Demographic Data

		N	Sex M/W	Age (years)	E d u - cation (years)	Years of Disease
Normal		61	20/41	63.2 (7.8)	13.5 (3.1)	-
AD		61	23/38	73.5 (7.6) ‡	10.1 (7.9) ‡	3.7 (2.7)
FTD		40				
	bvFTD	19	5/14	67.3 (5.7) *	8.2 (3.2) ‡	3.5 (3.4)
	svPPA	14	7/7	66.9 (8.5)	10.3 (4) *	3.5 (2.3)
	nfvPPA	7	3/4	66 (6.5)	13.4 (3.9)	3.5 (1.7)
	TOTAL	162				

Note: AD, Alzheimer's Disease; FTD, Frontotemporal dementia; bvFTD, behavioral variant Frontotemporal dementia; svPPA, semantic variant Primary Progressive Aphasia; nfvPPA, nonfluent variant Primary Progressive Aphasia;

Values are expressed as mean and standard deviation (mean ± SD). Significantly differ from NC group at * $P < 0.05$, ‡ $P < 0.001$

Empathy measures

Cognitive empathy

Normal controls performed significantly higher than all dementia groups on the PT subscale, while AD patients had significantly higher scores on PT than bvFTD and svPPA. Also, patients with bvFTD had lower PT than all other patient groups except svPPA patients.

Figure 1: Box plot of PT subscale and dementia syndromes

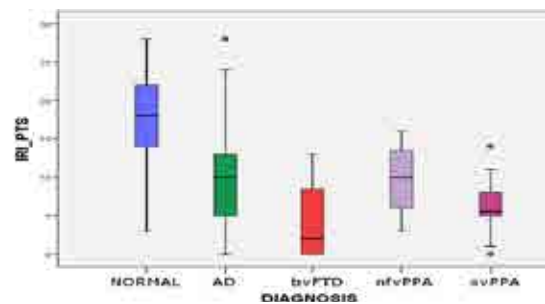


Figure 1	Normal	AD	bvFTD	nfvPPA	svPPA
Normal	---	**	***	*	***
AD	***	---	***	ns	*
bvFTD	***	**	---	*	ns
nfvPPA	*	ns	*	---	ns
svPPA	***	*	ns	ns	---

ns = non-significant; * = $p \leq 0.05$; ** = $p \leq 0.01$; *** = $p \leq 0.001$

Table 2: Empathy subscales and neuropsychological data

		IRI PT	IRI EC	MMSE	ACE-R	Phonemic Fluency	Semantic Fluency	FAB	Depression severity
Normal		17.6 (6)	24 (4.1)	29.3 (0.9)	94 (4)	13.9 (3)	17 (2.4)	17.5 (0.8) ‡	0.1 (0.3)
AD		10 (6.5) ‡	19.7 (6.1)*	23.2 (3.2) ‡	65.2 (10) ‡	7 (4.4) ‡	8.7 (2.6) ‡	12.4 (3.6) *	0.2 (0.5)
FTD									
	bvFTD	4.3 (4.5) ‡	11.8 (7.2) ‡	24.6 (3.9) ‡	72 (15) ‡	5.7 (3.1) ‡	8 (3.3) ‡	9.5 (4.2) ‡	0.1 (0.3)
	svPPA	6.2 (3.7) ‡	17.9 (6.2)*	18.8 (8.4) ‡	51.8 (18) ‡	3.6 (1.9) ‡	5.6 (4.2) ‡	12.7 (3.5) *	0.4 (1)
	nfvPPA	9.7 (4.8)*	18.5 (6.8)*	22.8 (3.6) ‡	60.8 (13.7) ‡	5.4 (2.7) ‡	5.6 (3.7) ‡	8.6 (5.1) ‡	0.2 (0.4)

Emotional empathy

Only bvFTD and svPPA patients had significantly lower EC than normal controls. In addition, patients with bvFTD had significantly lower EC scores than all other groups of patients. Also, the AD patients had significantly higher EC scores than bvFTD.

Figure 2: Box plot of EC subscale and dementia syndromes

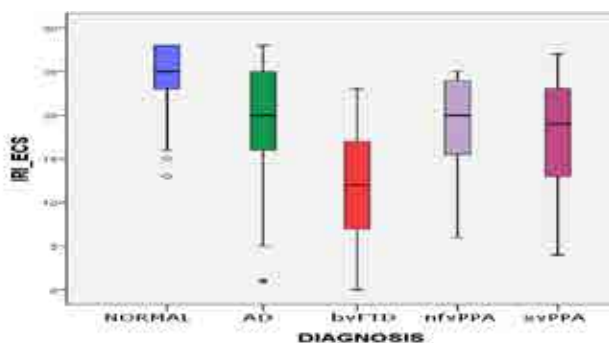


Figure 2	Normal	AD	bvFTD	nfvPPA	svPPA
Normal	---	*	***	*	*
AD	*	---	***	ns	ns
bvFTD	***	**	---	*	*
nfvPPA	*	ns	*	---	ns
svPPA	*	ns	*	ns	---

ns = non-significant; * = $p \leq 0.05$; ** = $p \leq 0.01$; *** = $p \leq 0.001$

Neuropsychological performance

Table 2 presents the neuropsychological performance of each group. The group of normal controls performed significantly higher than all dementia groups. Even both AD and bvFTD patients performed significantly lower than normal control there were no significant differences between them in the MMSE, semantic fluency (animals/minute) and phonemic fluency (words/minute).

Discussion

Patterns of empathy in Greek sample

Our results indicate that patterns of empathy in the Greek sample are compatible with the findings in the US and UK samples of same diagnostic categories.[2] In our study, bvFTD patients present a distinctive empathy pattern. In our sample, bvFTD and svPPA patients presented with significantly lower cognitive empathy compared to both normal controls and other dementia groups. However, only patients with bvFTD had significantly lower emotional empathy than normal controls and other dementia patients.

We observed that patients who were diagnosed with bvFTD and svPPA demonstrated abnormally reduced cognitive empathy compared with the normal control which is consistent with a previous study in US sample. [2] Previous studies [23,24,25,26] have shown that medial frontal and anterior temporal brain structures support the cognitive mechanisms that are responsible for effortful attempts to understand the other (i.e., cognitive perspective taking). These structures are likely recruited

because mental representation and differentiation of cognitive and emotional states, both within ourselves and in others, are required for cognitive empathy. Our bvFTD and svPPA patients had structural defects in both these regions.

However, patients with bvFTD but not with svPPA had abnormally reduced emotional empathy, which does not agree with a previous study in a US sample which did not present reduced emotional empathy. [2] Although the reason for this difference between Greek and US samples it is not obvious, the decrease which observed in the Greek sample may be due to the damage [15,27] to structures in the salience network, a symptom seen often in bvFTD patients. [3,4,19] The amygdala and the circuits of subcortical structures-OFC, which are associated with the feeling of fear and the evaluation of a potential behavior based on reward or punishment, are more damaged to such an extent as to show a massive reduction of EC [28]. Damage to regions in this network has been directly associated with many of the socioemotional deficits observed in bvFTD patients, likely via the mechanism of reduced reward-related attention to social cues.[29,30,31] With regard to emotional empathy, bvFTD patients may no longer have the capacity to respond emotionally to others' distress, and may not recognize that others' emotional expressions can be important, personally "salient" cues. The decrease in emotional empathy in Greek sample is possibly due to the age difference between Greek and US bvFTD patients [26] [mean age (SD): 67.3 (5.7) vs 59.5 (8.7) years, respectively]. As the Greek patients are older than the US, they are probably more progressed in disease course and also more impaired, resulting in wider reduced emotional empathy.

Patients with AD in this sample showed a reduction in both perspective taking and empathic concern compared to normal. This is different from the patterns observed previously in samples from other cultures, including in the US [2], where the perspective taking is lost in AD, but core emotional empathy remains normal. The overall loss of empathy seen in AD patients might be considered a result of the degree of general cognitive deterioration observed in these patients. According to the Rankin, Kramer, & Miller [2] deficits observed in empathy, and reflected in the PT and EC subscales, are mainly due

to impairment of specific frontal and temporal brain regions, which are often also impacted in more advanced AD. Patients in our sample were of moderate dementia severity (ACE-R Score = 65.2), (Table 2) thus were more progressed in their disease course than other reported samples. A previous study indicates that at diagnosis, FTD patients in Greece are more impaired than patients in the United States. Patients with FTD in Greece are diagnosed later in the disease course, as their behavioral symptoms are not easily detected by the medical system. [10] Cultural factors might also be responsible for this difference; it is possible that there is a higher baseline degree of socioemotional relatedness in Greek culture compared to the US, and any losses in emotional empathy would be more noticeable to informants.

Patterns of empathy in bvFTD vs svPPA

Our study has shown that bvFTD patients in the Greek sample present the most drastic deficit in both cognitive and emotional empathy than other dementia forms. In our sample, bvFTD patients showed significantly reduced cognitive empathy compared with all other dementia groups except svPPA, as well as significantly reduced emotional empathy compared with all other dementia groups. (Figure 1, Figure 2)

Yet because there are anatomical differences in the underlying brain lesions of these two groups, their loss of perspective taking may be due to different causes. For patients with bvFTD, their loss of perspective taking may be due to apathy, which might cause them to fail to actively pay attention to and engage in interpersonal activities. Also, because bvFTD patients often have a high degree of social disinhibition, their perspective taking may be reduced because they fail to carefully deliberate about others' emotions or thoughts, instead of jumping to conclusions or selecting inappropriate responses. For patients with svPPA, who have significant loss of both non-social and socioemotional semantics, they may lose perspective taking due to poor understanding of interpersonal situations. Conversely, svPPA patients did not have significant deficits in empathic concern, though patients with bvFTD did. This may reflect the greater relative vulnerability of structures supporting emotional experience and responsiveness in patients with

bvFTD.

Conclusions

In summary, our data confirm that in a sample of Greek individuals, patients with different types of dementia show a reduction in distinct aspects of empathy. This is consistent with what has previously been reported by Rankin, Kramer, & Miller, [2] and suggests that the lesions in specific brain structures in these dementia syndromes and lead to loss of empathy. However, Greek patients with AD showed greater impairment in empathic concern than has previously been seen in US patient samples, potentially due to cultural differences. In different sociocultural regions, health conditions are viewed differently. Divergent patterns across the subscales of the IRI can also contribute to the differential diagnosis of patients, with bvFTD patients showing the most extreme deficits in both empathic concern and emotional perspective taking compared to the other patient groups. Thus, even in a cross-cultural setting, IRI can be used for immediate neuropsychological examination regarding the evaluation of social cognition and specifically of empathy.

Disclosure of interest

The authors report no conflicts of interest.

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