

Closing-in behaviour in fronto-temporal dementia

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“Closing-in behaviour” (CIB) is the tendency in copying tasks (figure copying or gesture imitation) to perform very close to or even on the top of the model. This phenomenon, which has been reported in focal brain diseases (cerebral stroke, encephalitis, epilepsy) [1–3] and various forms of dementia [4–6], has been noted most commonly in Alzheimer’s disease (AD) [6]. In AD, the frequency of this behaviour increases with dementia severity [7] and with increasing complexity of the figures/gestures to copy [8, 9]. CIB has also been observed in fronto-temporal dementia (FTD) and interpreted as a sign of constructional apraxia (CA) [10]. However, the frequency and character of CIB have never been systematically investigated in FTD.

We assessed CA and CIB retrospectively in 71 patients with a diagnosis of FTD [11]. For comparison, 812 medical records of patients with AD [12] were also reviewed. All patients had completed the Milan Overall Dementia Assessment (MODA) test battery [13] at the Neurological Ward of San Paolo Hospital, Milan. Basic clinical and demographic information is shown in Table 1.

The presence of CA and CIB were assessed separately using the graphic copying task of the MODA, consisting of

three geometrical figures of increasing complexity (square, diamond, and multipart figure; see Fig. 1b). Each figure was presented on the upper half of an A4 sheet, to be copied below a dividing line. CA was diagnosed when the copy, or any part of it, was unrecognisable. CIB was diagnosed when any part of the copy was drawn within 10 mm of the dividing line or overlapped the space occupied by the model.

Figure 1a compares the frequency of CA and CIB in patients with AD and FTD. In both patient groups, both CA and CIB increase in frequency with dementia severity. At each level of severity, CA is significantly more common amongst patients with AD than with FTD [$\chi^2(1) \geq 32.167$; $P < 0.01$]. By contrast, the frequency of CIB does not differ between the two patient groups at any level of dementia severity [$\chi^2(1) \leq 2.376$; $P > 0.1$]. These divergent profiles of CA and CIB suggest that there is no simple relationship between these symptoms and raises the possibility that CIB may be differentially determined by different cognitive factors in the two groups.

This possibility is strongly supported by Fig. 1b, which illustrates the effect of visuospatial complexity on the frequency of CA and CIB in the two groups. Both groups showed clear increases in the frequency of CA with visuospatial complexity [$\chi^2(2) \geq 10.38$; $P < 0.01$]. CIB frequency similarly increased with complexity amongst patients with AD [$\chi^2(2) = 117.47$; $P < 0.001$], but was unaffected by this factor in the FTD group [$\chi^2(2) = 0.100$; ns], thereby showing a surprising independence from visuospatial demands.

These findings suggest that CIB is as common in FTD as in AD, but that the phenomenon might have different causes in these two conditions. Patients with AD show more frequent CA and a significant effect of visuospatial complexity on CIB, implying an important role for visuospatial deficits.

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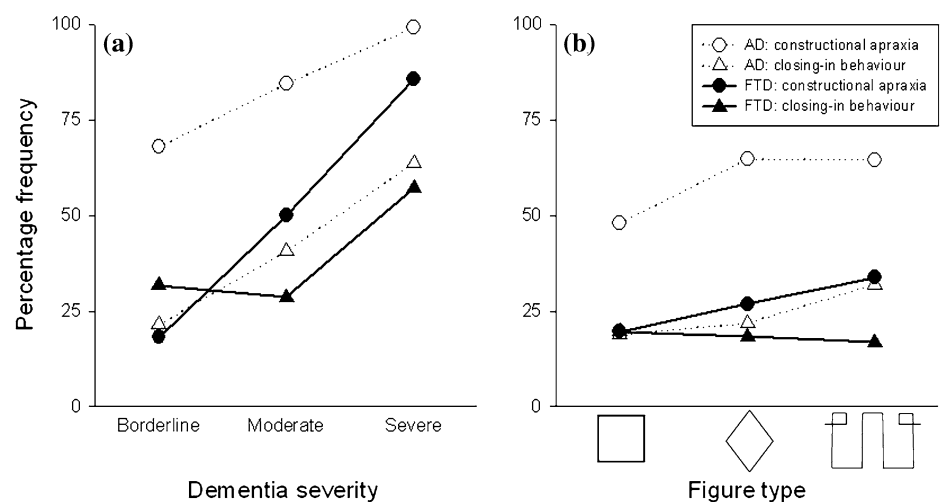
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Table 1 Demographic and clinical data of patients with AD and FTD

		AD			FTD		
		Borderline <i>n</i> = 56 (25 M, 31 F)	Moderate <i>n</i> = 643 (223 M, 420 F)	Severe <i>n</i> = 113 (39 M, 74 F)	Borderline <i>n</i> = 22 (14 M, 8 F)	Moderate <i>n</i> = 42 (23 M, 19 F)	Severe <i>n</i> = 7 (2 M, 5 F)
MODA (adjusted score)	Median	87.7	72.2	38.7	90.5	75.8	36.5
	Range	85.6–94.7	49.1–85.4	10–48.4	85.5–96.9	50.1–85	20.5–48
Age (years)	Median	75	78	80	71.5	70	64
	Range	45–88	50–97	56–98	52–86	55–88	41–85
Duration of disease (months)	Median	18	36	48	24	24	48
	Range	1–84	6–192	10–144	12–132	7–60	12–72
Education (years)	Median	8	5	5	12.5	5	5
	Range	3–18	0–22	0–19	5–18	1–19	0–18

Fig. 1 a Percentage frequency of CA and CIB in FTD and AD in relation to dementia severity; **b** percentage frequency of CA and CIB in FTD and AD in relation to figure complexity (increasing left to right)



In patients with FTD, by contrast, CA is relatively rare, and CIB is independent of figure complexity. It has been suggested, for patients with corticobasal degeneration, that CIB may reflect a primitive, automatic attraction towards salient visual stimuli, rather than a true visuospatial impairment [4, 14]. This hypothesis may also account for the CIB exhibited by patients with FTD.

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