

Exploring over- and underestimation of language difficulties in left unilateral brain damaged patients

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INTRODUCTION

PART ONE

Aphasic patients may exhibit anosognosia with a spectrum of awareness of their language deficits, leading to either underestimation or overestimation.

Dunning-Kruger Effect (DKE) and anosognosia (Kruger & Dunning, 1999): Mirroring the DKE observed in the general population, individuals with severe aphasia may underestimate their deficits, whereas those with milder forms may overestimate them.

The concept of "regression to the mean" (Galton, 1886) suggests that the DKE may be a statistical artefact that influences the accuracy of awareness assessments in patients and affects diagnostic thresholds.

AIMS: to i) explore the prevalence of over- and underestimation of language difficulties in a sample of left-unilateral brain damaged patients and ii) address the potential statistical biases due to the impact of 'extreme' mild and severe cases of aphasia.

PART TWO

Various mechanisms have been suggested as a possible cause of distorted awareness, including mechanisms of denial, attentional depletion (Maher, 19 and difficulties to monitor language (Dean et al., 2017).

Part II: to i) investigate possible underlying attentional and motivational factors that may contribute to the distortion of awareness.

METHODS

SAMPLE

78 left-injured aphasic patients were included in this study, a small subsample (N=10) took part in the second part of the study. Inclusion criteria: a) Confirmation of an acquired left-hemisphere brain injury through magnetic resonance imaging (MRI) or computerised tomography (CT); b) A diagnosis of aphasia confirmed by their healthcare team, and; c) No history of neurological conditions.

MEASURES

Language Assessment: For Italian speakers: the Aachen Aphasia Test (AAT; Luzzati, Willmes, and De Bleser, 1996); For English speakers: Western Aphasia Battery – Revised (WAB-R; Kertesz, 1982)

Awareness Measurement: Visual-Analogue Test Assessing Anosognosia for Language Impairment (VATA-L; Cocchini et al., 2010.).

Error Detection Task and Boston Naming Task- Short Version (Only for the second part of the study).

3 experimental conditions: a) Online-Own: Participants completed the Boston Naming Task and immediately rated their own performance on a visual scale; b) Offline-Own: Participants listened to a recording of their previous performance on the task and then rated it using a visual scale; c) Offline-Others: Participants were played altered recordings to make them believe they were rating someone else's performance on the task, and they rated that performance accordingly.

2. Do you have a problem understanding what people are talking about?



RESULTS

PART ONE

1. Descriptives of sample (N=78)

Figure 1. Underestimation (i.e., anosognosia) was the main tendency in our sample (*Fisher Test*, $p < 0.001$); No significant difference in the extent of error between underestimation and overestimation (*Welch's tests on absolute values*: $t(71.4) = 1.83$, $p = 0.07$, Cohen's $d = 0.41$).

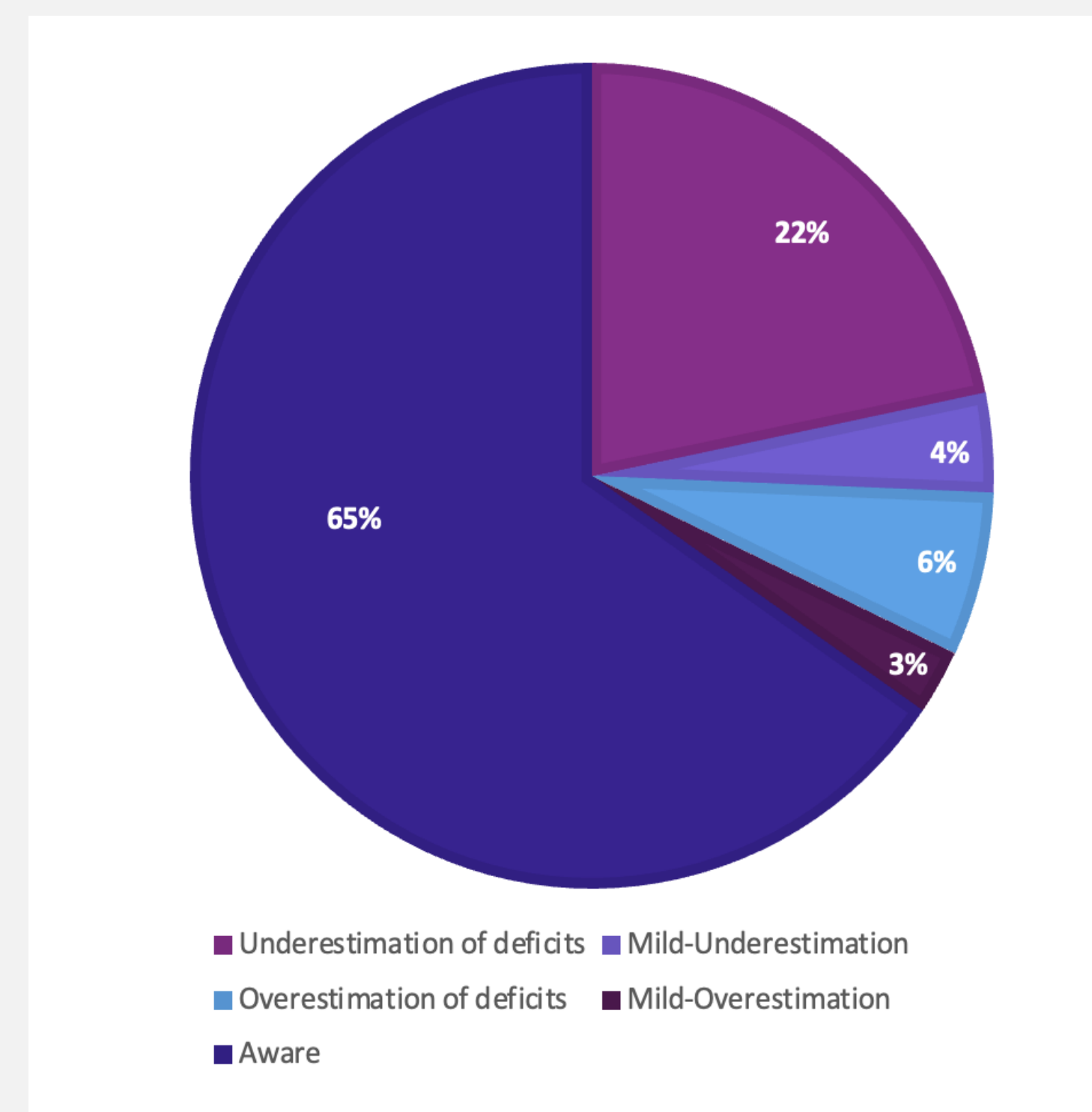
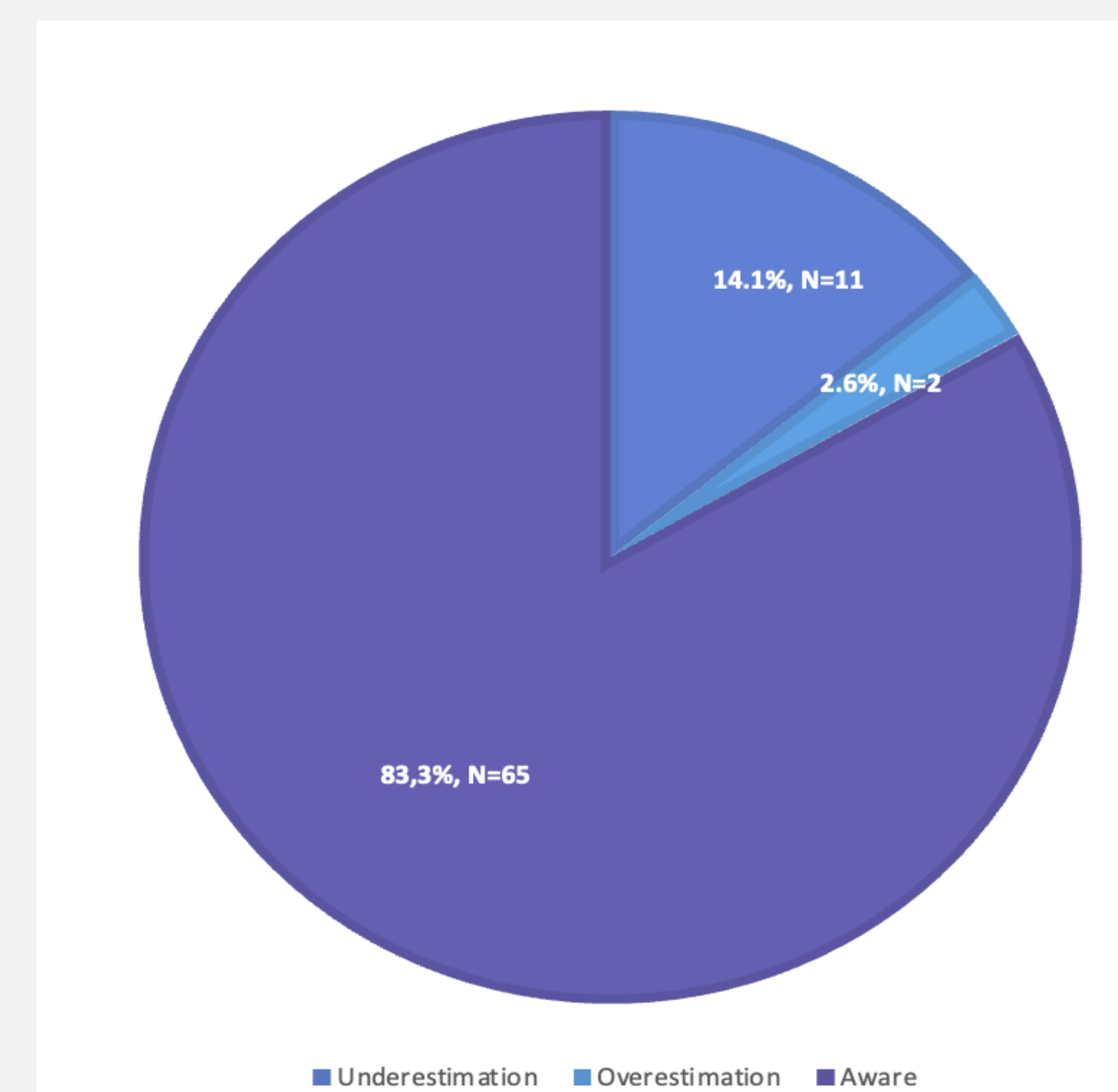


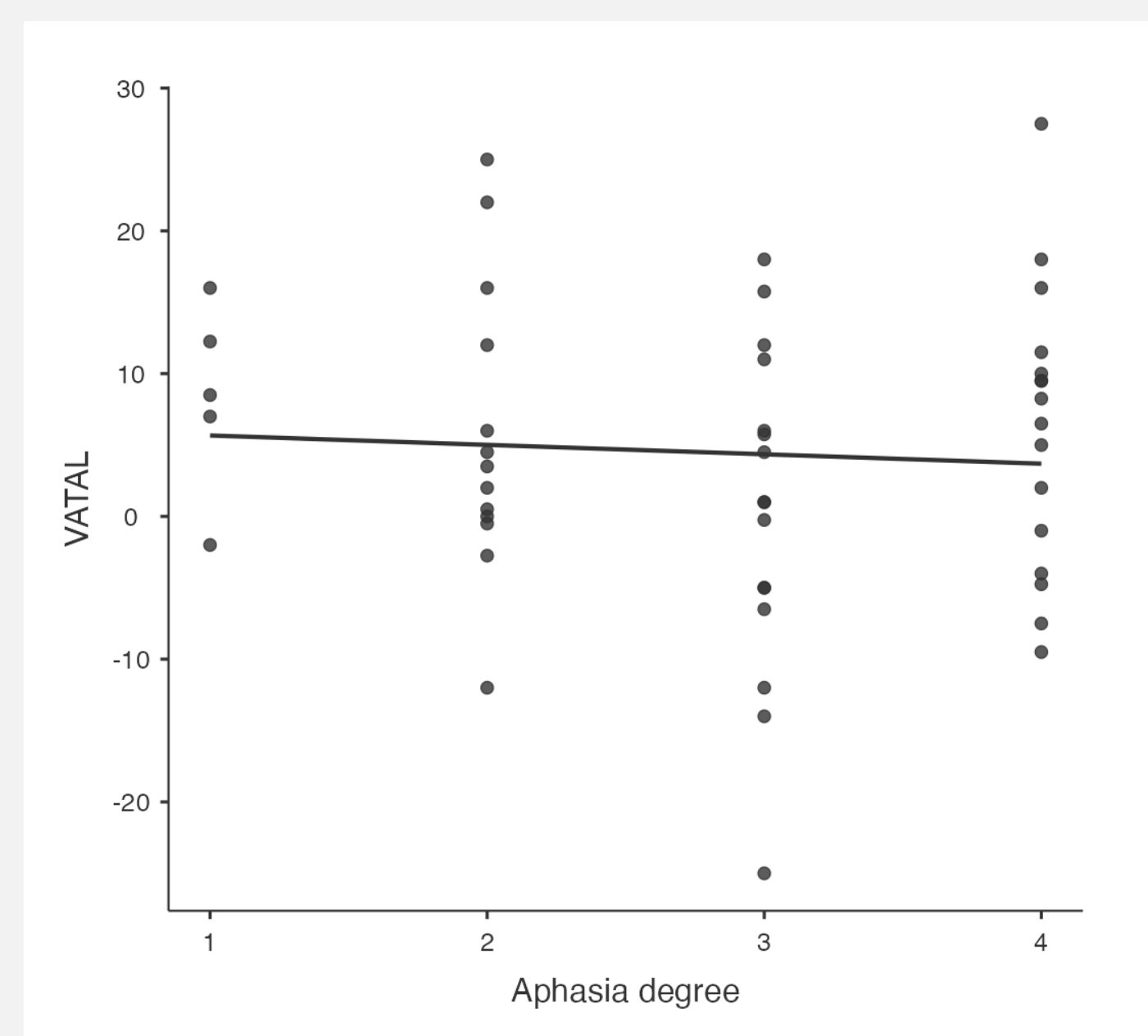
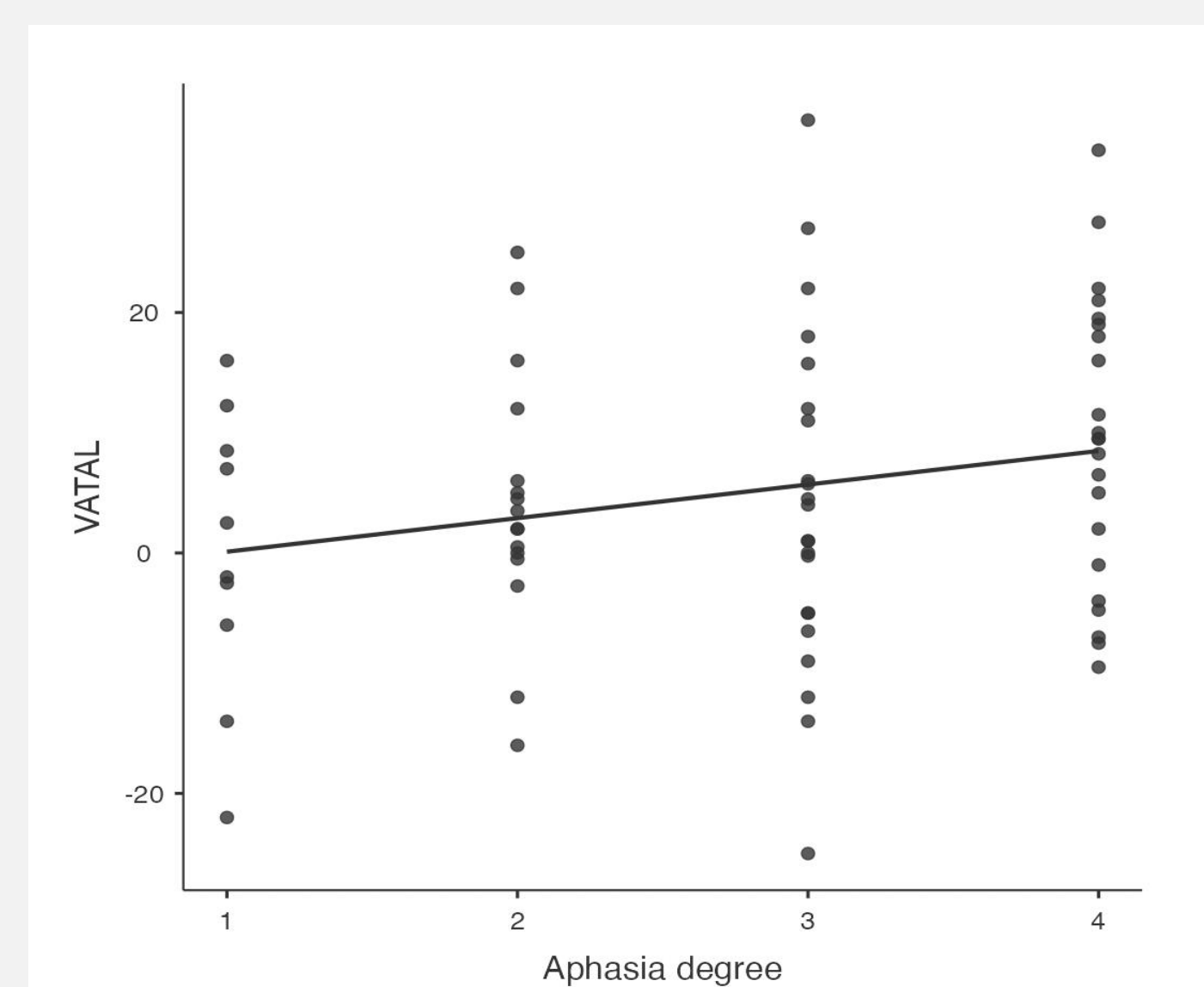
Figure 2: To address statistical biases, we excluded 12 individuals with minimal language impairment and 11 individuals with severe language impairment. We implemented recalibrated cut-offs through Bootstrap resampling (1,000 iterations). With the new conservative cut- offs we found a reduced number of cases of distorted awareness;

- Underestimation of deficits decreased from 21.8% to 14.1%, and overestimation of deficits decreased from 6.4% to 2.6% (**Figure 4**);
- Underestimation remains the main tendency in the sample (*Fisher Test*, $p < 0.001$, **Figure 4**).



	Mean (SD)	Sample Range
Age	60.2 (15.5)	19-86
Education	9.96 (4.32)	4-19
Gender-women	36 (46.2%)	-
Language		
English	12 (15.4%)	-
Italian	66 (84.6%)	-
Nature of Lesion		
-Vascular Causes		-
Ischemia	51 (65.4%)	-
Hemorrhage	20 (25.6%)	-
-TBI	7 (9%)	-
Time from lesion (months)	16.3 (39.7)	1-192

Figure 3. There is only a trend between Aphasia Degree and Awareness Level, $R^2 = 0.046$, $F(1, 68) = 3.33$, $p = 0.07$. The relationship is not significant when excluding the most extreme cases, $R^2 = -0.02$, $F(1, 48) = 0.019$, $p = 0.8$ (Figure 4).



RESULTS

PART TWO

1. Descriptives of sample (N=78)

	Mean (SD)	Sample Range
Age	51.1 (10.1)	29-60
Education		4-19
Gender- Male	8 (80%)	-
Lesion Site		
Unilateral	12 (15.4%)	-
Bilateral	66 (84.6%)	-
Nature of Lesion		
-Vascular Causes		-
Ischemia	3 (30%)	-
Hemorrhage	4 (40%)	-
-TBI	3 (30%)	-

2. Crawford's t-tests in Anosognosic group (N=3) vs control group (n=7). Online Vs Offline (Own) is indicative of underlying attentional factors, Offline-Own VS Offline-Others is indicative of underlying motivational factors

Online VS Offline (Own)	t	dof	p
P1	1.53	6	NS
P2	-2.68	6	Significant (p<0.05)
P3	0.53	6	NS

Offline-Own VS Offline-Others	t	dof	p
P1	-0.301	6	NS
P2	1.28	6	NS
P3	20.14	6	NS

CONCLUSIONS

- We did not find strong and predominant evidence that the Dunning-Kruger effect (DKE) and regression to the mean significantly influence self-report errors.
- Self-estimation error persisted even when accounting for 'extreme' cases.
- Patients tended to underestimate their language deficits, i.e., anosognosia. This degree of misestimation was consistent regardless of whether patients overestimated or underestimated their abilities.
- This finding is particularly significant as our sample consisted mainly of people with unilateral brain damage.
- Given that only one patient with attentional deficits was found in our study, our results lack a consistent pattern that links denial or attentional mechanisms to distorted awareness.
- This suggests that the nature of anosognosia may be multifaceted and not easily defined by singular explanatory factors.



REFERENCES