Sex differences of Multilingual Naming Test performance and its impact on the detection of cognitive impairment

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INTRODUCTION

- The Multilingual Naming Test (MINT) has been touted as a linguistically neutral tool for cognitive assessment.
- However, individual test items may still be fundamentally biased by lived experiences.
- As a result of these variations, male and female participants may experience and perform on the test differently.
- This study aimed to investigate the sex-based determinants of the MINT and evaluate its ultimate impact on the clinical detection of cognitive impairment.

METHOD

- The study evaluated 255 total participants: 156 cognitively unimpaired (CU) individuals (aged 40 to 84 years), 59 individuals diagnosed with mild cognitive impairment (MCI), and 27 individuals with dementia
- CU participants possessed a global Clinical Dementia Rating (CDR) score of 0 and scored above a demographic-adjusted Z-score of -1.5 on the MoCA using published local norms.
- All participants underwent the 32-item version of the MINT in Montreal, Canada.

ANALYSES

- Performance metrics were thoroughly analyzed regarding both overall total scores and specific individual item scores

	Age 40-60 and Years of Education ≤15 (N=23)	Age 40-60 and Years of Education >15 (N=25)	Age 61-68 and Years of Education ≤15 (N=24)	Age 61-68 and Years of Education >15 (N=29)	Age 69-84 and Years of Education ≤15 (N=25)	Age 69-84 and Years of Education >15 (N=30)	MCI (N=68)	Dementia (N=31)	Overall (N=255)
Age									
Mean (SD)	56.0 (4.54)	55.5 (4.30)	64.9 (2.55)	65.0 (1.95)	73.8 (4.88)	73.6 (3.72)	68.5 (8.84)	68.1 (7.52)	66.4 (8.41)
Median [Min, Max]	57.0 [40.0, 60.0]	56.0 [41.0, 60.0]	65.0 [61.0, 68.0]	65.0 [61.0, 68.0]	71.0 [69.0, 84.0]	73.5 [69.0, 83.0]	70.0 [50.0, 85.0]	69.0 [52.0, 84.0]	67.0 [40.0, 85.0]
gender									
female	12 (52.2%)	19 (76.0%)	19 (79.2%)	22 (75.9%)	17 (68.0%)	17 (56.7%)	41 (60.3%)	13 (41.9%)	160 (62.7%)
male	11 (47.8%)	6 (24.0%)	5 (20.8%)	7 (24.1%)	8 (32.0%)	13 (43.3%)	27 (39.7%)	18 (58.1%)	95 (37.3%)
education									
Mean (SD)	12.9 (1.35)	17.4 (1.50)	13.4 (1.38)	17.6 (1.54)	12.8 (2.17)	17.6 (1.92)	15.4 (3.39)	15.8 (3.24)	15.5 (3.02)
Median [Min, Max]	12.0 [11.0, 15.0]	17.0 [16.0, 21.0]	14.0 [10.0, 15.0]	18.0 [16.0, 23.0]	13.0 [5.00, 15.0]	17.0 [16.0, 23.0]	15.0 [7.00, 27.0]	16.0 [11.0, 25.0]	16.0 [5.00, 27.0]
MINTNoCues									
Mean (SD)	28.9 (2.12)	29.2 (2.05)	29.2 (1.83)	29.2 (1.82)	28.6 (2.14)	29.7 (1.81)	27.5 (2.84)	23.8 (6.25)	28.1 (3.48)
Median [Min, Max]	29.0 [24.0, 32.0]	30.0 [24.0, 32.0]	29.5 [25.0, 32.0]	30.0 [25.0, 32.0]	28.0 [24.0, 32.0]	30.0 [26.0, 32.0]	28.0 [20.0, 32.0]	26.0 [7.00, 31.0]	29.0 [7.00, 32.0]
MINTWith_Cues									
Mean (SD)	29.0 (2.13)	29.6 (2.12)	29.5 (1.79)	29.4 (1.74)	29.0 (2.01)	29.9 (1.60)	28.2 (2.65)	24.5 (6.11)	28.5 (3.30)
Median [Min, Max]	29.0 [24.0, 32.0]	30.0 [24.0, 32.0]	29.5 [26.0, 32.0]	30.0 [25.0, 32.0]	29.0 [24.0, 32.0]	30.0 [26.0, 32.0]	28.5 [20.0, 32.0]	28.0 [7.00, 32.0]	29.0 [7.00, 32.0]

Table 1: Demographic table showing a detailed distribution of the cognitively unimpaired across age and education subgroups as well as cognitively impaired participants

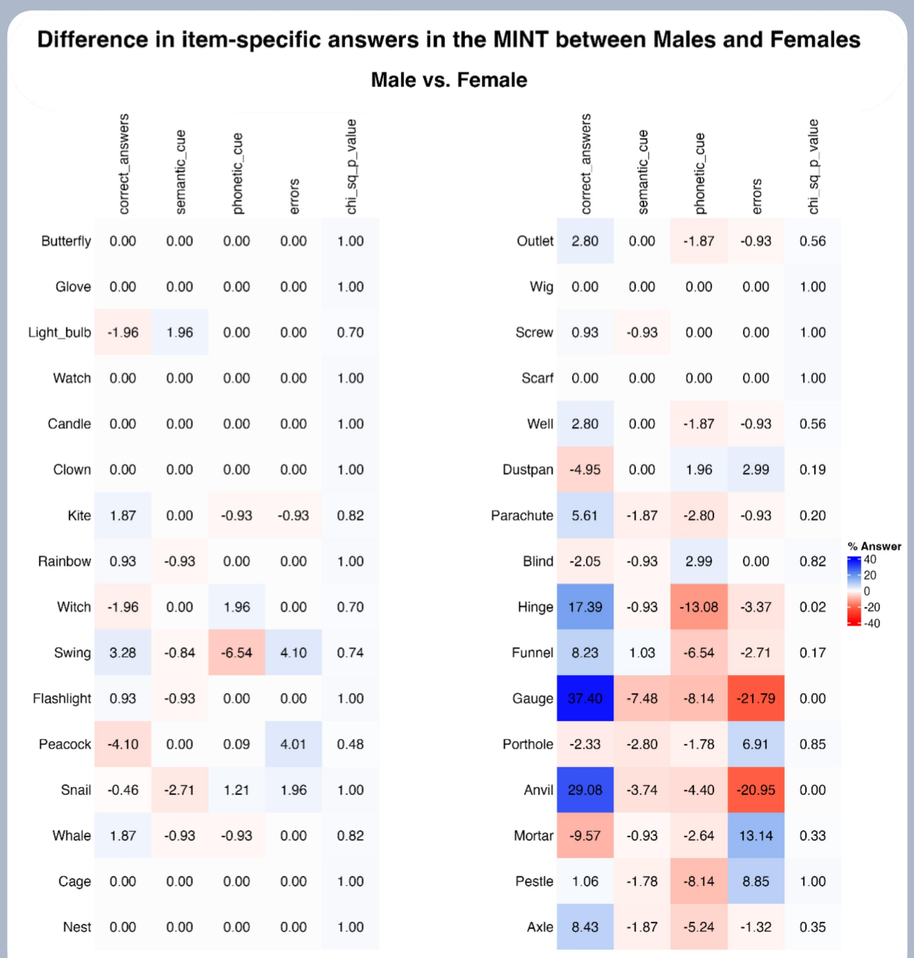

Figure 1: Gender performance difference among the cognitively unimpaired participants

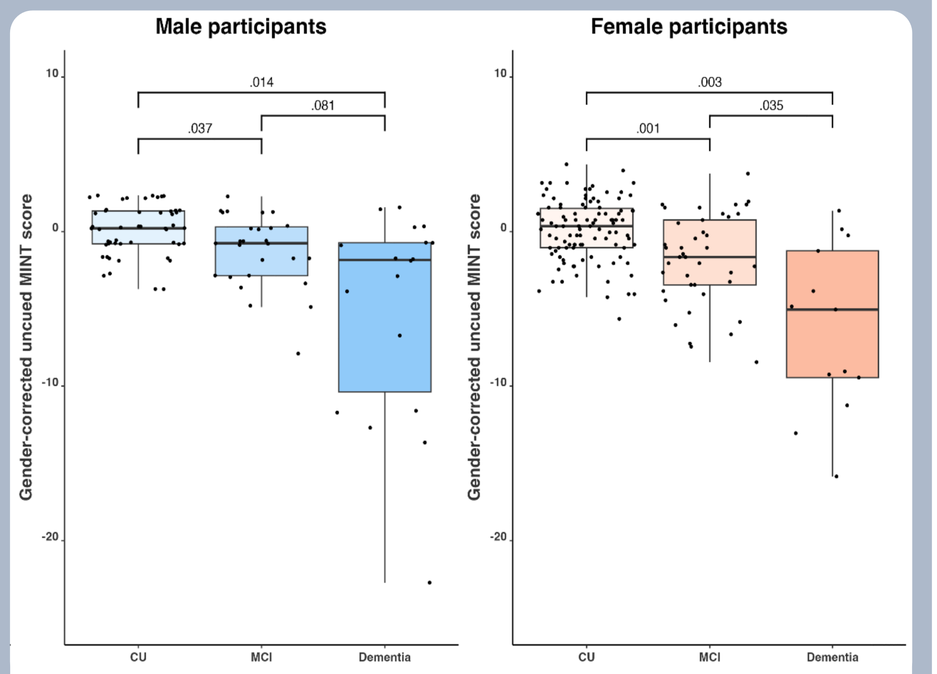

Figure 2: Detection of cognitive impairment using the gender-corrected MINT scores. With gender correction, the MINT was similarly sensitive to MCI and dementia in male and female participants.

RESULTS

a) Age and education subgroups displayed highly similar overall MINT performances and consistent proportions of female participants, ranging from 52.2% to 79.2% ($p > 0.05$; **Table 1).**
   - This resulted in higher variance, although clinical groups did not differ significantly from one another ($p > 0.05$).

b) Despite general score parity across the demographic subgroups, explicit item-specific analysis revealed significant item performance differences between male and female participants (**Figure 1)**;
   - The variance was highly concentrated on specific tool-related items: "pressure gauge", "anvil", and "hinge" ($p < 0.02$).

c) Statistically accounting for these explicit gender-related item discrepancies revealed highly significant diagnostic differences across clinical groups ($p < 0.005$; **Figure 2)**;
   - Applying this correction allowed the tracking of a distinct, stepwise diagnostic degradation from CU to MCI, and down to dementia.
   - Following the application of the gender correction, the MINT proved comparably effective at differentiating distinct clinical groups within both the male and female gender subgroups

DISCUSSION

- Performance on the MINT significantly differs between male and female participants, driven heavily by specific tool-related vocabulary items.
- Implementing a simple statistical correction effectively resolves these discrepancies and improves the overall diagnostic capability of the test.
- When appropriately considering gendered response patterns, the MINT serves as an effective, highly sensitive clinical tool to identify cognitive impairment.

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