Cognitive Intra-individual Variability Predicts IADL Function in the Women's Interagency HIV Study

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BACKGROUND

- Cognitive intra-individual variability (IIV) refers to the variation observed in cognitive performance when various cognitive tests are administered within the same person (i.e., dispersion).
- For example, someone who can solve problems well but has a poor memory is an example of cognitive IIV.
- In people with HIV, greater cognitive IIV has been associated with poorer cognitive performance and decline over time, cortical brain atrophy, and increased mortality risk.
- In this study, we calculated cognitive IIV from cognitive test performance in women with HIV (WWH) and without HIV (WWoH) and examined its relationship to everyday functioning items.
- The predictive value of two types of cognitive IIV were examined (i.e., *sd*IIV & *cov*IIV).

METHODS

- This study examined the association between cognitive IIV and self-reported everyday functioning among 1,086 (WWH) and 494 socio-demographically similar WWoH.
- Objective cognitive performance across 7 domains and the self-rated modified Lawton and Brody scale of Instrumental Activities of Daily Living (IADL) were assessed among participants of the Women's Interagency HIV Study (WIHS).
- Two types of cognitive IIV were calculated by taking the standard deviation across 7 cognitive domains to calculate dispersion:
  - 1) **intra-individual standard deviation** (*sd*; the *sd* of *Z*-scores for the 7 cognitive domains; denoted as *sd*IIV)
  - 2) **coefficient of variation** (the *sd* divided by the mean over Z-scores for the 7 cognitive domains; denoted as *cov*IIV).
- To account for the longitudinal nature of the data, generalized linear mixed effect models were conducted to examine the associations between the dispersion coefficient of cognitive IIV (predictor (*sd*IIV or *cov*IV)) and functional status outcomes (item level scores).
- Models were constructed in the overall sample (WWH + WWoH), WWH only, virally suppressed (VS)-WWH, and WWoH.

Women with HIV had higher levels of cognitive intra-individual variability (IIV).

*cov*IIV was more sensitive than *sd*IIV in predicting.

Table. Predictive Values of covIIV and sdIIV on IADL Items

IADL Item	covIIV		sdIIV	
	OR; CI	p-value	OR; CI	p-value
Money and Bills	0.34; 0.03, 0.64	0.031	ns	ns
Buying Groceries	0.33; 0.07, 0.59	0.013	ns	ns
Work	0.20; 0.02, 0.37	0.029	ns	ns
Getting Where You Need to Go	0.29; 0.05, 0.53	0.018	ns	ns
Using the Phone	0.81; 0.07, 1.55	0.032	ns	ns
Home Repairs	0.30; 0.15, 0.45	0.001	0.23; 0.07, 0.38	0.004
Dressing	0.76; 0.31, 1.20	0.001	0.84; 0.38,1.31	0.004
Laundry	0.33; 0.12, 0.54	0.002	0.29; 0.08, 0.50	0.004
Taking/Keeping Track of Medications	0.57; 0.20, 0.95	0.002	0.47; 0.06, 0.88,	0.023
Taking Care of Children	0.38; 0.14, 0.62	0.002	0.30; 0.04, 0.56	0.024

Notes: CI = confidence interval; covIIV = covariance intra-individual variability (IIV); ns = not significant; OR = odd ratio; sdIIV = intra-individual standard deviation.

RESULTS

- Regarding the cognitive IIV values, WWoH had lower cognitive IIV scores (both *sd*IIV (p=0.04) and *cov*IIV (p<0.01) Wilcoxin rank-sum test) than WWH, reflective of less variability which is an indicator of better underlying neurological functioning.
- With respect to IADLs, approximately 22% of the entire sample, WWoH and WWH, showed an overall total impairment in IADLs. Working (20%), planning social activities (12%), and home repairs (11%) were among the most common IADLs to be impaired in the overall sample of WWoH and WWH.
- *sd*IIV and *cov*IIV were not associated with any of the IADL items among WWoH but were for WWH and VS-WWH.
- At p<.05 (see Table), WWH cognitive IIV was predictive of poorer functional performance on 10 IADL items with *cov*IIV and 5 items with *sd*IIV.

CONCLUSIONS

- This study found that cognitive IIV was slightly greater among WWH compared to WWoH and predictive of everyday functioning.
- This study is unique in comparing two different mathematical formulae of cognitive IIV, indicating *cov*IIV to be more sensitive of predicting impairment in various IADLs.
- This means cognitive IIV, especially *cov*IIV, may be a predictive tool for other HIV-related behavioral phenomena.
- Cognitive training approaches (i.e., executive functioning training) are being developed to reduce cognitive IIV in people with HIV (5 R21 AG077957-02).

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