

Depression and executive dysfunction in people living with HIV: A neuropsychological study in Taiwan

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Introduction

Background

With the widespread use of antiretroviral therapy, HIV infection has become a manageable chronic condition. However, people living with HIV (PLWH) remain vulnerable to depression, anxiety, stigma, and neurocognitive impairment.

HIV-related neuroinflammation and structural brain alterations may negatively affect attention, executive function, emotional regulation, and overall brain health. Previous studies have shown that PLWH with depression are more likely to experience cognitive difficulties and poorer psychosocial outcomes.

Understanding the neuropsychological characteristics associated with depression in PLWH may support the development of targeted brain health interventions and personalized neuropsychotherapy.

Objectives

- To examine the relationship between depression and cognitive function among PLWH.
- To identify specific neuropsychological deficits associated with depressive symptoms.

Methods

Study Design: Between-subjects comparative study

- Depressed PLWH (D-PLWH)
- Non-depressed PLWH (ND-PLWH)

Participants

- Adults aged ≥18 years
- Recruited from outpatient clinics at three hospitals in Taiwan

Assessments

Participants completed neuropsychological and mental health assessments evaluating:

• Cognitive Function

Wechsler Adult Intelligence Scale (WAIS)
Cognitive screening: Community Mental Status Examination (CMSE)
Executive function: Wisconsin Card Sorting Test (WCST)
Attention: Comprehensive Non-verbal Attention Test Battery (CNAT)

• Mental health

Depression: Patient Health Questionnaire-9 (PHQ-9)
Anxiety: Generalized Anxiety Disorder-7 (GAD-7)
World Health Organization-Five Well-Being Index (WHO-5)
World Health Organization Quality of Life-Brief (WHOQOL-BREF)

Results

Participant Characteristics: 60 participants (D-PLWH: 21, ND-PLWH: 39)

Compared with ND-PLWH, participants in the D-PLWH group were younger and reported:

- Poorer quality of life
- Lower well-being
- Higher levels of anxiety

Neuropsychological Findings: D-PLWH demonstrated

- Poorer working memory and perceptual processing efficiency
- More impulsive errors during focused attention tasks

Table 1. Basic information

	D-PLWH (21)	ND-PLWH (39)	<i>t</i> / <i>χ</i> ²	<i>p</i>
Biological male	20 (95.2%)	37 (94.9%)	0.04	.95
Age (years)	38.19 ± 9.04	44.26 ± 10.14	-2.29	.03*
Education (years)	14.90 ± 2.28	15.21 ± 1.95	-0.54	.59

Table 2. Assessment results

	D-PLWH (21)	ND-PLWH (39)	<i>t</i>	<i>p</i>
Mental health				
WHOQOL-BREF (140)	71.90 ± 12.28	96.85 ± 12.40	-7.45	.00**
WHO-5 (100)	33.90 ± 20.18	54.77 ± 20.97	-3.72	.00**
BSRS (20)	11.90 ± 4.04	5.08 ± 2.90	7.57	.00**
PHQ-9 (9)	15.67 ± 4.82	4.44 ± 2.89	9.77	.00**
GAD-7 (7)	12.19 ± 5.35	3.74 ± 3.12	6.65	.00**
Full Scale IQ	98.76 ± 13.45	108.49 ± 14.07	-2.59	.01*
Verbal Comprehension Index	103.00 ± 14.03	109.90 ± 12.55	-1.95	.06
Similarities SS	11.43 ± 2.42	12.31 ± 2.21	-1.42	.16
Vocabulary SS	9.52 ± 2.82	12.00 ± 5.69	-1.87	.07
Information SS	10.57 ± 3.37	11.82 ± 3.22	-1.41	.16
Perceptual Reasoning Index	101.05 ± 16.84	105.49 ± 16.43	-0.99	.33
Block Design SS	10.05 ± 3.17	10.82 ± 3.29	-0.88	.38
Matrix Reasoning SS	10.19 ± 3.31	10.49 ± 2.67	-0.37	.71
Visual Puzzles SS	10.29 ± 3.18	11.54 ± 3.60	-1.34	.19
Working Memory Index	97.19 ± 15.63	106.67 ± 14.70	-2.33	.02*
Digit Span SS	9.43 ± 3.08	11.51 ± 3.12	-2.45	.02*
Letter-Number Sequencing SS	10.00 ± 3.27	11.00 ± 2.21	-1.35	.18
Processing Speed Index	93.95 ± 16.54	104.21 ± 13.79	-2.56	.01*
Symbol Search SS	9.52 ± 3.25	10.79 ± 2.76	-1.60	.12
Coding SS	8.33 ± 3.67	10.77 ± 2.88	-2.84	.01*
CMSE (50)	43.52 ± 2.50	43.90 ± 2.85	-0.51	.62
Left frontal (7)	6.24 ± 0.70	6.59 ± 0.72	-1.83	.07
Right frontal (18)	13.81 ± 1.83	13.51 ± 1.81	0.60	.55
Left posterior (19)	17.57 ± 1.36	17.92 ± 1.33	-0.97	.34
Right posterior (6)	5.95 ± 0.22	5.87 ± 0.34	1.12	.27
WCST: Cognitive flexibility				
% errors T	48.24 ± 7.10	46.49 ± 8.86	0.78	.44
% perseveration response T	48.71 ± 9.00	46.13 ± 11.16	0.91	.37
% perseveration errors T	47.86 ± 9.33	45.74 ± 10.43	0.78	.44
% nonperseveration errors T	48.52 ± 7.10	48.23 ± 8.37	0.14	.89
% conceptual level T	47.71 ± 7.72	47.00 ± 8.54	0.32	.75
Focused attention (CNAT)				
Impulsive error	0.00 ± 0.00	0.23 ± 0.67	-2.16	.04*
Omission errors	0.00 ± 0.00	0.08 ± 0.27	-1.78	.08
Delay errors	1.00 ± 0.56	1.00 ± 0.65	0.00	1.00
Reaction time (s)	0.31 ± 0.05	0.30 ± 0.07	0.41	.68
Search attention				
Impulsive error	0.05 ± 0.22	0.03 ± 0.16	0.48	.63
Omission errors	0.10 ± 0.45	0.31 ± 0.73	-1.16	.25
Delay errors	0.80 ± 0.77	1.03 ± 0.90	-0.95	.34
Reaction time (s)	0.32 ± 0.06	0.32 ± 0.56	0.08	.93

Conclusion

D-PLWH showed impairments in attention and executive control, suggesting possible prefrontal dysregulation independent of general intellectual functioning.

These findings highlight the importance of integrating into HIV mental health care:

- Emotional regulation strategies
- Executive function training
- Neuropsychological assessment

Future studies should incorporate real-time cognitive monitoring and brain health approaches to improve personalized interventions for PLWH.

Clinical Implications

- ✓ Early neuropsychological screening for PLWH
- ✓ Integration of mental health and brain health services
- ✓ Executive function-focused interventions
- ✓ Personalized neuropsychotherapy
- ✓ Promotion of health equity and patient empowerment