

Lower Levels of Moderate Physical Activity are Associated with Neurocognitive Impairment Among Older HIV+ Adults

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Common Risk and Protective Factors

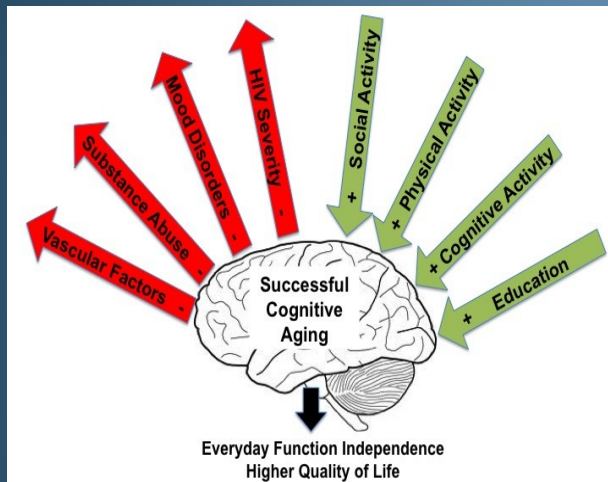
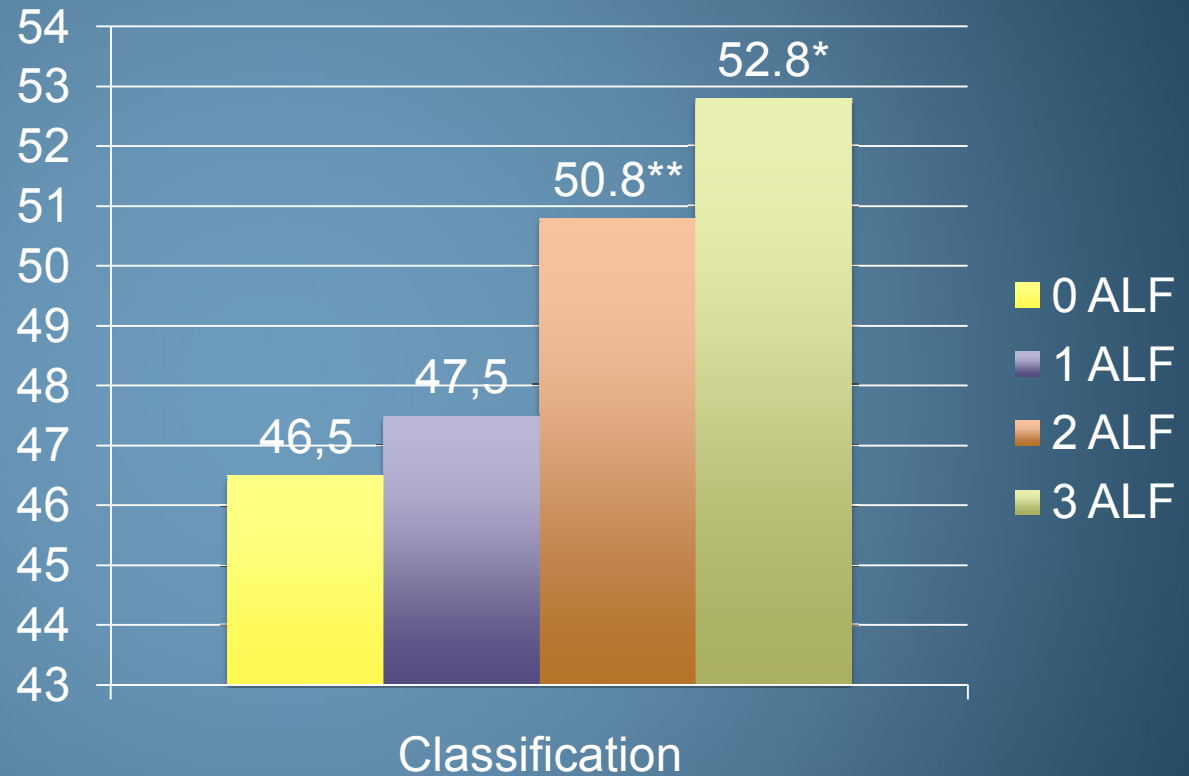


Figure 2
Potential Factors that Positively or Negatively Affect Successful Cognitive Aging in HIV



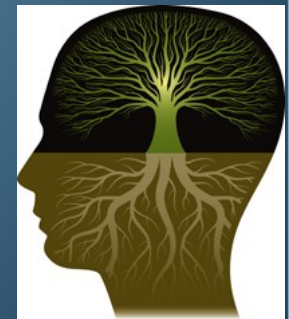
Notes. ALF = Active lifestyle factors (social, physical, and mental); *3 > 1 and 0 ($p < 0.05$); **2 > 0 ($p = 0.09$). The y-axis is truncated for visual representation of means. Bars represent standard errors.

Fazeli et al., (in press), JNV

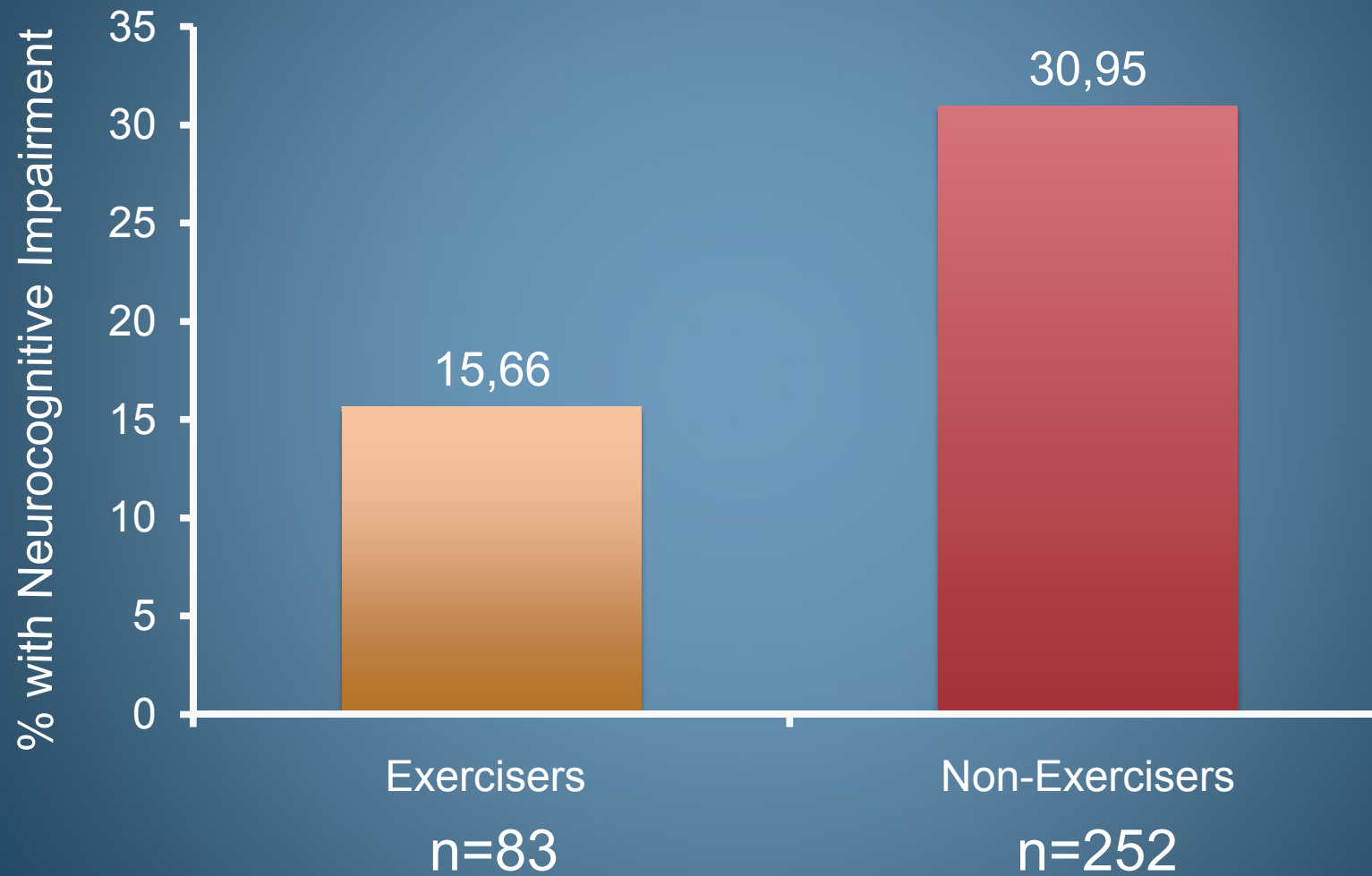
Physical Activity (PA) & NCI in HIV-

- HIV- : PA shown to decrease NCI
- Meta-Analysis of 18 RCT exercise interventions on sedentary older adults and found robust effects on cognition¹
 - » Executive and visuospatial processes showed largest benefit
 - » Long-term training better than moderate/brief
- PA offers opportunity for improving and preventing NCI
 - » Direct effect on CNS (e.g., neuroplasticity; ↑ cerebral blood flow)
 - » Indirect effect (e.g., ↓ vascular risk factors)
 - » Both

¹Colcombe & Kramer (2003), *Psychological Science*



PA & NCI in HIV+



Dufour et al., JNV, 2013

Objective

- Given ↑ vulnerability of older HIV+ adults to NCI, to explore the association between PA and NCI among older adults with HIV

Methods

- **Participants: 100 HIV+ subjects aged 50 – 79**
- **Neurocognitive Assessment:**
 - » **Standardized NC battery of seven domains (verbal fluency, working memory, speed of processing, verbal & visual learning & delayed recall, executive function, motor function)**
 - » **Raw scores converted to demographically-corrected T-scores; NCI was based on global deficit scores; emphasis on impaired scores¹**

¹Blackstone et al., 2012, JINS

PA Assessment

- Self-report, examiner-administered International Physical Activity Questionnaire (IPAQ) (domains assessed independently)
- During the past 7 days, on how many days did you do **vigorous** physical activity (i.e., activities that take **hard physical effort and make you breath much harder than normal**, like heavy lifting, aerobics, digging, fast bicycling)?
 - » How much time did you usually spend doing vigorous activity on one of those days?
- ...**moderate** physical activity (i.e., activities that take **moderate physical effort and make you breath somewhat harder than normal**, like carrying light loads, bicycling at a regular pace, doubles tennis)?
Do not include walking.
 - » How much time did you usually spend doing moderate activity on one of those days?
- ...**walk for at least 10 minutes at a time?**
 - » How much time did you usually spend walking on one of those days?
- Standard scoring for IPAQ includes 3 continuous scores based on minutes/week * intensity (using established metabolic equivalent [MET] values):
 - Walking MET (3.3) * minutes/week
 - Moderate MET (4.0) * minutes/week
 - Vigorous MET (8.0) * minutes/week

Sample Descriptives (N=100)

Variable	Mean (SD) or %
Demographics	
Age	58.2 (6.5)
Sex (% Male)	88.0%
Education	14.3 (2.6)
Race (% White)	82.0%
HIV Characteristics	
Current CD4*	597 (365.0 – 776.0)
Nadir CD4*	135.5 (39.5 – 300.0)
AIDS Status (% Yes)	66%
ART status (% On)	98%
Plasma Viral Load (% Undetectable)	91.8%
Est. Duration HIV Infection (yrs)	18.0 (8.0)

Variable	Mean (SD) or %
Mental Health	
Beck Depression Inventory-II*	8.0 (3.0 – 16.8)
Lifetime MDD Diagnosis (% Yes)	60.0%
Current MDD Diagnosis (% Yes)	14.1%
Lifetime Substance Diagnosis (% Yes)	69.7%
Current Substance Diagnosis (% Yes)	6.1%
Global Neurocognitive Impairment (% Yes)	43.0%

Notes. ART=antiretroviral therapy; MDD=Major Depressive Disorder. *Median (IQR) reported for these variables.

Physical Activity Characteristics (N=100)

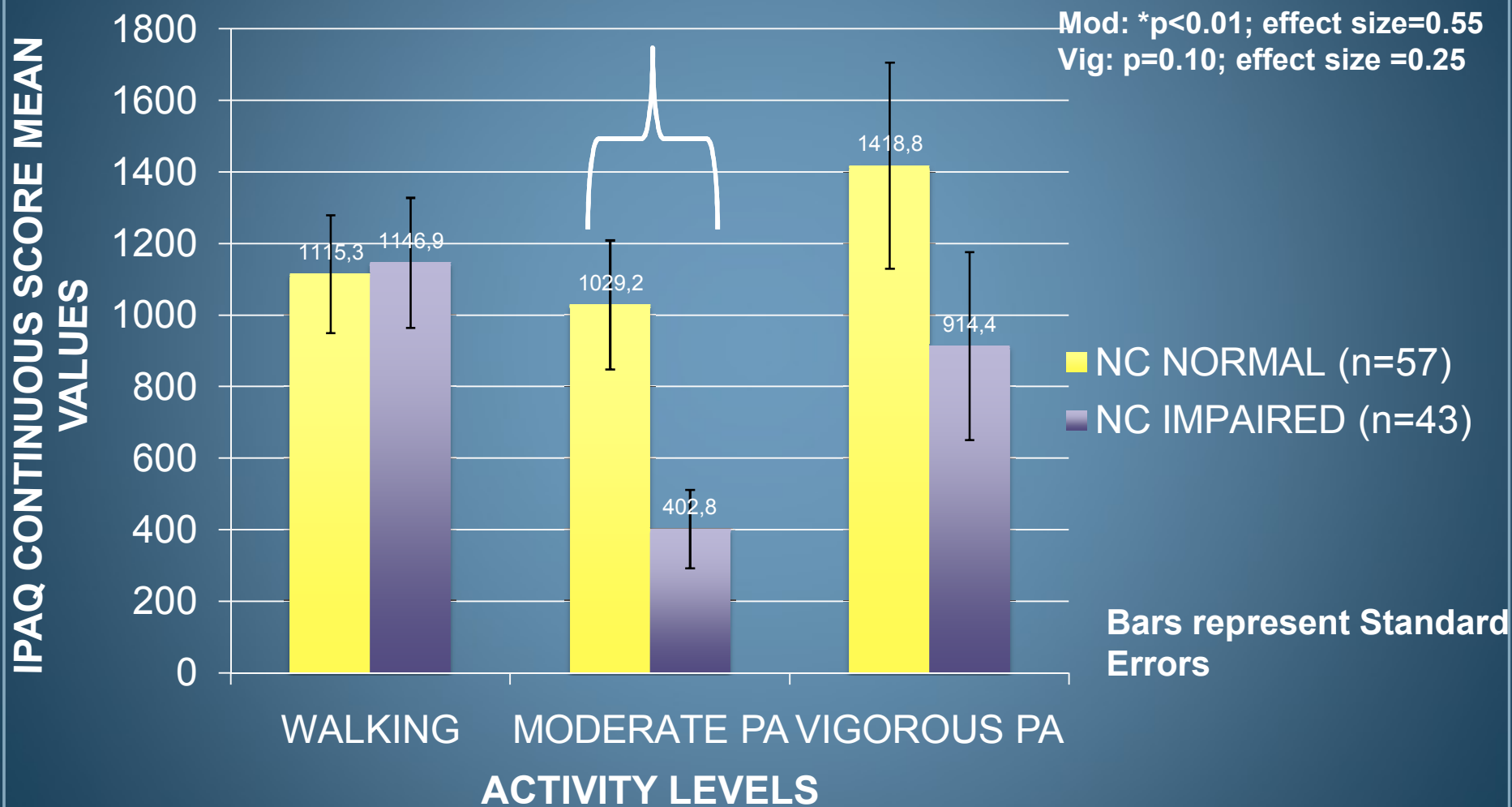
Variable	M(SD), Median (IQR), or %
Vigorous PA	
IPAQ Continuous Score	480.0 (0 – 1,440.0)
Any Vigorous PA (% Yes)	53.0%
Moderate PA	
IPAQ Continuous Score	210.0 (0 – 1,080.0)
Any Moderate PA (% Yes)	59.0%
Walking	
IPAQ Continuous Score	594.0 (251.6 – 1,534.5)
Any Walking (% Yes)	89.0%
Total Days of Activity	5.8 (2.1)
Hours Sitting on Avg Day	6.7 (4.0)
Notes. IPAQ = International Physical Activity Questionnaire.	

→ 60 min/wk

→ 53 min/wk

→ 180 min/wk

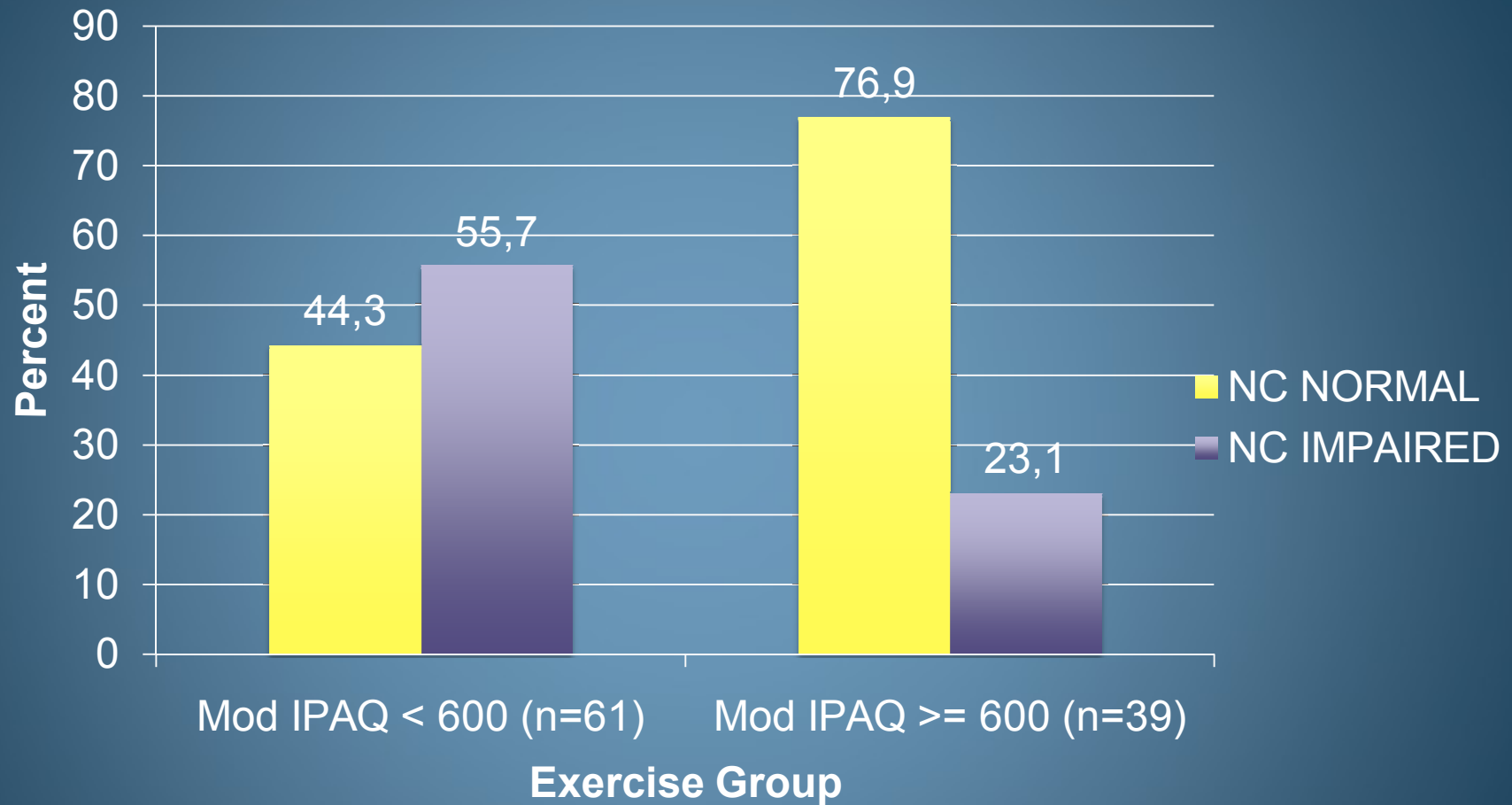
Physical Activity by Global Impairment



Analyses & Results

- Examination of domain-specific NCI revealed the association between moderate PA and global NCI was driven by executive function ($p=0.02$).
- When including all significant and trend-level covariates in the model (depression/depressive symptoms, moderate PA score remained significant ($p<0.05$))
- When running a forward selection stepwise regression using minimum AIC values to determine predictors, gender, current MDD, and MOD IPAQ score were retained in the model, and only MOD IPAQ was significant ($p=0.02$)

Categorical Score Created using Recursive Partitioning on the Moderate IPAQ Continuous Score



Interestingly, a Moderate IPAQ Continuous score of 600 = 150 minutes of moderate activity a week (600 / MET value of 4 for moderate activity = 150 mins), which is the recommended amount; $p < 0.01$

Conclusions

- Lower levels of moderate PA associated with global NCI, and specifically executive dysfunction among older HIV+ adults
- Recursive partitioning maps on to CDC recommendations
- Lack of association with vigorous PA may have been due to over-reporting, while the lack of association with walking may suggest low intensity PA does not influence NCI; this highlights the need for objective PA measures in studies (e.g., pedometers)
- Directionality unknown, literature among older HIV- shows PA can:
 - Promote neurogenesis, ↓ central obesity (a previously determined risk for HIV-associated NCI), and ↓ other cardiovascular comorbidities

Future Directions

- Examine differences between HIV+ and HIV- and Older/Younger
- Examine causality through longitudinal studies
- Explore neural mechanisms; imaging before after PA intervention
- Use objective PA methods (e.g., pedometers, accelerometers) in natural environment
- Use intervention approaches to change PA
 - Text messaging as per Henry NIMH R21 (iSTEP)
 - Traditional training interventions

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