

Intergenerational Effects of Socioeconomic Status on Cognition: The Mediating Role of Epigenetic Clock Measures of Biological Age

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Hypotheses

- Replication: is parent social disadvantage reflected biologically in the next generation?
 - H1: Low parent SES will predict offspring epigenetic age acceleration
 - H2: Similar relationship across race and ethnicity
 - H3: Not DNAm-based measures of incident dementia risk (IncDemMRS)
- Does biological aging mediate the relationship between Parent SES and Offspring cognition?
 - H4: Expect partial mediation with DNAm clocks
 - H5: Biological aging will be a stronger mediator in Black and Latinx participants

Data & Measures

Who: Offspring cohort with DNA methylation measures (N=1,209)

Exposure: WHICAP parent SES composite: education, income, occupation

Offspring DNAm Mediators:

- GrimAge2: prediction of mortality risk in Framingham
- DunedinPACE: within-individual decline across 19 biological indicators of organ-system integrity as the predicted phenotype
- IncDemMRS (Zhang et al., 2025): prediction of incident dementia in Framingham

Offspring Cognitive Outcomes: A comprehensive neuropsychological battery (factor scores for memory, language, speed, and executive function)

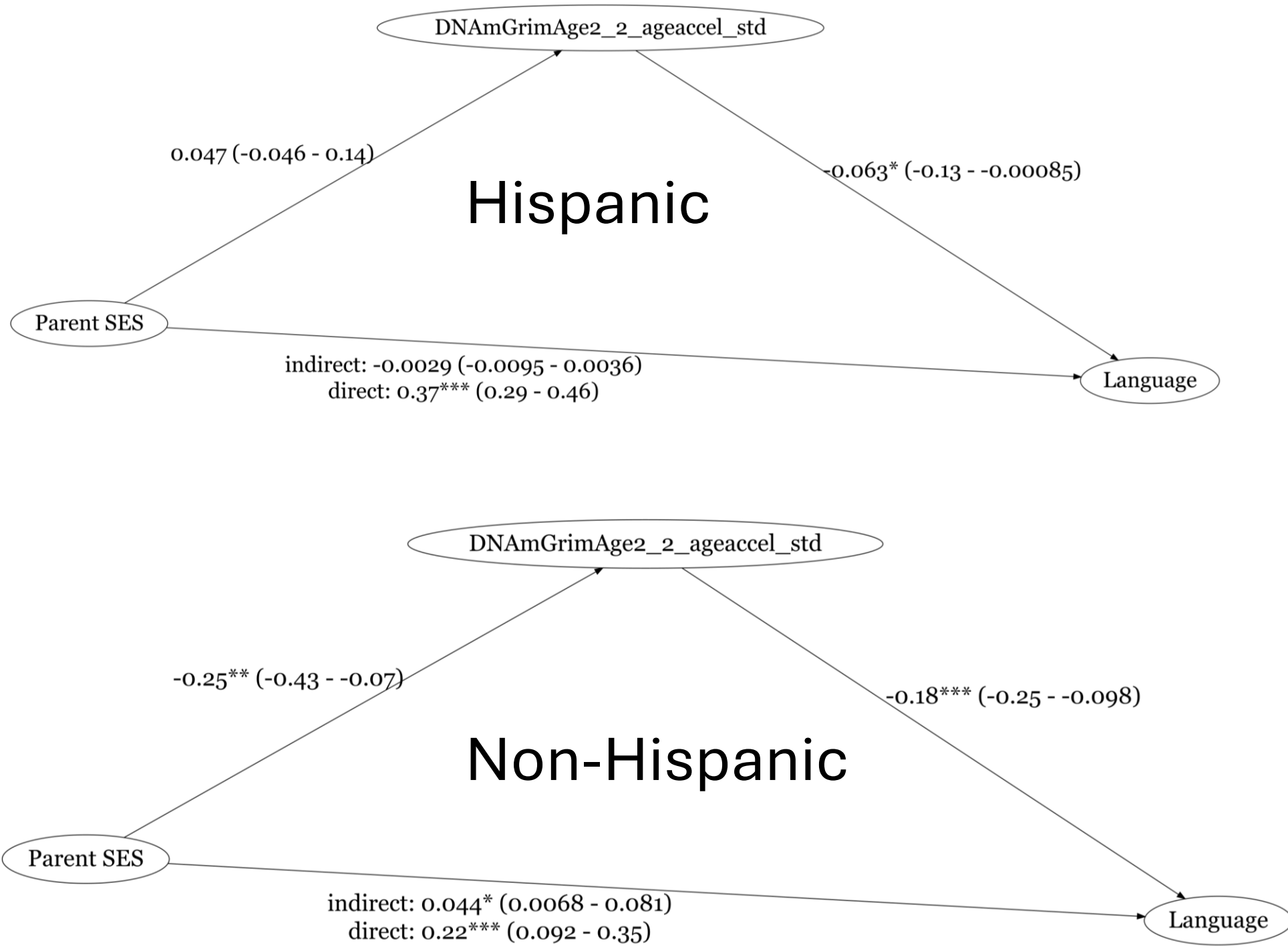
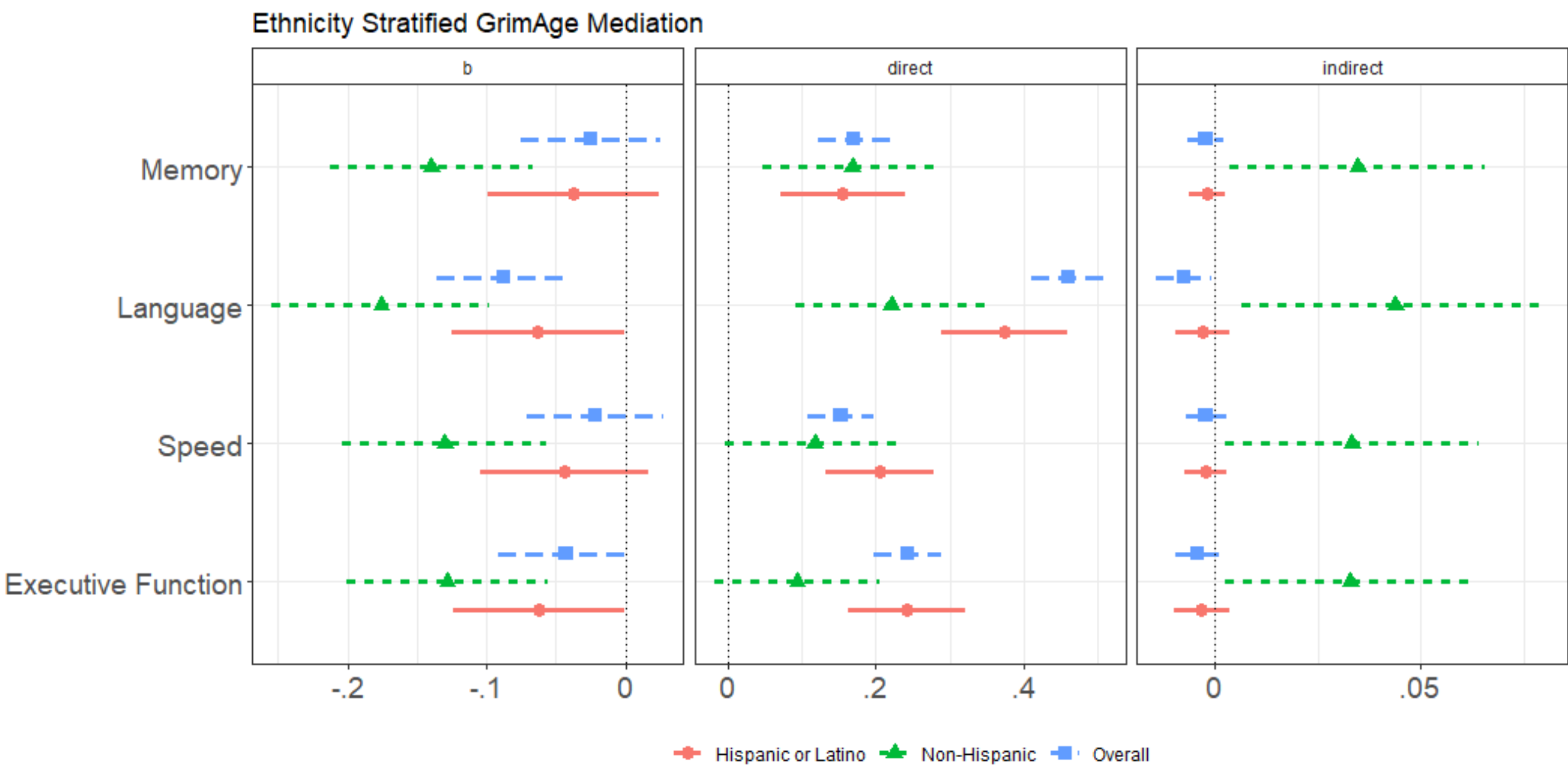
Covariates:

- Offspring age
- Sex/gender
- Sibling relatedness

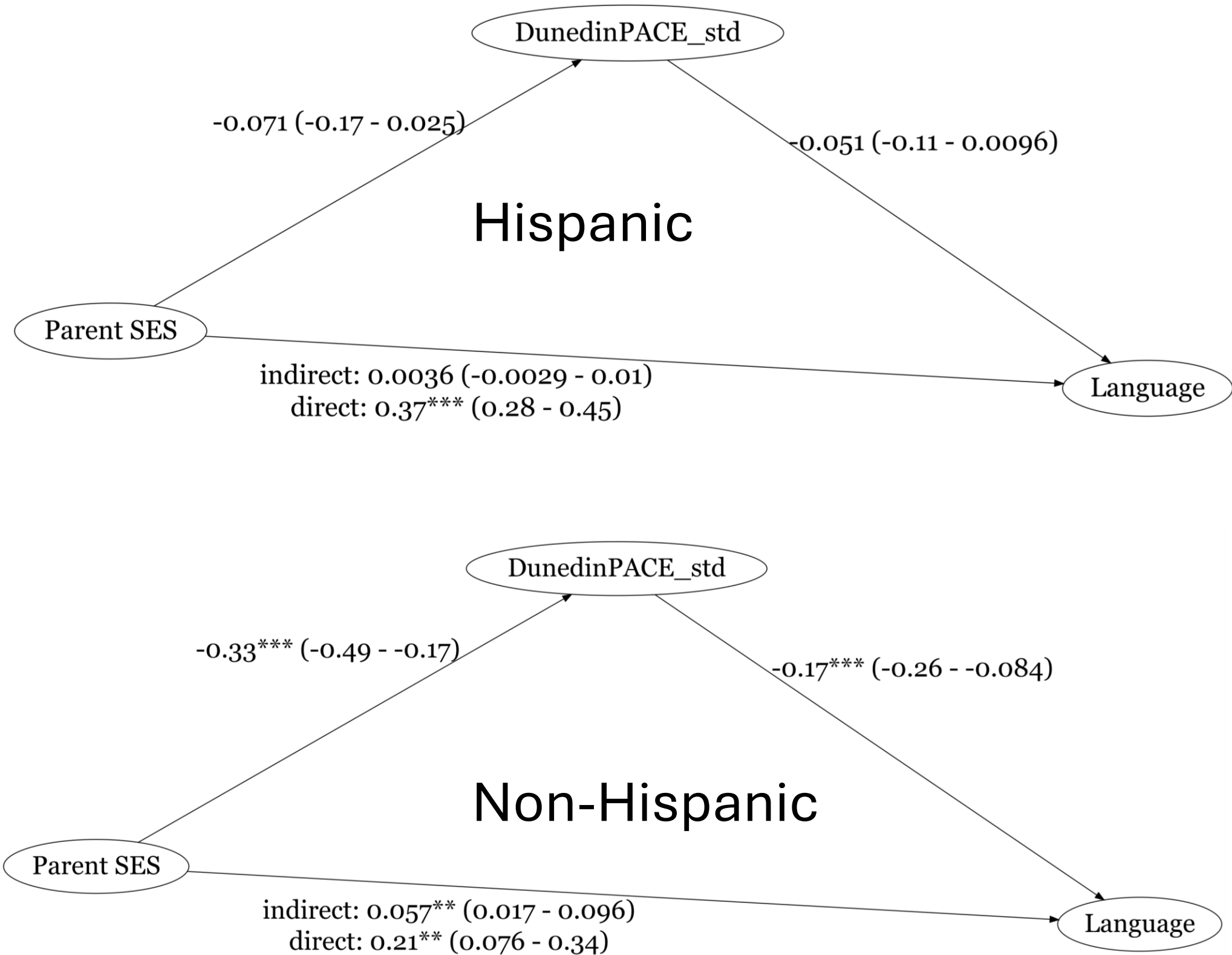
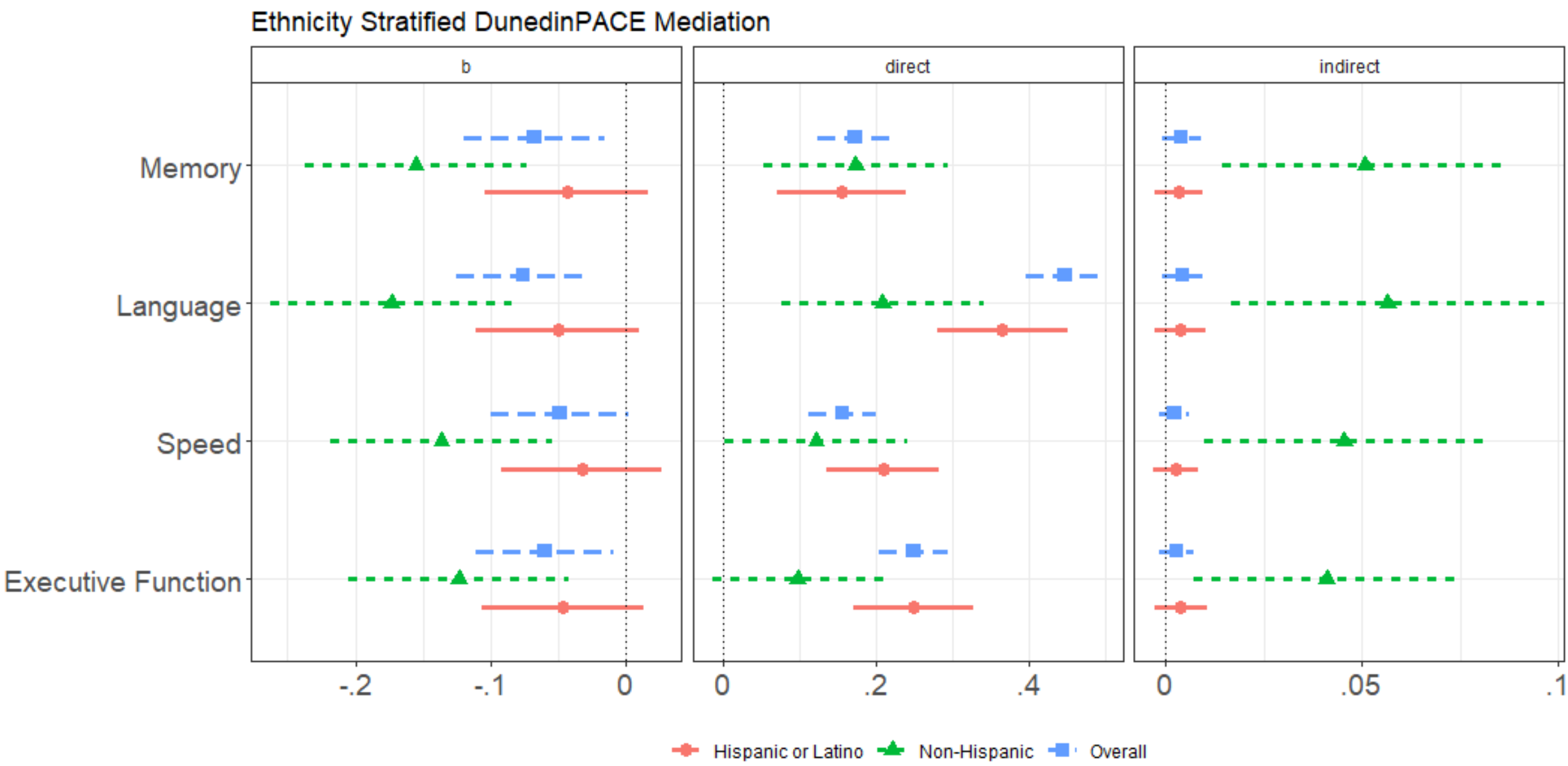
Participants

	Overall N = 1,209	Hispanic or Latino N = 868	Non-Hispanic Black or biracial N = 244	Non-Hispanic White N = 87	Other Race N = 10
Baseline Age	56 (11); 28-89	56 (11); 28-89	55 (11); 28-89	54 (12); 28-83	50 (14); 35-73
Female	807 (67%)	599 (69%)	149 (61%)	54 (62%)	5 (50%)
Education (Years)	12.8 (3.7); 0.0-20.0	12.0 (3.8); 0.0-20.0	14.1 (2.5); 6.0-20.0	16.5 (2.0); 12.0-20.0	15.1 (2.8); 10.0-18.0
Parent Education (Years)	8.3 (5.0); 0.0-20.0	6.3 (4.1); 0.0-20.0	13.0 (3.0); 3.0-20.0	14.7 (3.1); 6.0-20.0	13.8 (7.1); 3.0-20.0
% Parent Occupation Professional/technical	160 (14%)	40 (4.9%)	70 (30%)	45 (53%)	5 (50%)
Parent Monthly Income	1,077 (897)	770 (491)	1,641 (1,034)	2,553 (1,257)	2,390 (1,611)
Parent Dementia	427 (35%)	372 (43%)	47 (19%)	7 (8.1%)	1 (10%)
Grim2 Age Acceleration	0.0 (5.2); -12.3-22.8	-0.4 (4.7); -11.1-22.2	2.5 (6.3); -12.3-22.8	-2.2 (4.9); -10.3-13.5	-2.6 (4.0); -10.5-4.5

GrimAge Mediation Models



DunedinPACE Mediation Models



Conclusions

- In some groups, parent social disadvantage reflected biologically in the next generation
 - H1: Low parent SES associated with accelerated offspring epigenetic age BUT
 - H2: Not among Hispanic participants
 - H3: No association with IncDemMRS
- Biological aging mediates the relationship between Parent SES and Offspring cognition in non-Latinx participants only
 - H4: Partial mediation with GrimAge2 and DunedinPACE
 - H5: Stronger mediator in non-Hispanic Black and White participants
- Ethnic differences could be:
 - SES may not map onto the same exposures, selection & resilience among Latinx participants, measurement bias/poor calibration in biological clocks due to all-White non-Hispanic training samples