Supplementary Table 1: PRISMA Checklist.

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1 Title Page
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 2 and Page 3 Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 4, Page 5, and Page 6
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 6
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 7
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 7

Section and Topic	Item #	Checklist item	Location where item is reported
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 7
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 8
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g., for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 8
	10b	List and define all other variables for which data were sought (e.g., participant and intervention characteristics, funding sources). Describe any assumptions	Page 8

Section and Topic	Item #	Checklist item	Location where item is reported
		made about any missing or unclear information.	
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 9
Effect measures	12	Specify for each outcome the effect measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8 and Page 9
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g., tabulating the study intervention characteristics and comparing against the planned groups for each synthesis [item #5]).	Page 7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 8 and Page 9
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 8 and Page 9
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to	Page 8 and Page 9

Section and Topic	Item #	Checklist item	Location where item is reported
		identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g., subgroup analysis, meta-regression).	Page 9 and Page 10
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 9 and Page 10
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 9
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 8 and Page 9
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 10 and Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 10 and Figure 1

Section and Topic	Item #	Checklist item	Location where item is reported
Study characteristics	17	Cite each included study and present its characteristics.	Page 11 and Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 12 and Supplementary Figure 1
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g., confidence/credible interval), ideally using structured tables or plots.	Page 12, Page 13, Figure 2, Table 3, and Table 4
Results of syntheses	20a	For each synthesis, briefly summarize the characteristics and risk of bias among contributing studies.	Page 12 and Page 13
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g., confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 12, Page 13, Figure 2, Table 3, and Table 4
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 12 and Page 13
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 12 and Page 13

Section and Topic	Item #	Checklist item	Location where item is reported
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 12 and Page 13
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 12, Page 13, Figure 2, Table 3, Table 4, and Supplementary Figures 2–8
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 14, Page 15, and Page 16
	23b	Discuss any limitations of the evidence included in the review.	Page 16
	23c	Discuss any limitations of the review processes used.	Page 16
	23d	Discuss implications of the results for practice, policy, and future research.	Page 17
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 6
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 6

Section and Topic	Item #	Checklist item	Location where item is reported
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 6
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 18
Competing interests	26	Declare any competing interests of review authors.	Page 18
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 17

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

For more information, visit: http://www.prisma-statement.org/

Supplementary Table 2: Quality assessment results.

Items	Corder *et al*[31]	Valcour *et al*[32]	Spector *et al*[33]	Morgan [64]	Joska *et al*[37]	Sun *et al*[36]	Andres *et al*[65]	Chang *et al*[28]	Soontornniyomkij *et al*[18]	Bol *et al*[66]	Morales *et al*[41]	Hoare *et al*[43]	Morgan *et al*[38]	Panos *et al*[34]	van Brakel [67]	Chang *et al* [42]	Cysique *et al* [17]	Mukerji *et al*[68]	Wendelken *et al*[44]	Yang *et al*[25]
1. Was the research question or objective in this paper clearly stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Was the study population clearly specified and defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Was the participation rate of eligible persons at least 50%?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5. Was a sample size justification, power description, or variance and effect estimates provided?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

9. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10. Were the outcome assessors blinded to the exposure status of participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Overall rating	9	10	10	10	10	9	10	10	10	9	10	10	10	10	10	10	9	10	10	10

Supplementary Table 3: Characteristics of included studies in domain-specific cognitive impairment meta-analyses.

Study	Sample	Domain included in	Neuropsychological test
Morgan[64]	46 *vs*. 95*	Memory	HVLT-R Delayed Recall
			BVMT-R Delayed Recall
		Motor	Grooved Pegboard (non-dominant and dominant hand)
Andres *et al*[65]	15 *vs*. 33	Fluency	RFFT
			Controlled Oral Word Association Test
			Animal Naming Test
		Executive function	Stroop Color Word Interference Tests
			Trail Making Part B
		Learning	Rey Auditory Verbal Learning Test trials 1 and 5
		Memory	Rey Auditory Verbal Learning Test trial 7
			Rey Osterrieth Complex Figure test (immediate and delayed)
		Speed of Information Processing	Stroop color and word naming
			Trail Making Part A
			Symbol Digit Test
			CalCAP simple reaction time and sequential reaction time
		Attention	WAIS-III Digit Span (backward and forward)
			PASAT trial 1
			WAIS-III Letter-number Sequencing
			Arithmetic
		Motor	Grooved Pegboard (non-dominant and dominant hand)

			Timed Gait
Chang *et al*[28]	22 *vs*. 47	Fluency	RFFT
			Verbal Fluency (with letters FAS)
		Executive function	Stroop Interference
			Trail Making Test B
		Learning	Rey Auditory Verbal Learning Test Trial 5
			Rey-Osterreith Complex Figure Test (Immediate Recall)
		Memory	Rey Auditory Verbal Learning Test Delayed Recall (Trial 7)
			Rey Complex Figure Delayed Recall
		Speed of Information Processing	Symbol Digit
			Trail Making Test A
			Stroop Color Naming
			CalCAP Simple Reaction Time
		Attention	WAIS-III Digit Span Backward
			WAIS-III Letter-Number Sequencing
			Arithmetic and PASAT 1
		Motor	Grooved Pegboard (non-dominant and dominant hand)
Morales *et al*[41]	8 *vs*. 12	Executive Function	Stroop Color Word Test
			Trail Making B
		Memory	Rey Auditory Learning Test
			Trial 5
			Memory Recall
			Delayed Memory

		Speed of Information Processing	Symbol Digit Modality Test
			Visual Reaction Time Non-dominant Hand
			Auditory Reaction Time Non-dominant Hand
		Motor	Trial Making A
			Grooved Pegboard (non-dominant and dominant hand)
Hoare *et al*[43]	24 *vs*. 19	Memory	HVLT immediate verbal recall
			HVLT delayed verbal recall
Panos *et al*[34]	77 *vs*. 182	Attention	PASAT Trial 1
			WAIS-III Letter-Number Sequencing
		Executive Function	Trail Making Test B
			Wisconsin Card Sorting Test
		Learning	HVLT–Revised Learning Trials total
			BVMT–Revised Learning Trials total
		Memory	HVLT–Revised Free Recall
			BVMT–Revised Free Recall
		Speed of Information Processing	Digit Symbol
			Symbol Search
			Trail Making Test-Form A
Chang *et al*[42]	23 *vs*. 57	Attention	WAIS-III Digit Span Backward
			WAIS-III Letter-Number Sequencing
			Arithmetic
			PASAT 1
		Executive Function	Stroop Interference

			Trail Making Test B
		Fluency	RFFT
			Verbal Fluency (with letters Fluency and Verbal Fluency)
		Learning	Rey Auditory Verbal Learning Test Trial 5
			Rey-Osterreith Complex Figure Test (Immediate Recall)
		Memory	Rey Auditory Verbal Learning Test Delayed Recall (Trial 7)
			Rey Complex Figure Delayed Recall
		Motor	Grooved Pegboard (non-dominant and dominant hand)
		Speed of Information Processing	Symbol Digit
			Trail Making Test A
			Stroop Color Naming
			CalCAP Simple Reaction Time
Mukerji *et al*[68]	31 *vs*. 77	Attention	CalCAP -Mean Simple Reaction time and Mean Complex Reaction Time
		Executive Function	Trail-Making Test Part B
			Stroop Interference Task
		Memory	RAVLT Sum of Trials 1 to 5
			RAVLT-Immediate Recall
			RAVLT-Delayed Recall
		Motor	Grooved Pegboard (non-dominant and dominant hand)
		Perceptual Speed†	Symbol Digit Modalities Test
			Stroop Color Naming
			Stroop Word Naming
			Trail-Making Test Part A

Wendelken *et al*[44]	19 *vs*. 57	Executive Function	Modified Trails
			Trails B
			Stroop Interference
			Lexical Fluency (D words)
			Digit Span Backward
		Memory	Delayed and immediate recall trials of the CVLT-II
			Story Recall
			Benson Figure delayed recall
		Psychomotor Speed†	Trails A
			WAIS Digit Symbol Modalities Test
			Stroop Color Naming
Yang *et al*[25]	26 *vs*. 73	Attention	WAIS-III Symbol Search
			WAIS-III Line Number Sequencing
		Executive Function	Stroop: Color & Word
			Trail Making B
			Wisconsin Card Sorting Test
		Fluency	Animal Fluency
			COWAT: F
			COWAT: A
			COWAT: S
			WRAT4
		Learning	HVLT-R: Total Recall
			HVLT-R: Discrimination Index

			BVMT-R: Total Recall
			BVMT-R: Discrimination Index
		Memory	HVLT-R: Delayed Recall
			HVLT-R: Retention Rate
			BVMT-R: Delayed Recall
			BVMT-R: Retention Rate
		Motor	Grooved Pegboard (non-dominant and dominant hand)
		Speed of Information Processing	WAIS III Digit Symbol
			Trail Making A
			Symbol Digit Modality Test

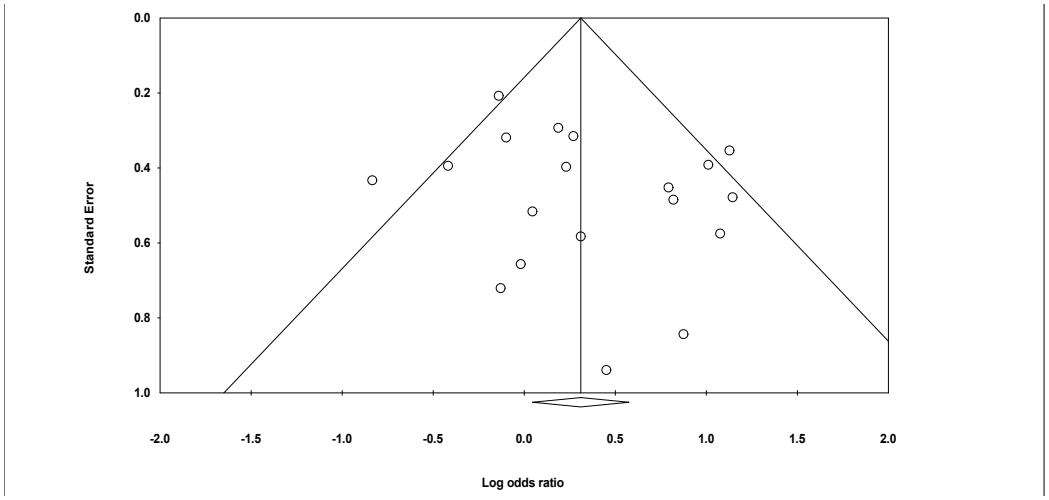
APOE ε4: Apolipoprotein E epsilon 4 allele; BVMT-R: Brief Visuospatial Memory Test–Revised; Cal CAP: California Computerized Assessment Package; HVLT: Hopkins Verbal Learning Test; PASAT: Paced Auditory Serial Addition Test; PLWH: People living with HIV; RFFT: Ruff Figural Fluency Test; WAIS: Wechsler Adult Intelligence Scale.

vs. = APOE ε4 carriers *vs.* non-carriers of PLWH.

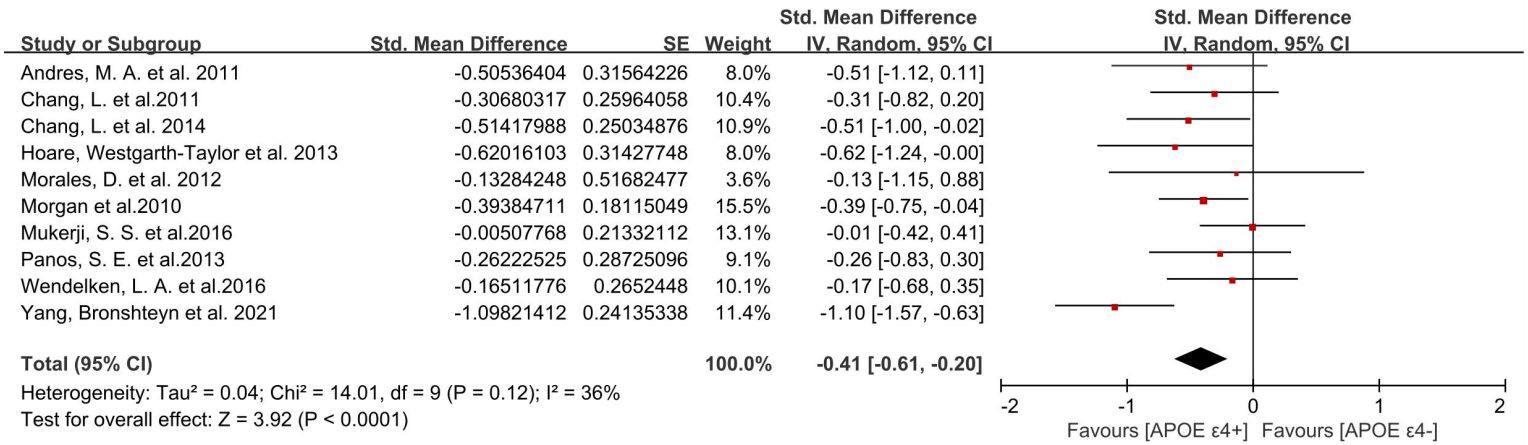
*Data from Caucasians group of this study.

†Perceptual Speed and Psychomotor Speed was included in subgroup meta-analysis of Speed of Information Processing for the similar function assessed by their cognitive testing tasks.

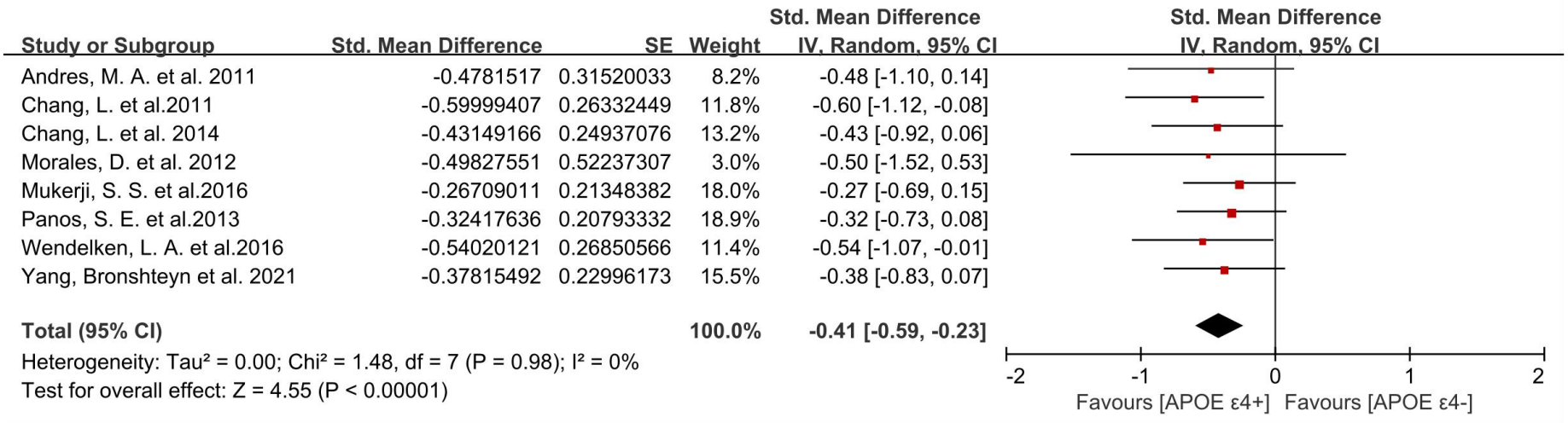
‡Due to which cognitive domain these neurocognitive tests belonging to was not clearly presented in this study, we divided the tests by referring to other included studies.



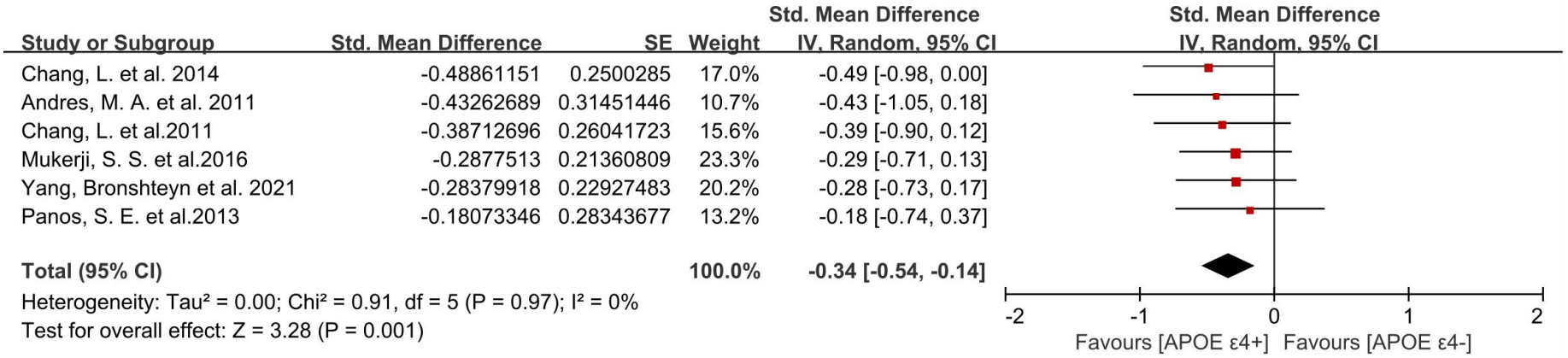
Supplementary Figure 1: Funnel plot of SE by log odds ratio. OR: Odds ratio. SE: Standard error.



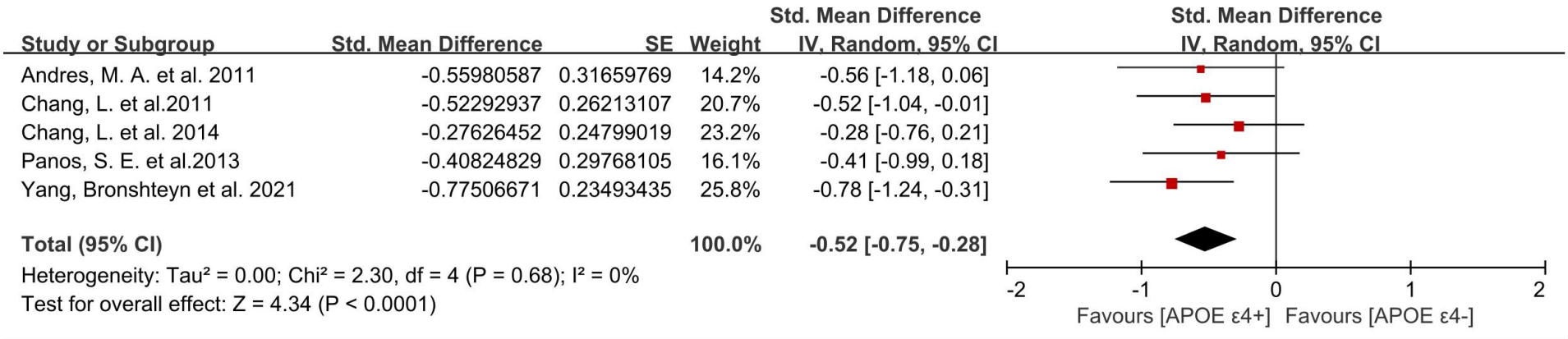
Supplementary Figure 2: Memory. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.



Supplementary Figure 3: Executive function. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.

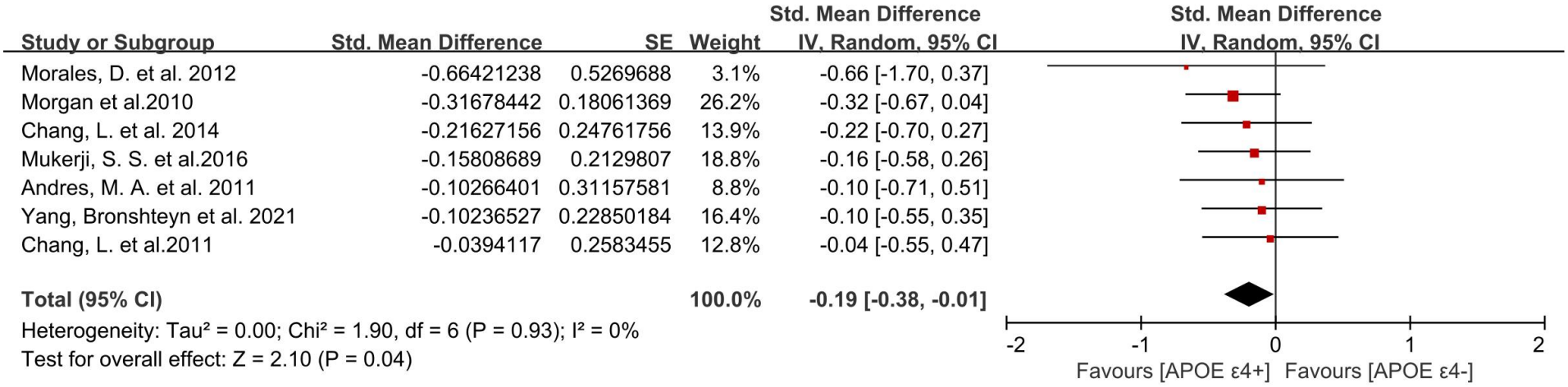


Supplementary Figure 4: Attention.APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.

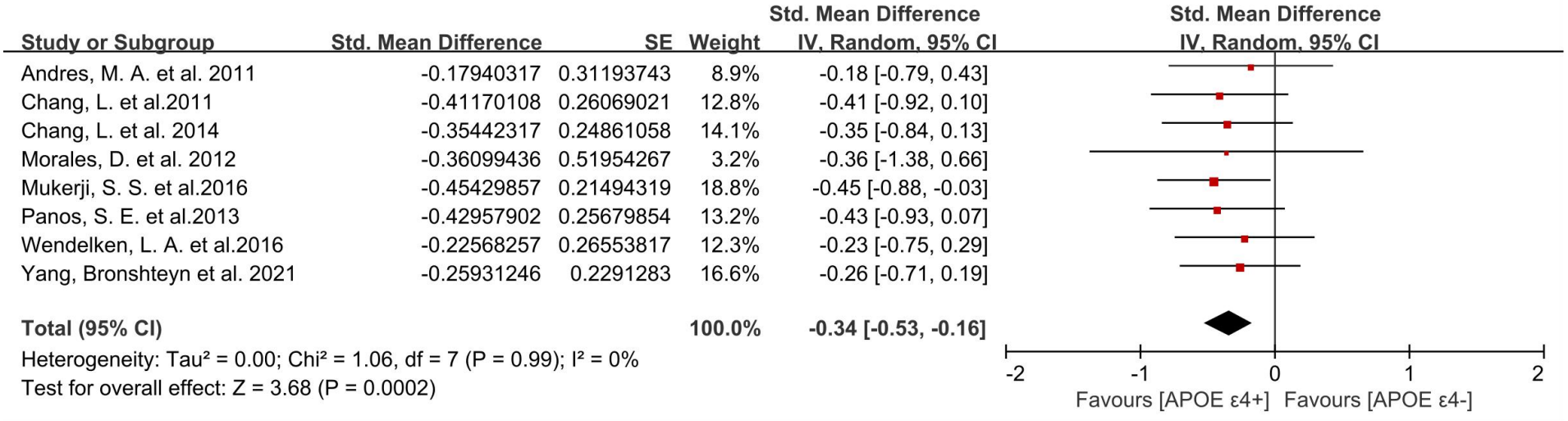


Supplementary Figure 5: Learning. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.

Supplementary Figure 6: Fluency. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.



Supplementary Figure 7: Motor. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.



Supplementary Figure 8: Speed of information processing. APOE ε4: Apolipoprotein E epsilon 4 allele; CI: Confidence interval; SE: Standard error.