

Additional file 4

Meta-analyses and composite scores

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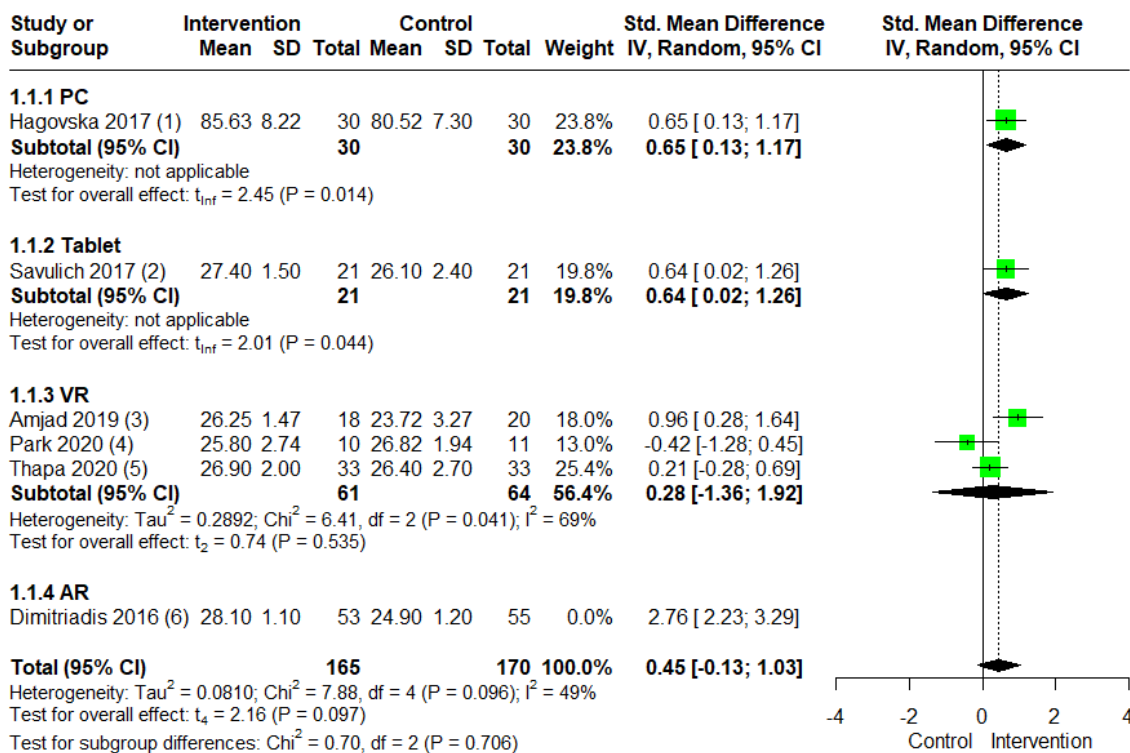
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Abbreviations:

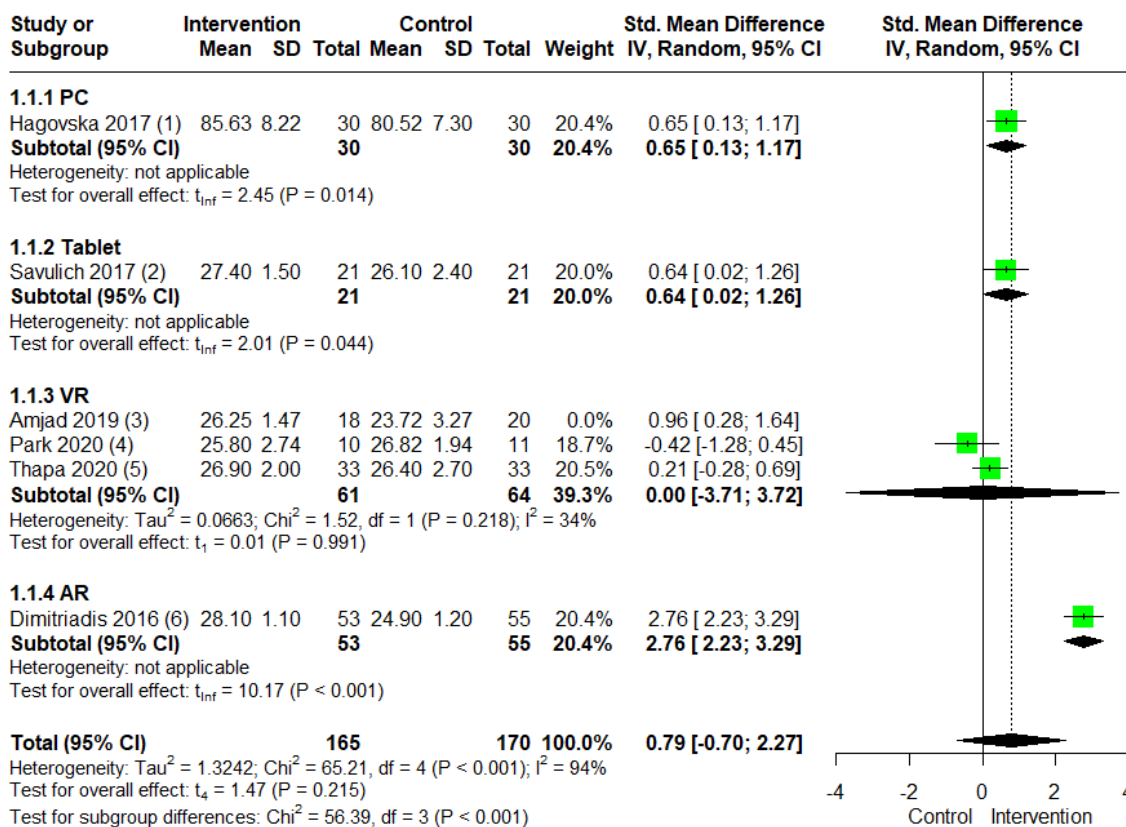
Cont: Control; Int: Intervention; IV: inverse variance; SD: standard deviation; SE: standard error; SMD; standardized mean difference; 95 % CI: 95 % confidence interval;



Footnote

- (1) Addenbrooke's Cognitive Examination (ACE)
- (2) Mini Mental State Examination (MMSE)
- (3) MMSE
- (4) MMSE
- (5) MMSE
- (6) MMSE; intervention group vs. control group 2 (CG2)

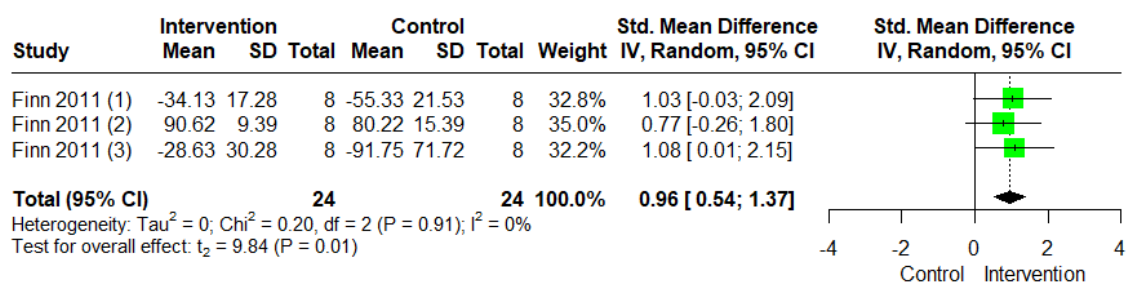
Figure 1: Sensitivity meta-analysis; Computer-based cognitive interventions without Dimitriadis 2016 (large SMD) (MCI) vs. control immediately post intervention; Outcome: **Global cognition**



Footnote

- (1) Addenbrooke's Cognitive Examination (ACE)
- (2) Mini Mental State Examination (MMSE)
- (3) MMSE
- (4) MMSE
- (5) MMSE
- (6) MMSE; intervention group vs. control group 2 (CG2)

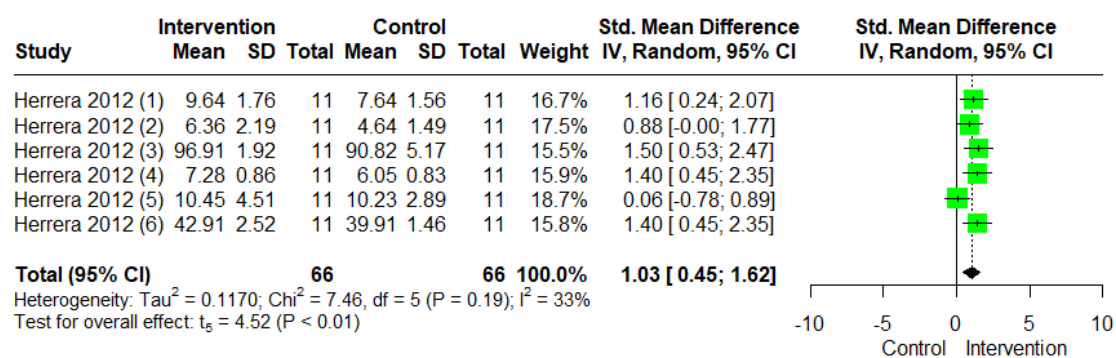
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Footnote

- (1) CANTAB-Spatial working memory (SWM), errors
- (2) CANTAB-Pattern recognition memory (PRM), % correct
- (3) CANTAB-Paired associated learning (PAL), error (adj.)

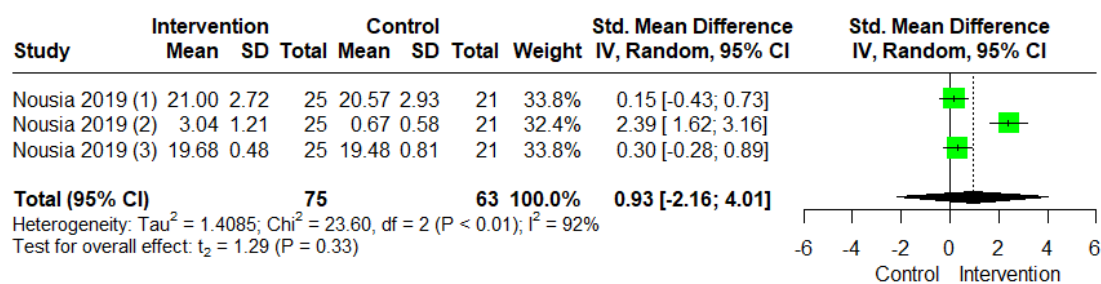
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Footnote

- (1) Doors recognition subtest (Set A)
- (2) Doors recognition subtest (Set B)
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- (4) BEM144 (12-word-list-recall test), total score
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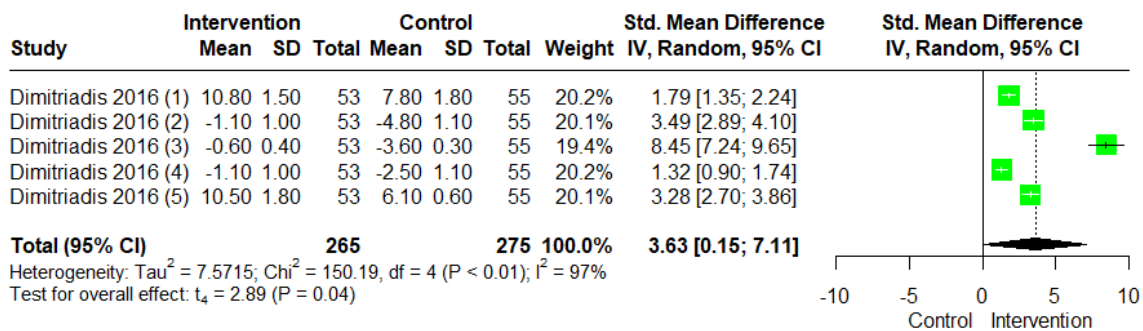
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Footnote

- (1) Recall, word recognition and delayed word memory test, recall
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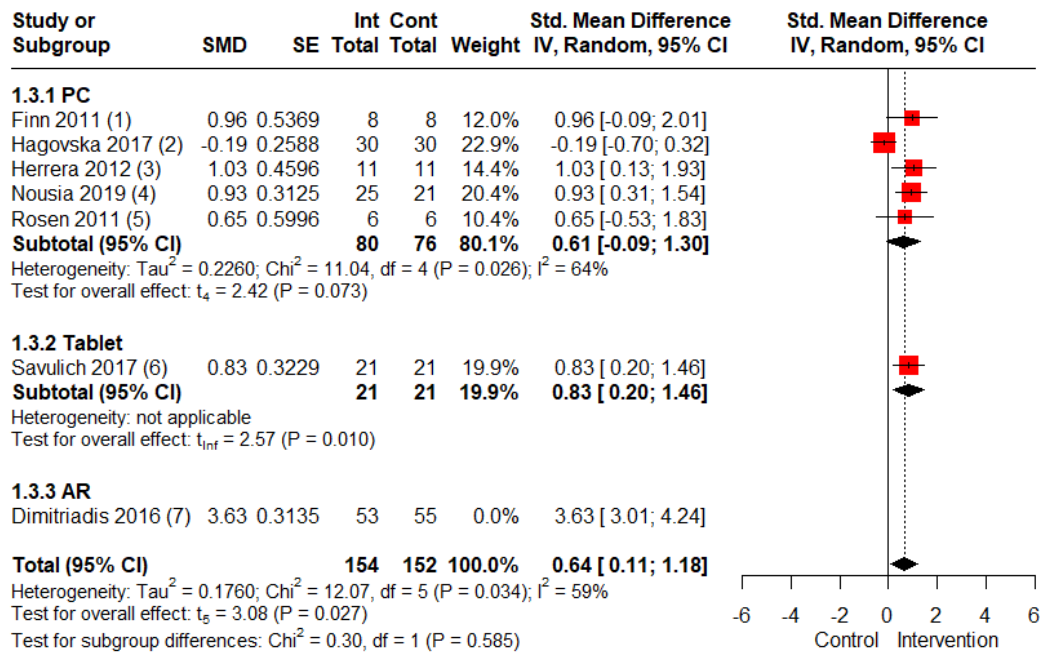
Figure 5: Composite score; Memory_Nousia 2019 (see Figure 4 in Manuscript)



Footnote

- (1) California Verbal Learning Test (CVLT) II, immediate recall
- (2) CVLT II, perseverative errors
- (3) CVLT II, intrusions error
- (4) CVLT II, memory decay
- (5) CVLT II, delayed recall

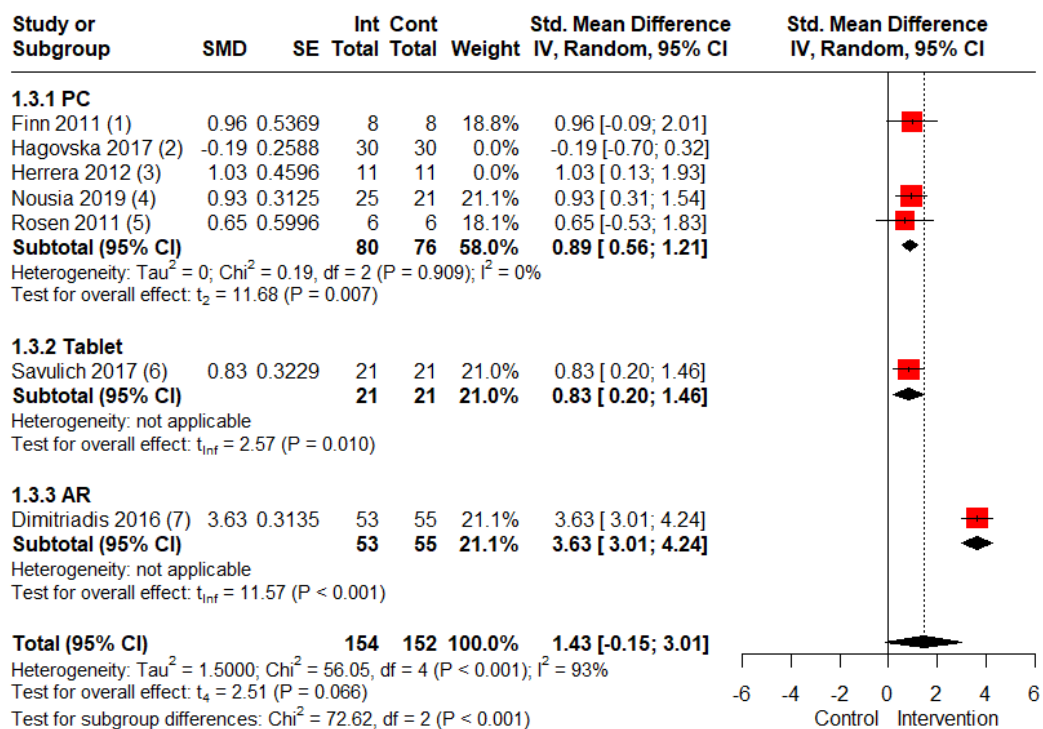
Figure 6: Composite score; Memory_Dimitriadis 2016 (see Figure 4 in Manuscript)



Footnote

- (1) Composite score (n=3)
- (2) Addenbrooke's Cognitive Examination (ACE), memory
- (3) Composite score (n=6)
- (4) Composite score (n=3)
- (5) Repeatable Battery for Assessment of Cognitive Status (RBANS), immediate memory
- (6) Brief Visuospatial Memory Test-Revised (BMVT-R)
- (7) Composite score (n=5); intervention group vs. control group 2 (CG2)

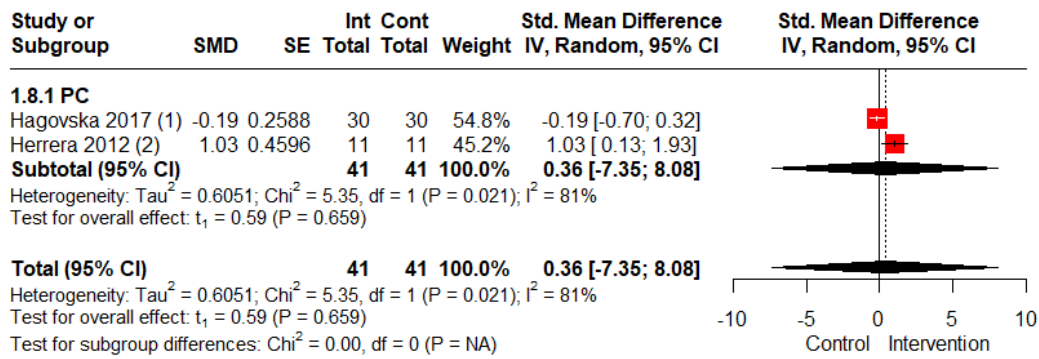
Figure 7: Sensitivity meta-analysis; Computer-based cognitive interventions without Dimitriadis 2016(large SMD) (MCI) vs. control immediately post intervention; Outcome: **Memory**



Footnote

- (1) Composite score (n=3)
- (2) Addenbrooke's Cognitive Examination (ACE), memory
- (3) Composite score (n=6)
- (4) Composite score (n=3)
- (5) Repeatable Battery for Assessment of Cognitive Status (RBANS), immediate memory
- (6) Brief Visuospatial Memory Test-Revised (BMVT-R)
- (7) Composite score (n=5); intervention group vs. control group 2 (CG2)

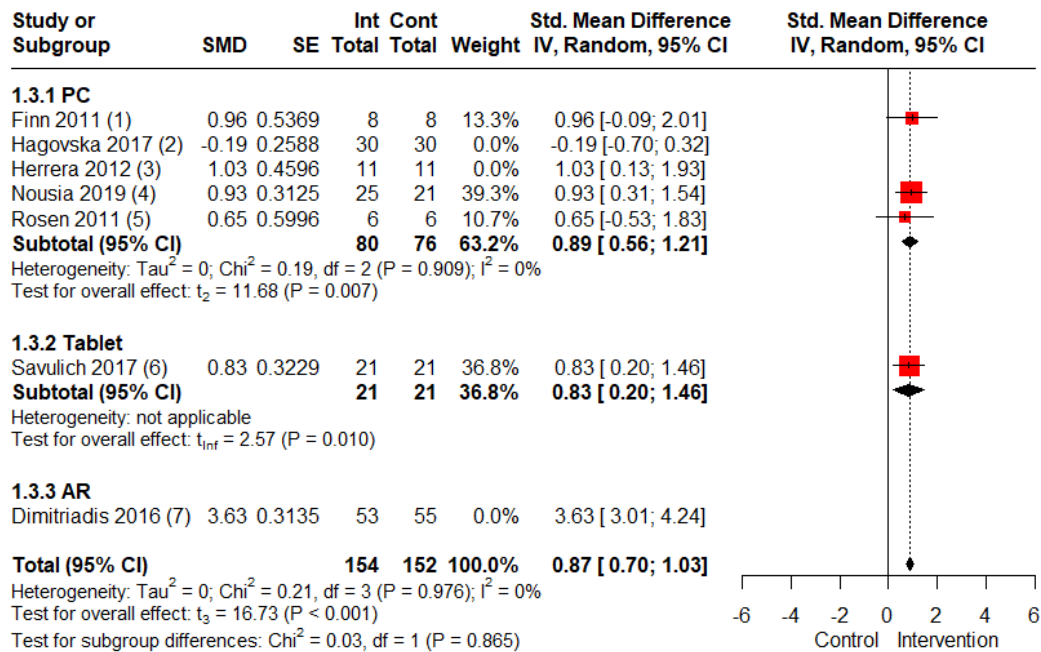
Figure 8: Sensitivity meta-analysis; Computer-based cognitive interventions without Hagovska 2017 and Herrera 2012 (non-computer-based cognitive training as control group intervention) (MCI) vs. control immediately post intervention; Outcome: **Memory**



Footnote

- (1) Addenbrooke's Cognitive Examination (ACE), memory
- (2) Composite score ($n = 6$)

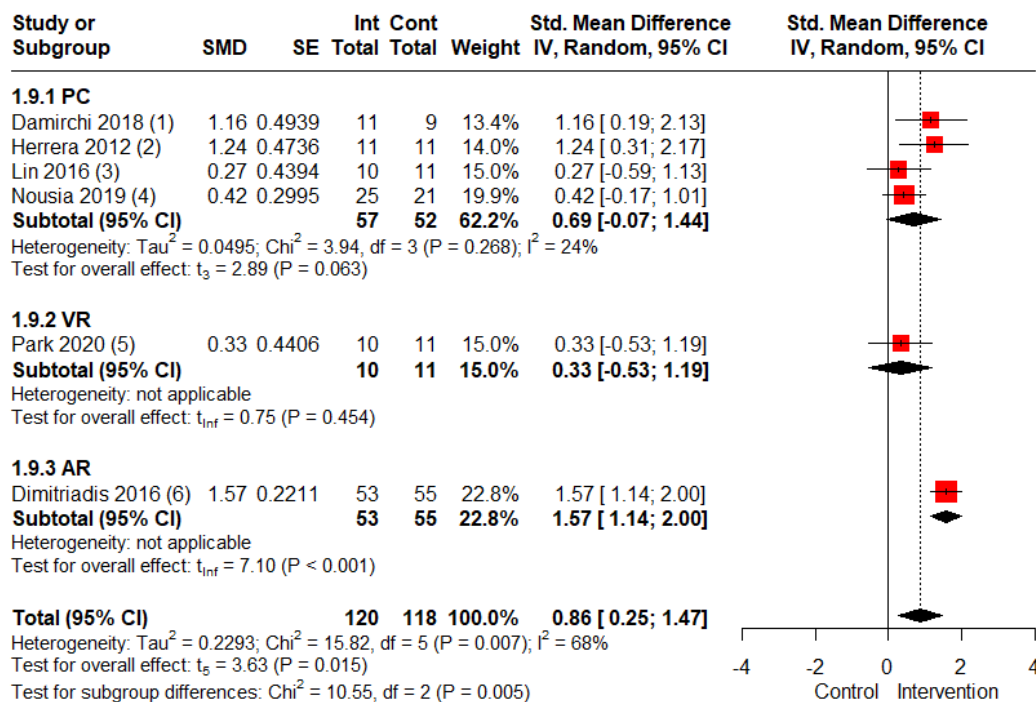
Figure 9: Meta-analysis; Computer-based cognitive interventions (MCI) vs. non-computer-based cognitive intervention as control immediately post intervention, Outcome: **Memory** (Composite score Herrera 2012 see Figure 3)



Footnote

- (1) Composite score (n=3)
- (2) Addenbrooke's Cognitive Examination (ACE), memory
- (3) Composite score (n=6)
- (4) Composite score (n=3)
- (5) Repeatable Battery for Assessment of Cognitive Status (RBANS), immediate memory
- (6) Brief Visuospatial Memory Test-Revised (BMVT-R)
- (7) Composite score (n=5); intervention group vs. control group 2 (CG2)

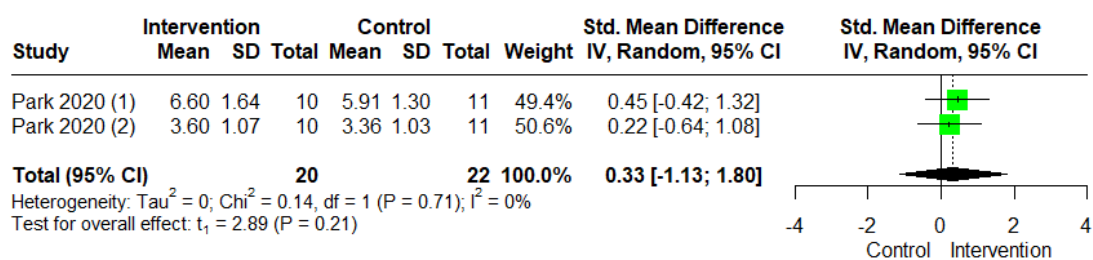
Figure 10: Sensitivity meta-analysis; Computer-based cognitive interventions without Hagovska 2017, Herrera 2012 (non-computer-based cognitive training as control group intervention) and Dimitriadis 2016 (large SMD) (MCI) vs. control immediately post intervention; Outcome: **Memory**



Footnote

- (1) Digit span forward
- (2) Digit span forward
- (3) EXAMINER working memory (computerized test)
- (4) Digit span forward
- (5) Composite score (n=2)
- (6) Composite score (n=2)

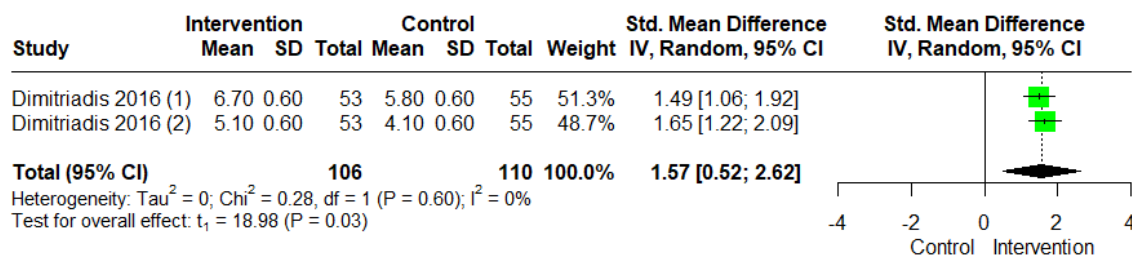
Figure 11: Meta-analysis; Computer-based cognitive interventions (MCI) vs. control immediately post intervention; Outcome: **Working memory** (see Figure 5 in Manuscript).



Footnote

- (1) Digit span forward
- (2) Digit span backward

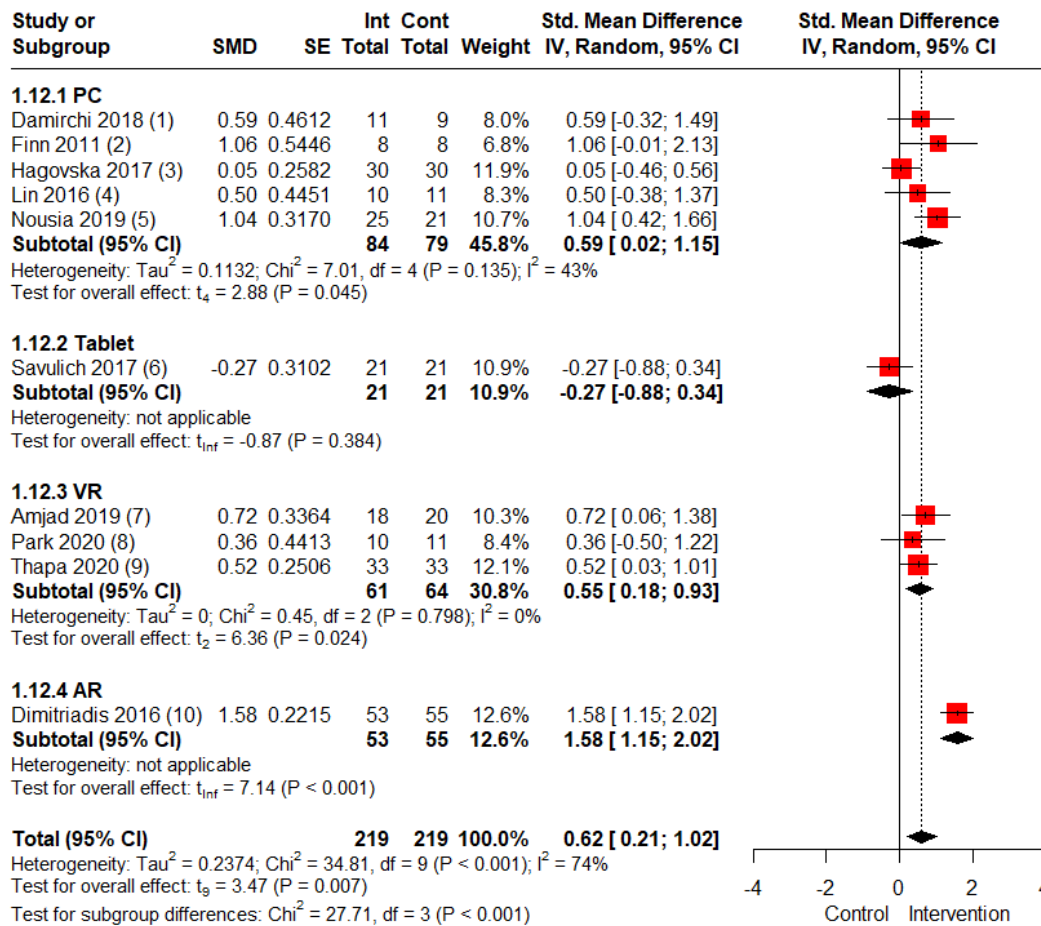
Figure 12: Composite score; Working memory_Park 2020 (see Figure 11)



Footnote

- (1) Digit span forward
- (2) Digit span backward

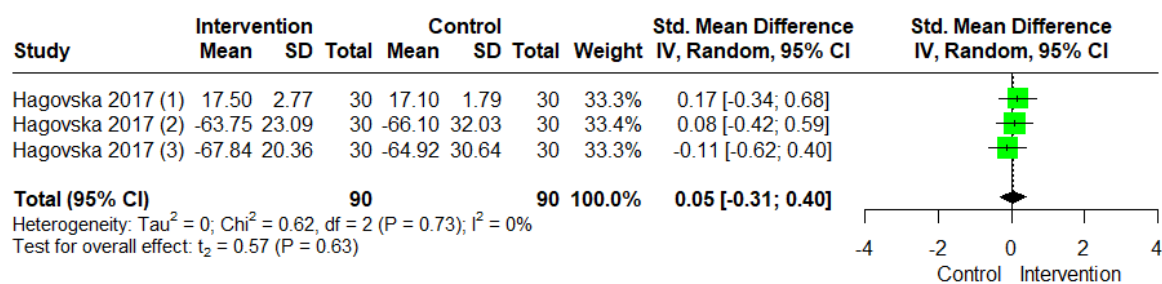
Figure 13: Composite score; Working memory_Dimitriadis 2016 (see Figure 11)



Footnote

- (1) Digit symbol coding
- (2) CANTAB-Rapid visual information processing (RVP)
- (3) Composite score (n=3)
- (4) Useful Field of View (UFOV) (computerized test)
- (5) TMT A
- (6) Composite score (n=2)
- (7) TMT A
- (8) Composite score (n=2)
- (9) TMT A
- (10) TMT A

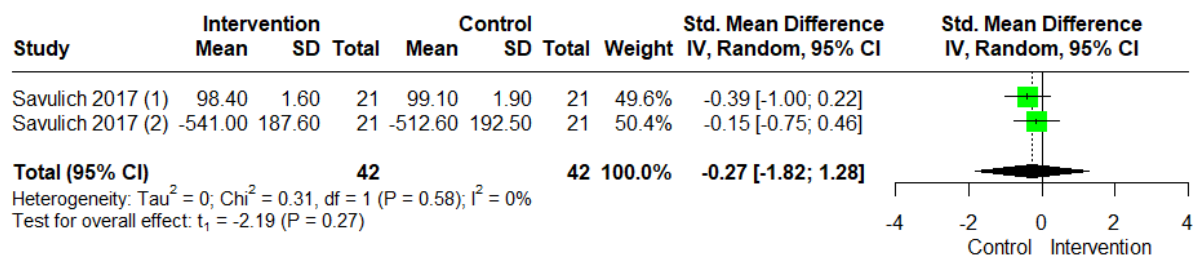
Figure 14: Meta-analysis; Computer-based cognitive interventions (MCI) vs. control immediately post intervention, Outcome: **Attention/concentration/processing speed** (see Figure 5 in Manuscript)



Footnote

- (1) Addenbrooke's Cognitive Examination (ACE), attention/concentration
- (2) Stroop Color-Word Test (SCWT), words, personal tempo, time (sec.))
- (3) SCWT, colors, perception factor (sec.)

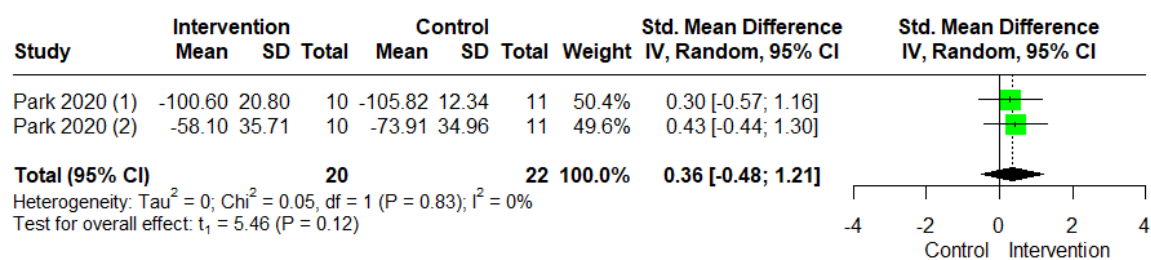
Figure 15: Composite score; Attention/concentration/processing speed_Hagovska 2017 (see Figure 14)



Footnote

- (1) CANTAB-Choice reaction time (CRT), correct trials
- (2) CANTAB-Choice reaction time (CRT), time latency

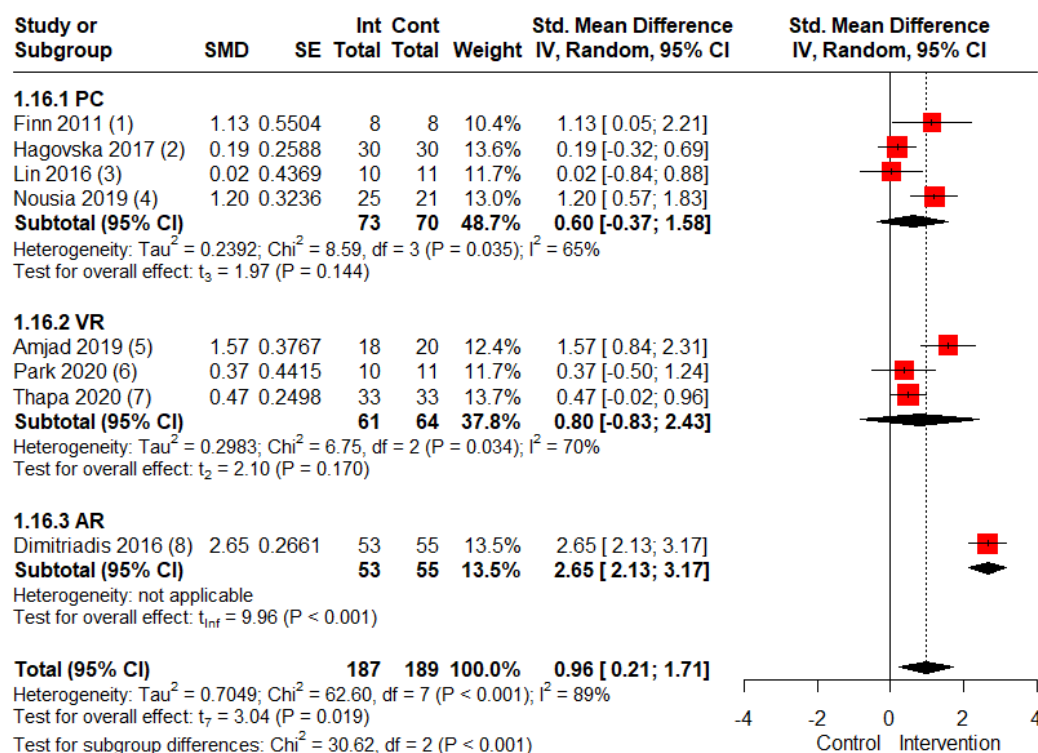
Figure 16: Composite score; Attention/concentration/processing speed_Savulich 2017 (see Figure 14)



Footnote

- (1) SCWT, color word interference test, naming (ie. word), score
- (2) SCWT, color word interference test, reading (ie. color), score

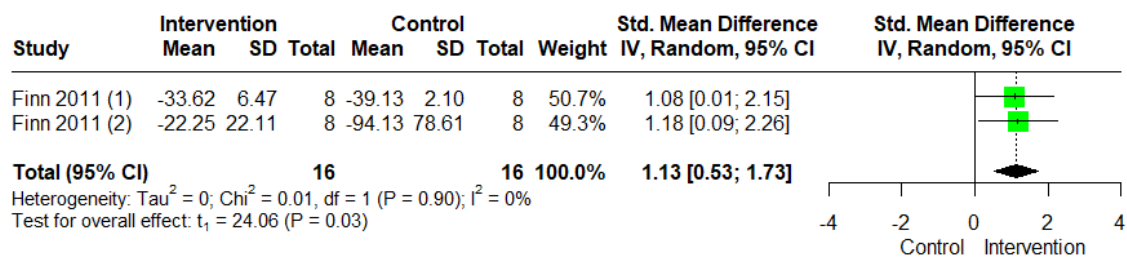
Figure 17: Composite score; Attention/concentration/processing speed_Park 2020 (see Figure 14)



Footnote

- (1) Composite score (n=2)
- (2) Addenbrooke's Cognitive Examination (ACE), verbal fluency
- (3) Composite score (n=2)
- (4) Composite score (n=2)
- (5) TMT B
- (6) Composite score (n=4)
- (7) TMT B
- (8) TMT B

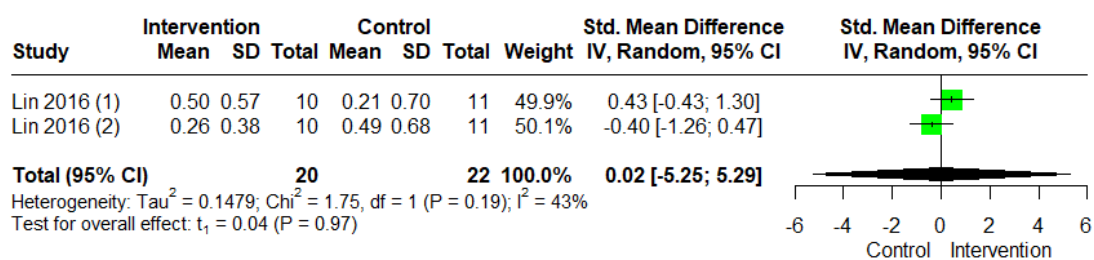
Figure 18: Meta-analysis; Computer-based cognitive interventions (MCI) vs. control immediately post intervention, Outcome: **Executive functioning** (see Figure 5 in Manuscript)



Footnote

- (1) CANTAB-Spatial-working memory (SWM) strategy
- (2) CANTAB- Intra-/extra-dimensional set shifting (IED), errors (adj.)

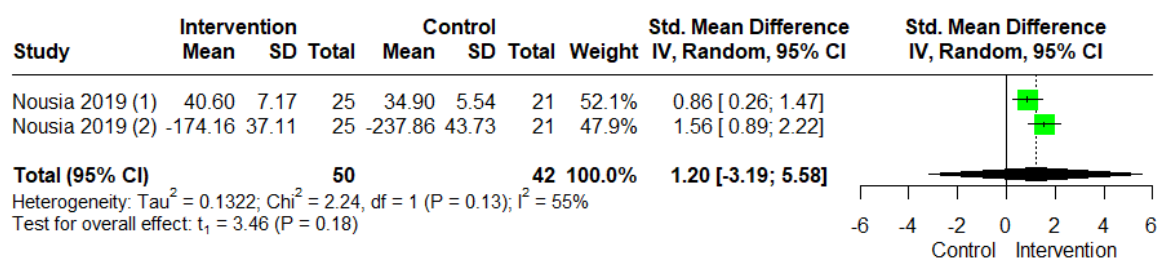
Figure 19: Composite score; Executive functioning_Finn 2011 (see Figure 18)



Footnote

- (1) EXAMINER, verbal fluency
- (2) EXAMINER, cognitive control (set shift and flanker task)

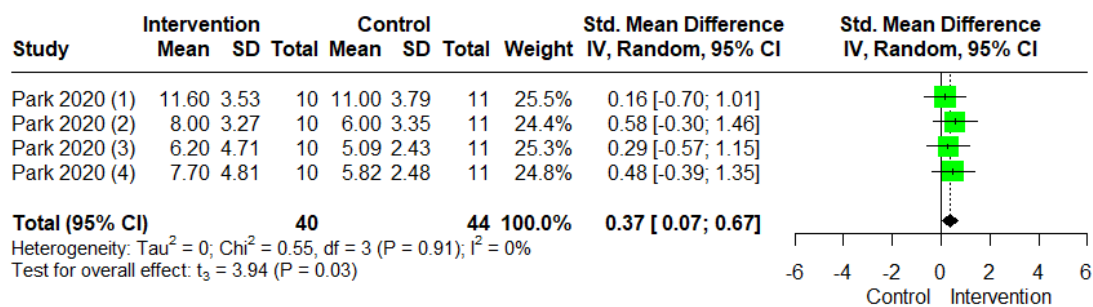
Figure 20: Composite score; Executive functioning_Lin 2016 (see Figure 18)



Footnote

- (1) Semantic Fluency measure (SF)
- (2) TMT B

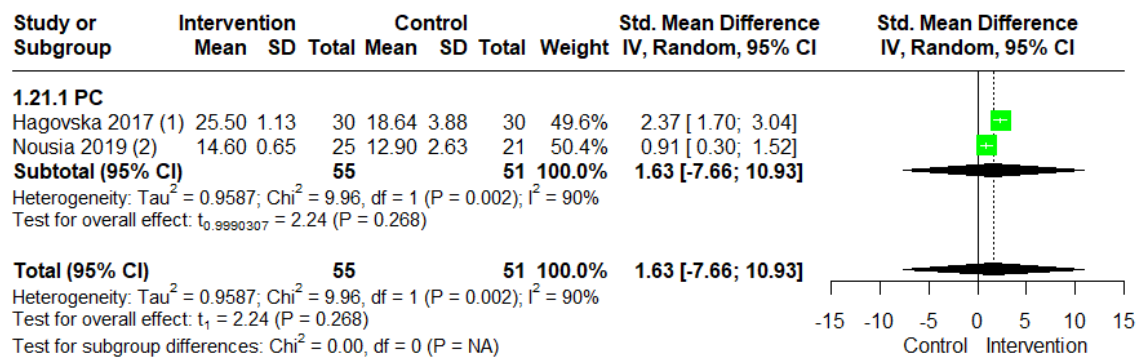
Figure 21: Composite score; Executive functioning_Nousia 2019 (see Figure 18)



Footnote

- (1) Word fluency test (animal)
- (2) Word fluency test (Korean names 1)
- (3) Word fluency test (Korean names 2)
- (4) Word fluency test (Korean names 3)

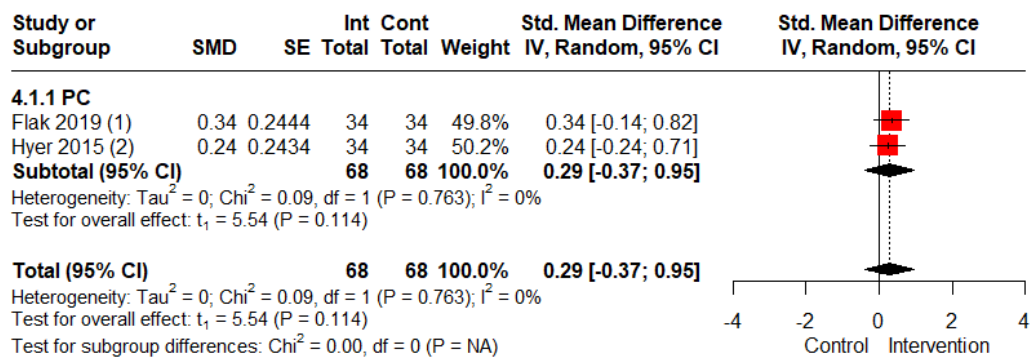
Figure 22: Composite score; Executive functioning_Park 2020 (see Figure 18)



Footnote

- (1) Addenbrooke's Cognitive Examination (ACE), language
- (2) Boston Naming Test

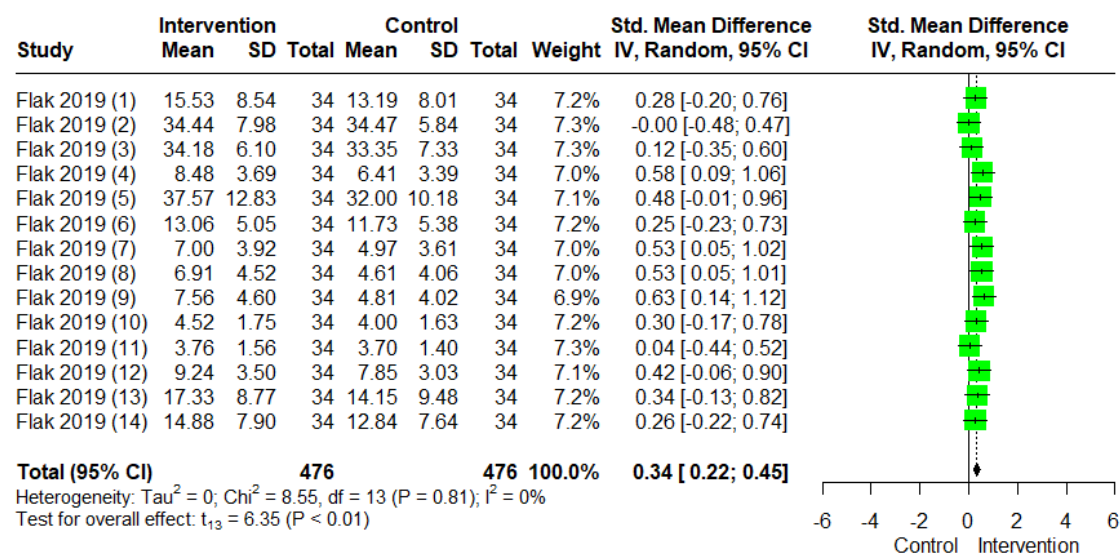
Figure 23: Meta-analysis; Computer-based cognitive interventions (MCI) vs. control immediately post intervention, Outcome: **Language** (see Figure 5 in Manuscript)



Footnote

- (1) Composite score (n=14)
- (2) Span Board (WMS III)

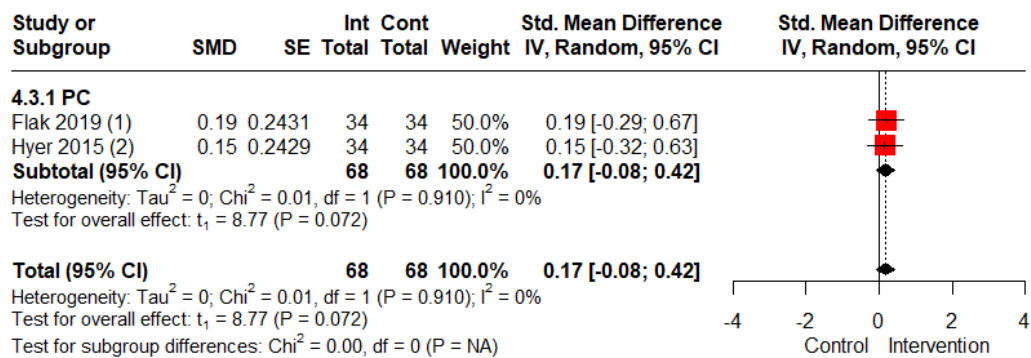
Figure 24: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions as control immediately post intervention, Outcome: **Memory**



Footnote

- (1) Rey-Osterreith Complex Figure, long delay recall
- (2) Wechsler Memory Scale (WMS) III Faces, short delay recall
- (3) Wechsler Memory Scale (WMS) III Faces, long delay recall
- (4) California Verbal Learning Test (CVLT) II Short delay cued recall
- (5) CVLT II, totals learned
- (6) CVLT II, total hits recognition trial
- (7) CVLT II, short delay free recall
- (8) CVLT II, long delay free recall
- (9) CVLT II, long delay cued recall
- (10) CVLT II, Trial 1
- (11) CVLT II, Trial B
- (12) CVLT II, Trial 5
- (13) WMS III, logical memory, long delay recall
- (14) Rey-Osterreith Complex Figure, short delay recall

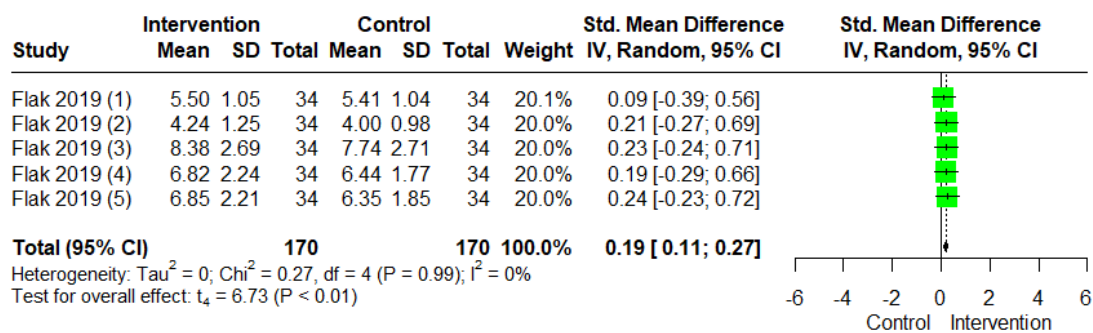
Figure 25: Composite score; Memory_Flak 2019 (see Figure 24)



Footnote

- (1) Composite score (n=5)
- (2) Letter Number Sequencing (LNS)

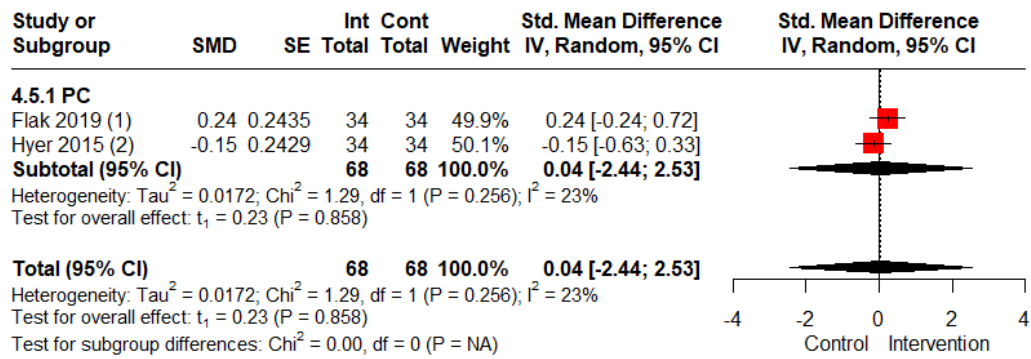
Figure 26: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions as control immediately post intervention, Outcome: **Working memory**



Footnote

- (1) Digit Span forward
- (2) Digit Span backward
- (3) WMS III, letter number sequencing
- (4) WMS III, spatial span backward
- (5) WMS III, spatial span forward

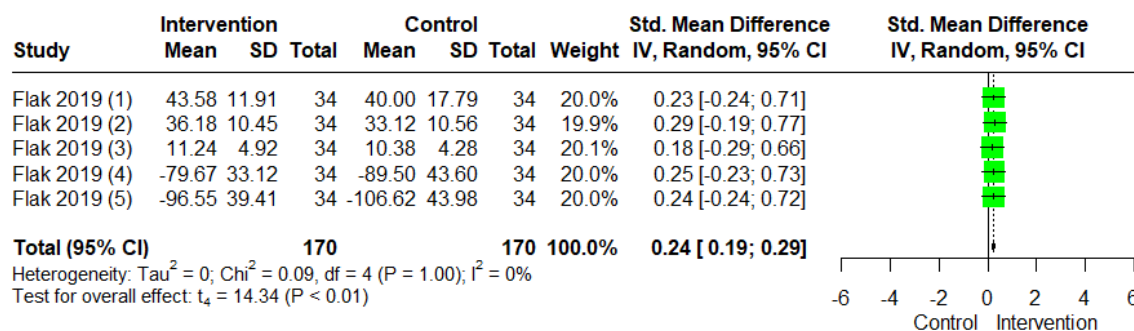
Figure 27: Composite score; Working memory_Flak 2019 (see Figure 26)



Footnote

- (1) Composite score (n=5)
- (2) TMT B

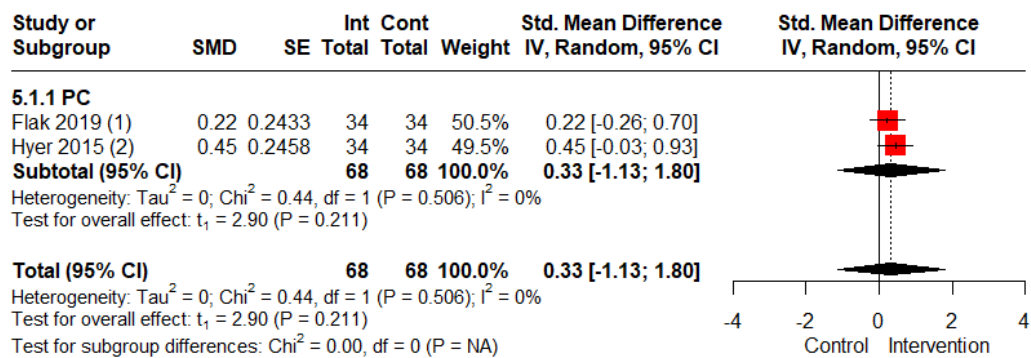
Figure 28: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions as control immediately post intervention, Outcome: **Executive functioning**



Footnote

- (1) Verbal Fluency Test Letter fluency
- (2) Verbal Fluency Test Category fluency
- (3) Verbal Fluency Test Category Switching
- (4) Delis Kaplan, Color Word Interference Test, inhibition (interference)
- (5) Delis Kaplan, Color Word Interference Test, inhibition switching

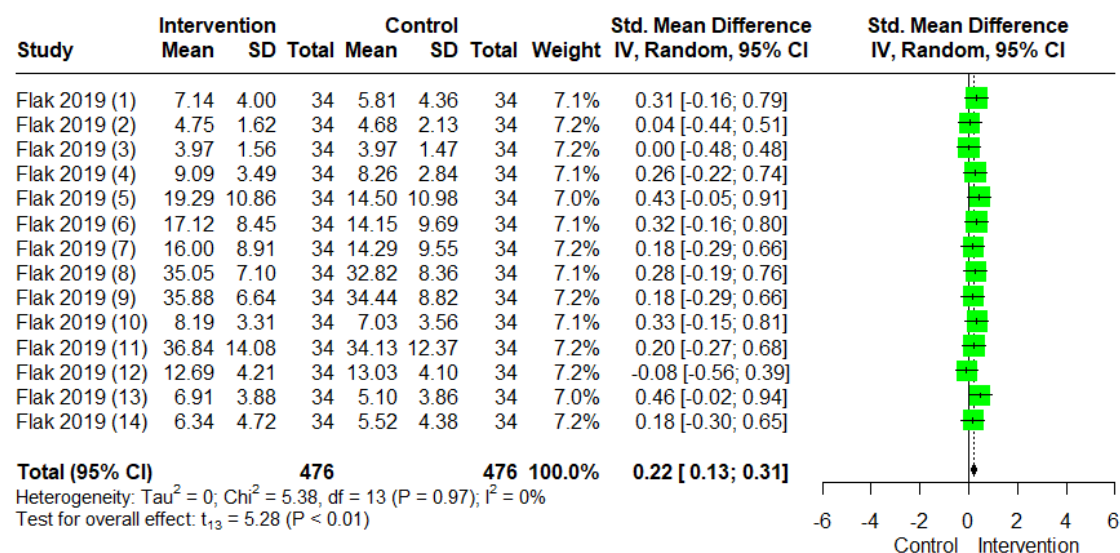
Figure 29: Composite score; Executive functioning_Flak 2019 (see Figure 28)



Footnote

- (1) Composite score (n=14)
- (2) Wechsler Memory Scale (WMS) III, span board

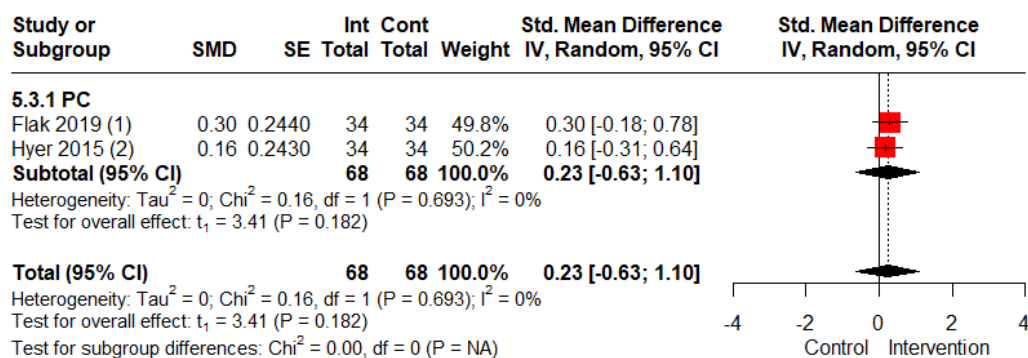
Figure 30: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions follow-up, Outcome: **Memory**



Footnote

- (1) California Verbal Learning Test (CVLT) II, long delay cued recall
- (2) CVLT II, Trial 1
- (3) CVLT II, Trial B
- (4) CVLT II, Trial 5
- (5) Wechsler Memory Scale (WMS) III, logical memory, long delay recall
- (6) Rey-Osterreith Complex Figure, short delay recall
- (7) Rey-Osterreith Complex Figure, long delay recall
- (8) WMS III, faces, long delay recall
- (9) WMS III, faces, short delay recall
- (10) CVLT II, short delay cued recall
- (11) CVLT II, totals learned
- (12) CVLT II, total hits recognition trial
- (13) CVLT II, short delay free recall
- (14) CVLT II, long delay free recall

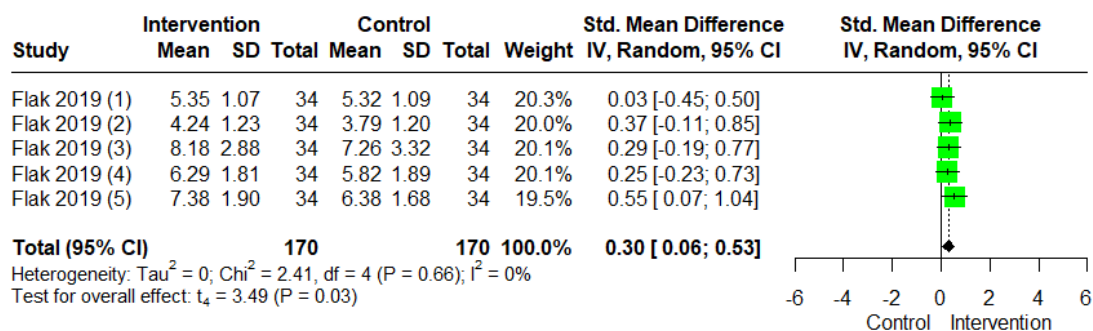
Figure 31: Composite score; Memory_Flak 2019 (see Figure 30)



Footnote

- (1) Composite score (n=5)
- (2) Letter Number Sequencing (LNS)

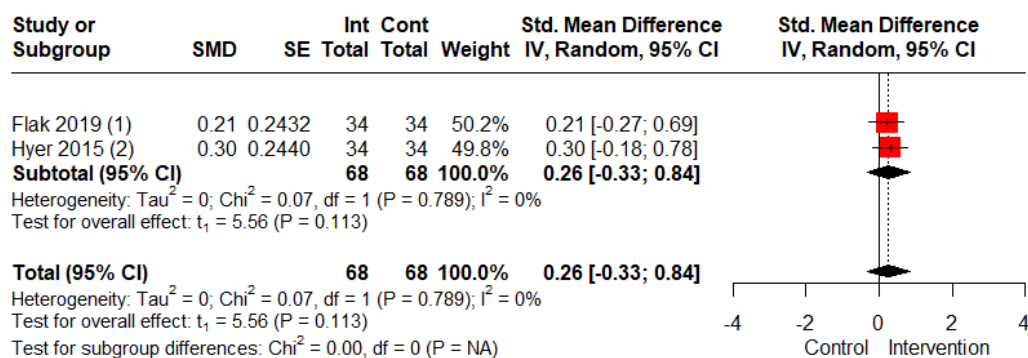
Figure 32: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions follow-up, Outcome: **Working memory**



Footnote

- (1) Digit Span forward
- (2) Digit Span backward
- (3) Wechsler Memory Scale (WMS) III, Letter-number sequencing
- (4) WMS III, Spatial Span Backward
- (5) Spatial span forward

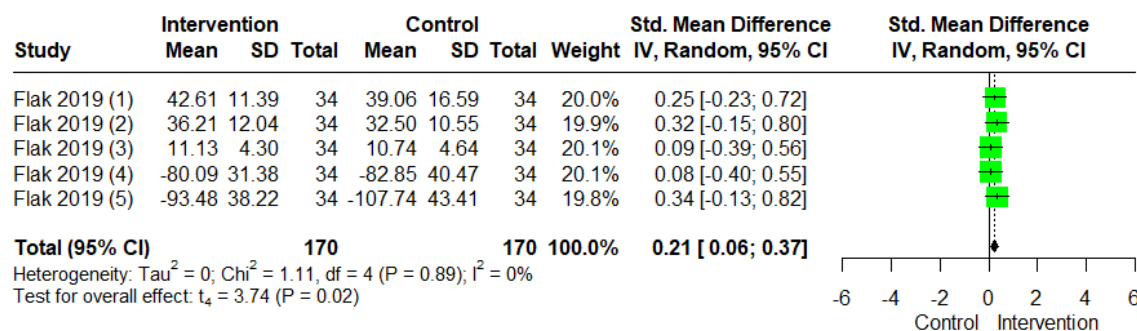
Figure 33: Composite score; Working memory_Flak 2019 (see Figure 32)



Footnote

- (1) Composite score (n=5)
- (2) TMT B

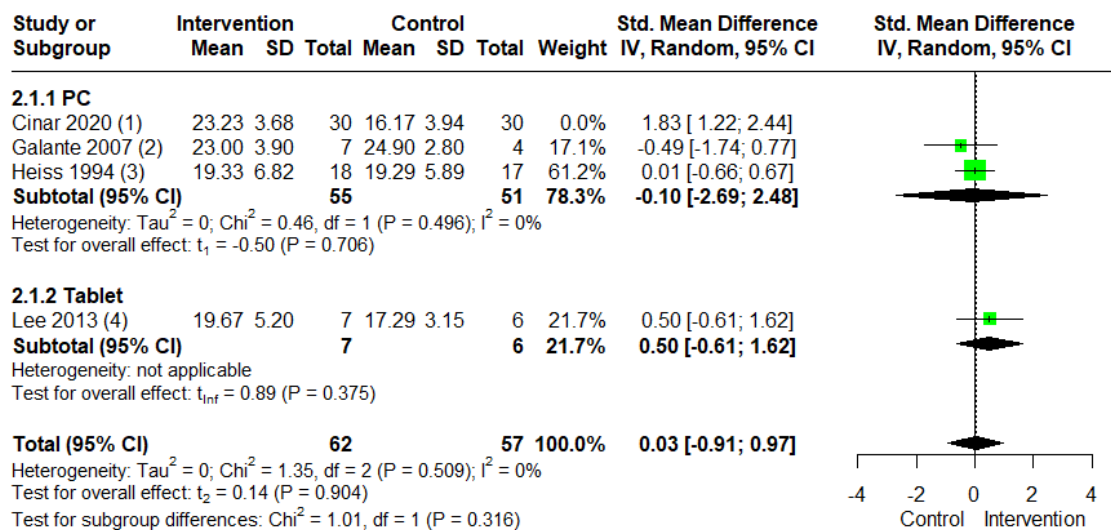
Figure 34: Meta-analysis; Computer-based cognitive interventions (MCI) vs. computer-based cognitive interventions follow-up, Outcome: **Executive functioning**



Footnote

- (1) Verbal fluency test, letter fluency
- (2) Delis Kaplan, Verbal fluency test, category fluency
- (3) Delis Kaplan, Verbal fluency test, category switching
- (4) Delis Kaplan, Color Word Interference Test, inhibition (interference)
- (5) Delis Kaplan, Color Word Interference Test, inhibition switching

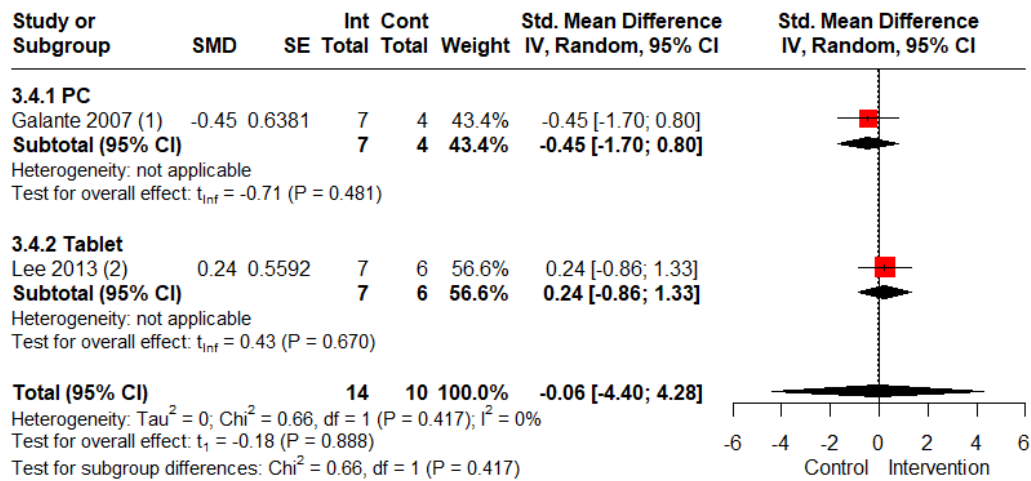
Figure 35: Composite score; Executive functioning_Flak 2019 (see Figure 34)



Footnote

- (1) Montreal Cognitive Assessment (MoCA)
- (2) Mini Mental State Examination (MMSE)
- (3) MMSE; intervention group 1 (IG1) vs. control group
- (4) MMSE

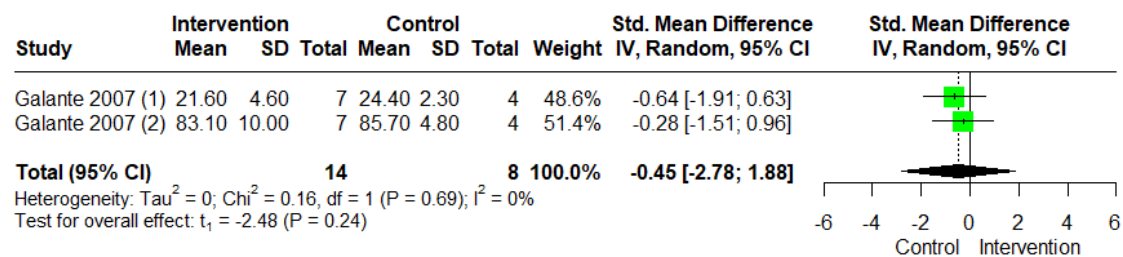
Figure 36: Sensitivity meta-analysis; Computer-based cognitive interventions without Cinar 2020 (large SMD) (DEMENTIA) vs. control immediately post intervention, Outcome: **Global cognition**



Footnote

- (1) Composite score (n=2)
- (2) Mini Mental State Examination (MMSE)

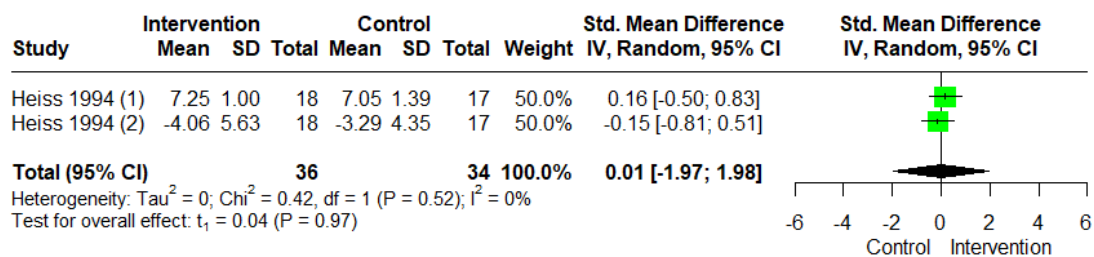
Figure 37: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control follow-up (3 months), Outcome: **Global cognition**



Footnote

- (1) Mini Mental State Examination (MMSE)
- (2) Milan Overall Dementia Assessment (MODA)

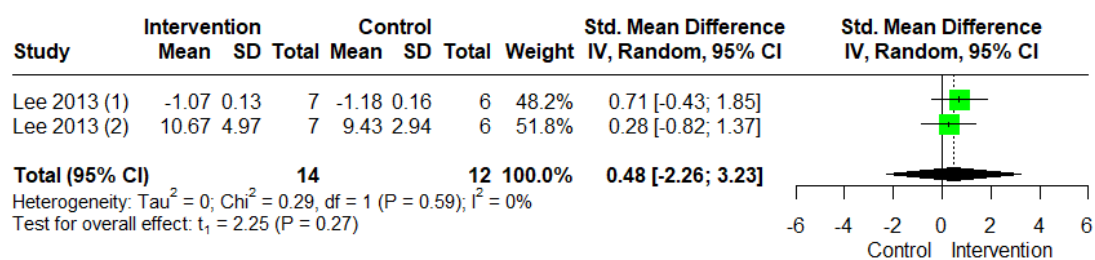
Figure 38: Composite score; Global cognition_Galante 2007 (see Figure 37)



Footnote

- (1) Selective reminding test/task - Recognition (hits)
- (2) Selective reminding test/task - Recognition (false-positive)

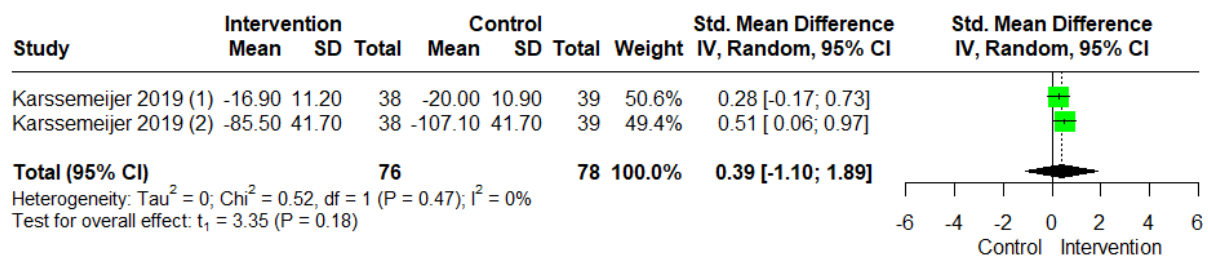
Figure 39: Composite score; Memory_Heiss 1994 (see Figure 7 in Manuscript)



Footnote

- (1) Brief Assessment of Prospective Memory-Short Form (BAPM)
- (2) Hong Kong List Learning Test (HKLLT)

Figure 40: Composite score; Memory_Lee 2013 (see Figure 7 in Manuscript)

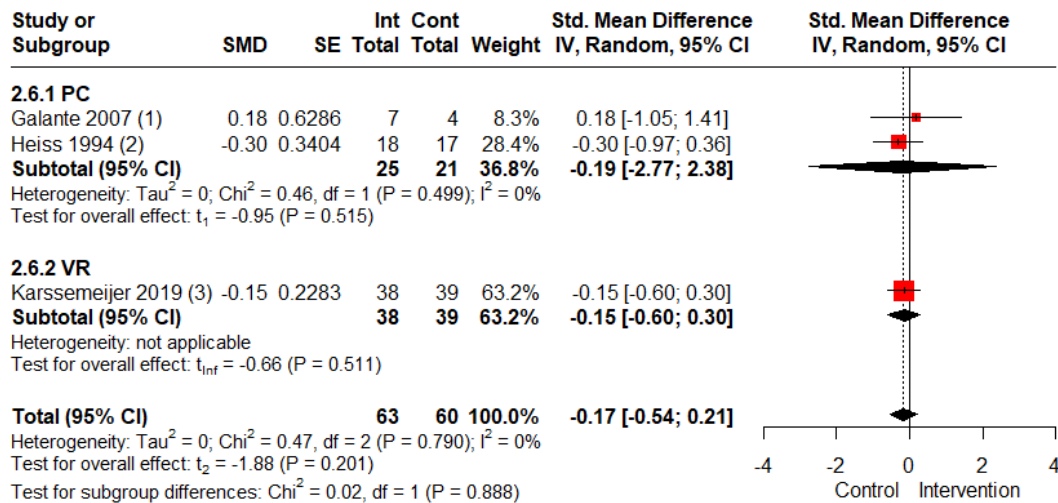


Footnote

(1) Location learning test (revised) – displacement score delayed recall

(2) Location learning test (revised) – displacement score trial 1-5

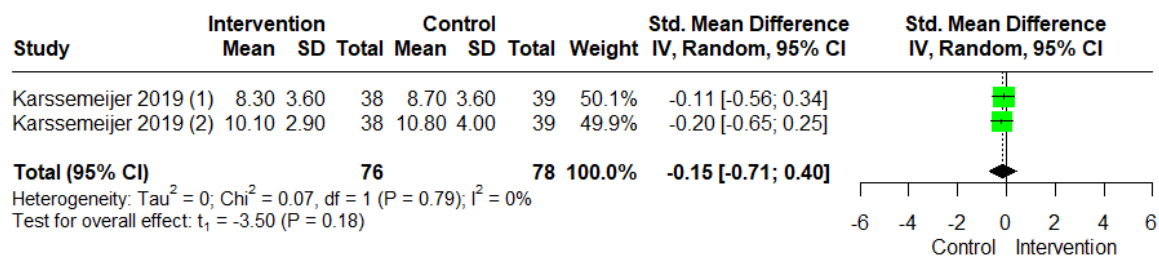
Figure 41: Composite score; Memory_Karssemeijer 2019 (see Figure 7 in Manuscript)



Footnote

- (1) Corsi's block tapping test
- (2) Corsi's block tapping test
- (3) Composite score (n=2)

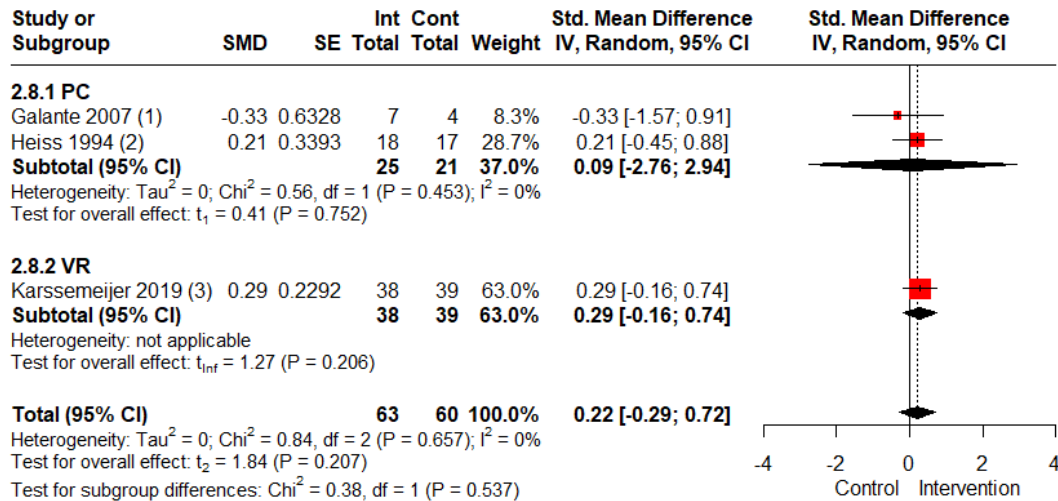
Figure 42: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control immediately post intervention, Outcome: **Working memory** (see Figure 8 in Manuscript)



Footnote

- (1) Spatial Span
- (2) Digit span (WAIS-III)

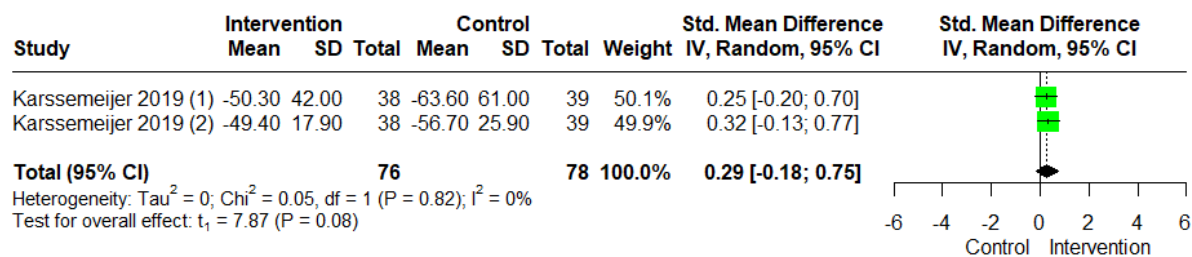
Figure 43: Composite score; Working memory_Karssemeijer 2019 (see Figure 42)



Footnote

- (1) Digit cancellation test
- (2) Alters-Konzentrationstest (AKT) (t)
- (3) Composite score (n=2)

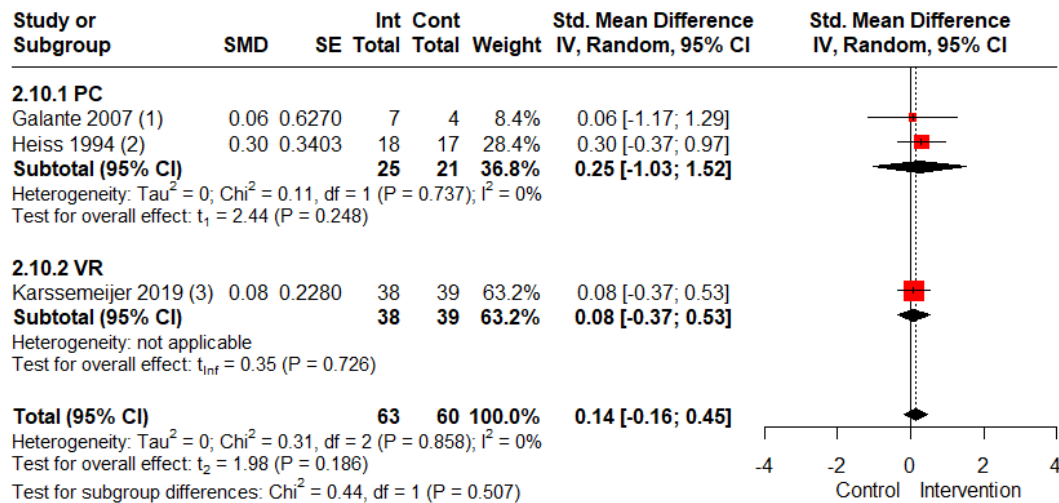
Figure 44: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control immediately post intervention, Outcome: **Attention/concentration/processing speed** (see Figure 8 in Manuscript)



Footnote

- (1) TMT A
- (2) Stroop Color-Word Test (SCWT) – word reading (sec)

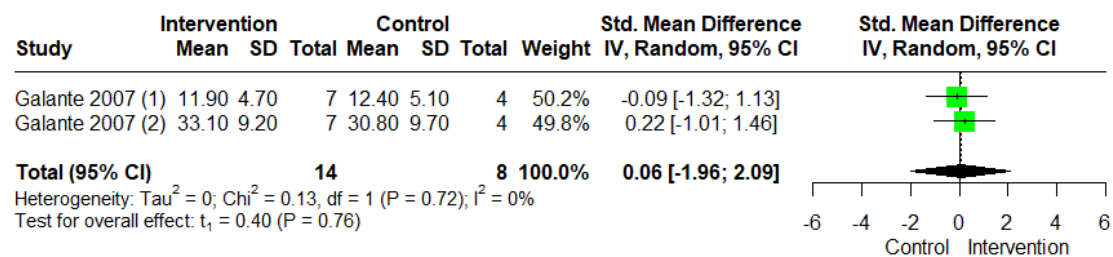
Figure 45: Composite score; Attention/concentration/processing speed_Karssemeijer 2019 (see Figure 44)



Footnote

- (1) Composite score (n=2)
- (2) Composite score (n=2)
- (3) Composite score (n=3)

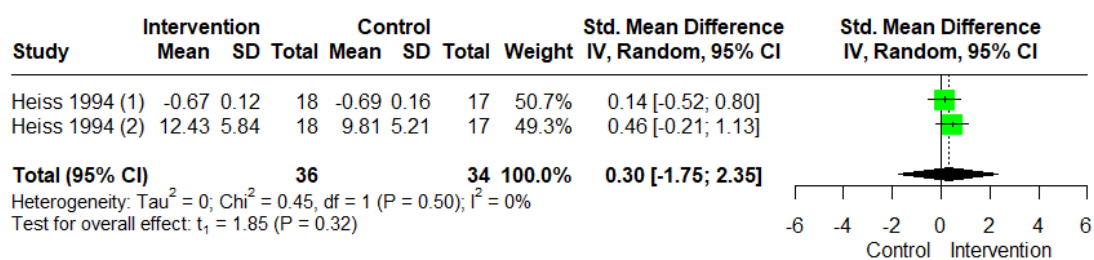
Figure 46: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control immediately post intervention, Outcome: **Executive functioning** (see Figure 8 in Manuscript)



Footnote

- (1) Semantic verbal fluency
- (2) Phonemic verbal fluency

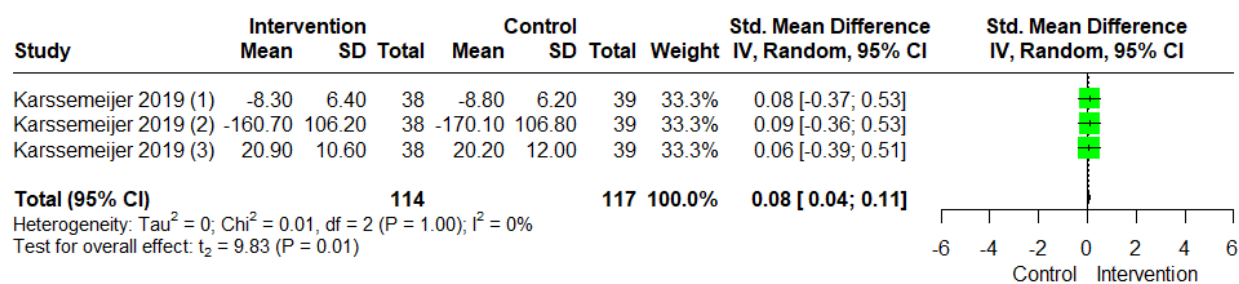
Figure 47: Composite score; Executive functioning_Galante 2007 (see Figure 46)



Footnote

- (1) Go/no go reaction time
- (2) Verbal fluency (Supermarket)

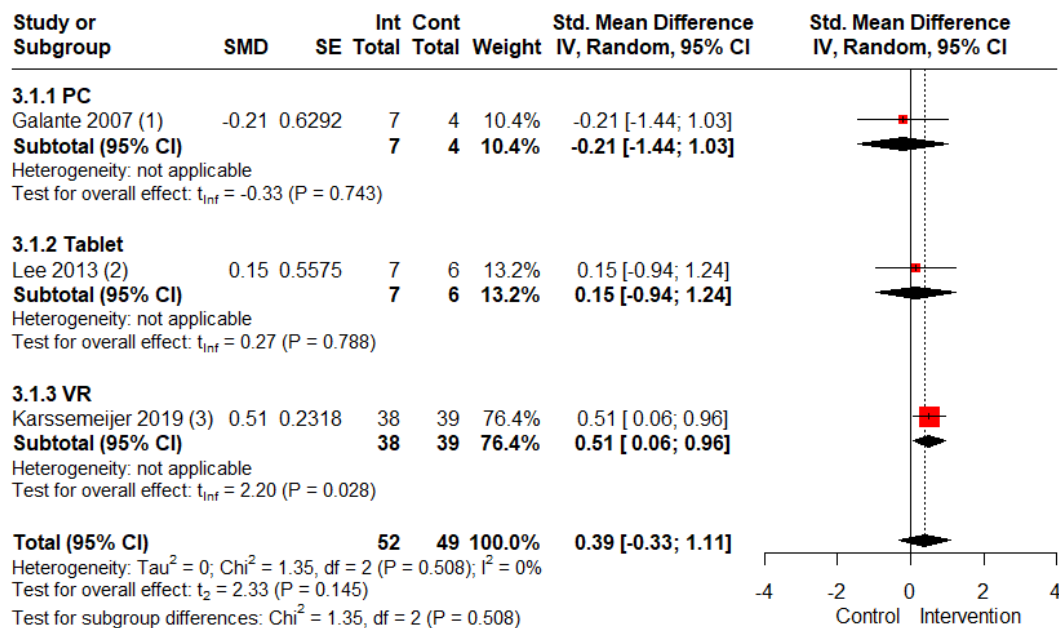
Figure 48: Composite score; Executive functioning_Heiss 1994 (see Figure 46)



Footnote

- (1) Rule Shift Cards Test, errors
- (2) TMT B
- (3) Verbal fluency test, letter fluency

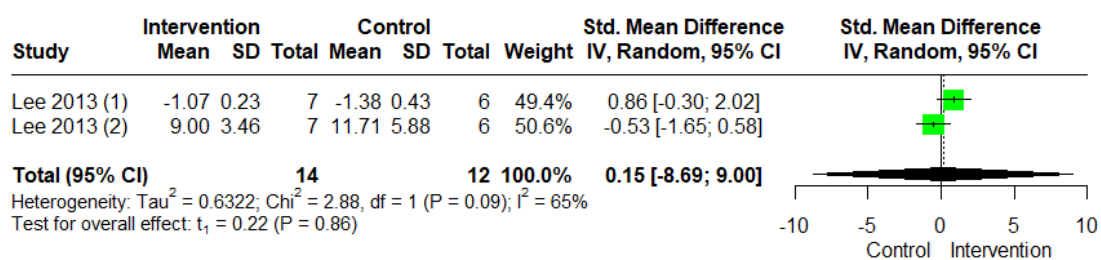
Figure 49: Composite score; Executive functioning_Karssemeijer 2019 (see Figure 46)



Footnote

- (1) Prose memory
- (2) Composite score (n=2)
- (3) Composite score (n=2)

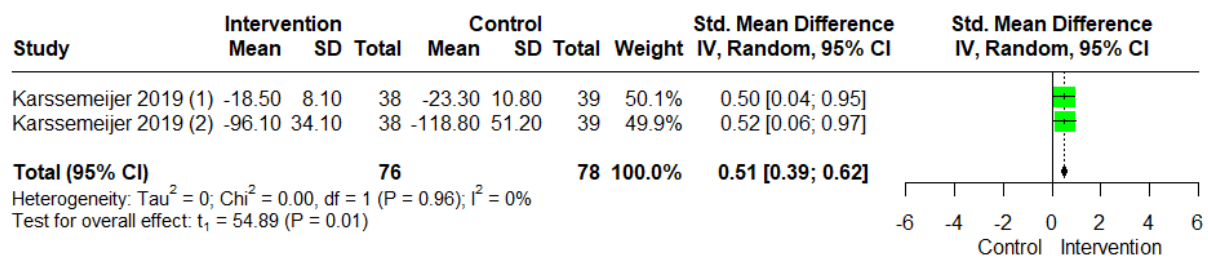
Figure 50: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control follow-up (3 months), Outcome: **Memory**



Footnote

- (1) Brief Assessment of Prospective Memory-Short Form (BAPM)
- (2) Hong Kong List Learning Test (HKLLT)

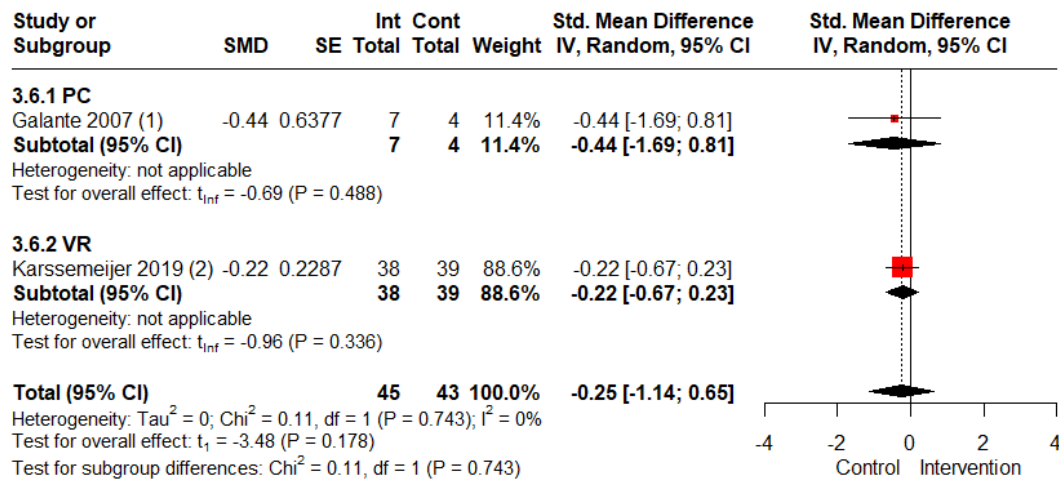
Figure 51: Composite score; Memory_Lee 2013 (see Figure 50)



Footnote

- (1) Location learning test (revised) – displacement score delayed recall
- (2) Location learning test (revised) – displacement score trial 1-5

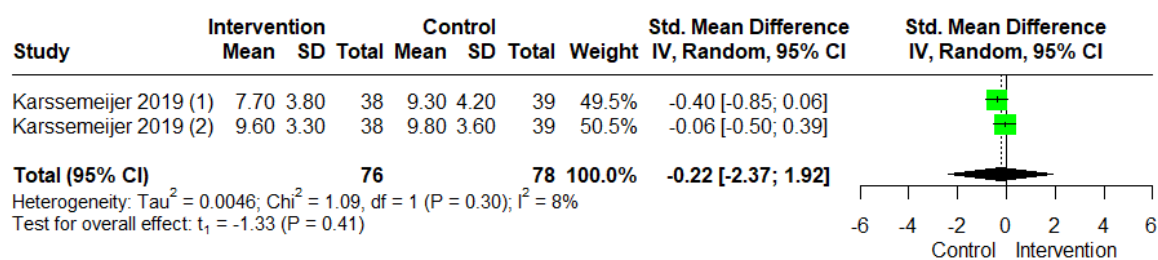
Figure 52: Composite score; Memory_Karssemeijer 2019 (see Figure 50)



Footnote

- (1) Corsi tapping test
- (2) Composite score (n=2)

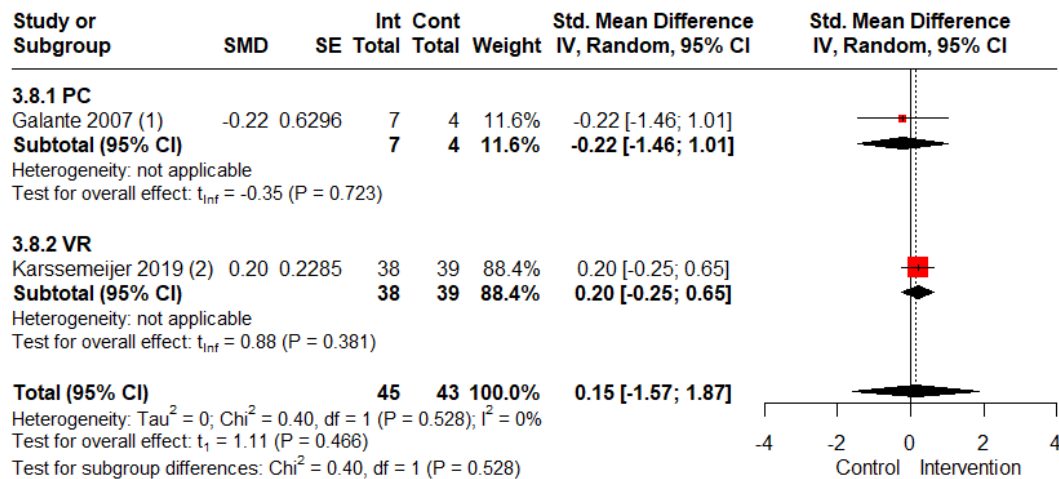
Figure 53: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control follow-up (3 months), Outcome: **Working memory**



Footnote

- (1) Spatial Span
- (2) Digit span (WAIS-III)

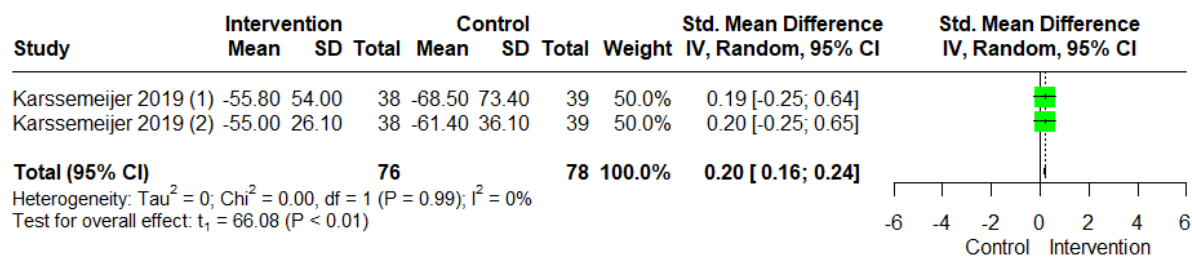
Figure 54: Composite score; Working memory_Karssemeijer 2019 (see Figure 53)



Footnote

- (1) Digit cancellation test
- (2) Composite score (n=2)

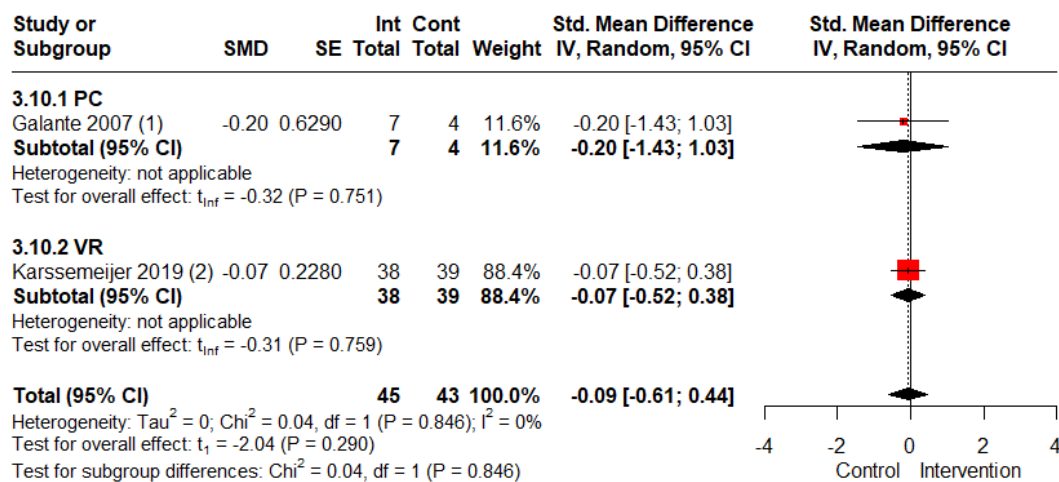
Figure 55: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control follow-up (3 months), Outcome: **Attention/concentration/processing speed**



Footnote

- (1) TMT A
- (2) Stroop Color-Word Test (SCWT) – word reading (sec)

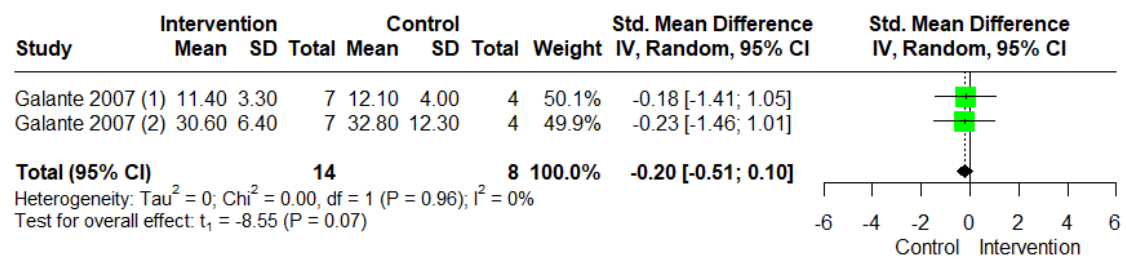
Figure 56: Composite score; Attention/concentration/processing speed_Karssemeijer 2019 (see Figure 55)



Footnote

- (1) Composite score (n= 2)
- (2) Composite score (n= 2)

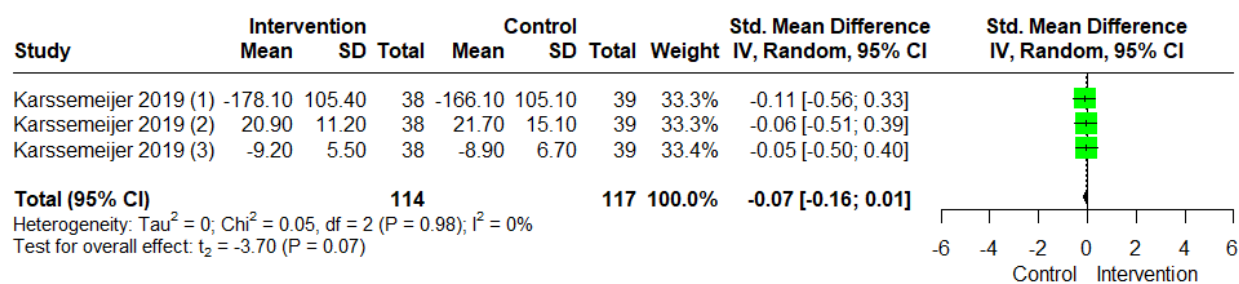
Figure 57: Meta-analysis; Computer-based cognitive interventions (DEMENTIA) vs. control follow-up (3 months), Outcome: **Executive functioning**



Footnote

- (1) Semantic verbal fluency
- (2) Phonemic verbal fluency

Figure 58: Composite score; Executive functioning_Galante 2007 (see Figure 57)



Footnote

- (1) TMT B
- (2) Verbal fluency test, letter fluency
- (3) Rule Shift Cards Test, errors

Figure 59: Composite score; Executive functioning_Karssemeijer 2019 (see Figure 57)