Table H-8. Findings on cognitive training interventions for ADHD

| **Study****(Companion)****N****Qualitya****Design****Age Categoryb** | **Intervention** | **Comparison** | **Follow-up Times** | **Findings–Intervention** | **Findings–Comparison** | **Between group P value** |
| --- | --- | --- | --- | --- | --- | --- |
| **Academic performance** |
| Chacko, 20143985GoodRCTb | Cogmed working memory training with difficulty titrated to a user’s ability | “Placebo” Cogmed working memory training with difficulty not titrated to a user’s ability | 3 weeks post | WRAT-4 – word readingWRAT-4 Sentence completionWRAT-4 Math computationWRAT-4 Spelling |  | Treatment effect = -2.72 (SE = 5.5) p = -.5Treatment effect = 5.6 (SE = 4.7) p = .23Treatment effect = 5.22 (SE = 5.21) p = .31Treatment effect = 1.28 (SE = 6.17) p = .83 |
| **Acceptability of treatment** |
| Gevensleben,200933(Gevensleben, 201034Wangler, 201135)102GoodRCTb | Neurofeedback training  | Attention skills training  | 2 months | Effectiveness of treatmentMean = 3.19 (SD = .82)Parent-rated motivation of their children to participate in treatmentMean = .64 (SD = .77)  | Effectiveness of treatmentMean = 3.13 (SD = .90)Parent-rated motivation of their children to participate in treatmentMean = .56 (SD = 1.13)  | P= .77P= .71 |
| **Behavior changes** |
| Dovis, 20154089GoodRCTb | Braingame Brian (computerized, home-based executive functioning training) | Braingame Brian in training mode and the working memory task in placebo mode All tasks in training mode (overall easier) | 3 months | Parent DBDRS InattentionMean=12.9 (SD=4.1)P-DBDRS Hyperactivity/ImpulsivityMean = 12.6 (SD = 6.4)Teacher DBDRS InattentionMean = 12.2 (SD = 5.8)Teacher DBDRS Hyperactivity/ImpulsivityMean = 9.3 (SD = 4.9) | Parent DBDRS InattentionMean = 14.6 (SD = 5.3)P-DBDRS Hyperactivity/ImpulsivityMean = 13 (SD = 5.1)Teacher DBDRS InattentionMean = 13.3 (SD = 6.6)Teacher DBDRS Hyperactivity/ImpulsivityMean = 11.5 (SD = 7)Parent DBDRS InattentionMean = 14.1 (SD = 4.7)P-DBDRS Hyperactivity/ImpulsivityMean = 12.5 (SD = 5.7)Teacher DBDRS InattentionMean = 11.3 (SD = 5.1)Teacher DBDRS Hyperactivity/ImpulsivityMean = 6 (SD = 9.1) | NS NSNSNSNSNSNSNS |
| **Changes in standardized symptom scores** |
| Chacko, 20143985GoodRCTb | Cogmed working memory training with difficulty titrated to a user’s ability | “Placebo” Cogmed working memory training with difficulty not titrated to a user’s ability | 3 weeks post | Parent Disruptive Behavior Disorder Rating Scale – Inattention symptomsParent Disruptive Behavior Disorder Rating Scale – Hyperactive symptomsTeacher Disruptive Behavior Disorder Rating Scale – Inattention symptomsTeacher Disruptive Behavior Disorder Rating Scale – Hyperactive |  | Treatment effect = 1.98 (SE = 1.17) p = .2Treatment effect = 1.88 (SE = 1.15) p = .2Treatment effect = 1.84 (SE = 1.49) p = .22Treatment effect = 1.94 (SE = 1.54) p = .21 |
| Egeland, 201341(Hovik, 201342)75GoodRCTb | Cogmed RoboMemo program  | Waitlist control  | 8 months | ADHD-RS Total Score TeacherMean=20.1 (SD=9.8)ADHD-RS Parent Mean=27 (SD=11.5) | ADHD-RS Total Score TeacherMean=22.6 (SD=12.3)ADHD-RS ParentMean=28.1 (SD=11) | NSNS |
| Gevensleben, 200933(Gevensleben, 201034Wangler, 201135)102GoodRCTb | Neurofeedback Training  | Attention skills training  | 1 month | German ADHD rating scale (FBB-HKS)Mean w/in group change = -.39 (SD = .37) | German ADHD rating scale (FBB-HKS)Mean w/in group change = -.1 (SD = .44) | P<.005 |
| Steiner, 201437(Steiner, 201438)104GoodRCTb | Neurofeedback | Cognitive trainingWaitlist control | 5 months | Conner 3 Parent InattentionWithin-group effect size = -0.8Conners 3 Parent Executive FunctioningWithin-group effect size = -0.49Conners 3 Parent Global IndexWithin-group effect size = -0.37Conners 3 Teacher InattentionWithin-group effect size = -0.25 | Conner 3 Parent InattentionWithin-group effect size = -0.46Conners 3 Parent Executive FunctioningWithin-group effect size -0.12Conners 3 Parent Global IndexWithin-group effect size = -0.09Conners 3 Teacher InattentionWithin-group effect size = 0.24Conner 3 Parent InattentionWithin-group effect size = -0.15Conners 3 Parent Executive FunctioningWithin-group effect size = -0.09Conners 3 Parent Global IndexWithin-group effect size = -0.05Conners 3 Teacher InattentionWithin-group effect size =0 | p<.05NSp<.05p<.05p<.001p<.001p<.001NS |
| van Dongen-Boomsma, 20144351Good RCTc | Cogmed training program | Cogmed training program without adjustment for patient skill level (control group) | 5 weeks | ADHD-RS Total Investigator ScoreMean=32.4 (SE=5.7)ADHD-RS TeacherMean=27.5 (SE=10.1) | ADHD-RS Total Investigator ScoreMean=30.3 (SE=7.4)ADHD-RS TeacherMean=25.5 (SE=7.7) | NSNS |
| Beck, 20104452FairObservationalb | Computer-based working memory intervention  | Waitlist control | Baseline/ 4-month follow-up | ADHD Index Parent Mean = 71.7 (SD = 8.82) / Mean = 62.78 (SD = 9.35)Conners Cognitive Problems/Inattention Parent Mean = 67.96 (SD = 9.55) /Mean = 59.89 (SD = 9.15)Conners Hyperactivity ParentMean = 68.37 (SD = 15.98) /Mean = 59.59 (SD = 14.89)Conners Oppositional ParentMean = 60 (SD = 13.34)/Mean = 53.96 (SD = 9.67)Conners ADHD Index Teacher# patients with outcome = 60.78 (SD = 14.96) / # patients with outcome = 56.38 (SD = 13.28)Conners Cognitive Problems/Inattention Teacher Mean = 60.89 (SD = 10.58) /Mean = 57.5(SD = 7.91)Conners Hyperactivity TeacherMean = 59.59 (SD = 15.17) /Mean = 56.31 (SD = 13.47)Conners Oppositional TeacherMean = 56.52 (SD = 8.93) /Mean = 52.35 (SD = 10.12)BRIEF Metacognition Index ParentMean = 72.96 (SD = 8.06)/Mean = 64.19 (SD = 9.24)BRIEF Metacognition Index TeacherMean = 67.96 (SD = 18.67) /Mean = 64.85 (SD = 16.35) | ADHD Index Parent Mean = 69.92 (SD = 7.86) / Mean = 67.33 (SD = 7.33)Conners Cognitive Problems/Inattention Parent Mean = 65.38 (SD = 9.22) /Mean = 64.75 (SD = 10.22)Conners Hyperactivity ParentMean = 65.7 (SD = 16.5) /Mean = 62.75 (SD = 13.73)Conners Oppositional ParentMean = 59.79 (SD = 12.17) /Mean = 57.5 (SD = 10.59)Conners ADHD Index Teacher# patients with outcome = 58.4 (SD = 11.4) /# patients with outcome = 56.52 (SD = 10.25)Conners Cognitive Problems/Inattention Teacher Mean = 56.24 (SD = 11.05) /Mean = 55.56 (SD = 10.26)Conners Hyperactivity TeacherMean = 55.36 (SD = 13.2) /Mean = 55.64 (SD = 11.14)Conners Oppositional TeacherMean = 52.92 (SD = 8.93) /Mean = 50.58 (SD = 8.71)BRIEF Metacognition Index ParentMean = 71.38 (SD = 7.73) /Mean = 69.61 (SD = 7.19)BRIEF Metacognition Index TeacherMean = 60.2 (SD = 13.04) /Mean = 60.79 (SD = 12.76) | p=.01p<.01p=.04p=.10p=.43p=.23p=.25p=.59p=.01p=.22 |
| Van der Donk, 201545105FairRCTb | Cogmed Working Memory Training | Paying Attention in Class (experimental, combined working memory and compensatory training) | 6 weeks6 months | CBCL Attention Problems Scale CBCL Externalizing Problems Scale | CBCL Attention Problems ScaleCBCL Externalizing Problems Scale | NRNR |
| **Functional impairment** |
| van Dongen-Boomsma, 20144351Good RCTc | Cogmed training program | Cogmed training program without adjustment for patient skill level (control group) | 5 weeks | CGI-I# patients w/ outcome = 25 | CGI-I# patients w/ outcome = 21 | P=0.514 |

a See Methods section “Quality Assessment of Individual Studies” for definitions of quality assessment ratings.

b Age categories: a = children aged ≤6 years, b = children aged 7-17, c = children of all ages ≤17.

Abbreviations: ADHD=attention deficit hyperactivity disorder; BRIEF=Behavior Rating Inventory of Executive Function; CBCL= Child Behavior Checklist; DBDRS=Disruptive Behavior Disorder Rating Scale; SNAP=Swanson, Nolan and Pelham Revision