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, 201439  85  Good  RCT  b | 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 reading  WRAT-4 Sentence completion  WRAT-4 Math computation  WRAT-4 Spelling |  | Treatment effect = -2.72 (SE = 5.5) p = -.5  Treatment effect = 5.6 (SE = 4.7) p = .23  Treatment effect = 5.22 (SE = 5.21) p = .31  Treatment effect = 1.28 (SE = 6.17) p = .83 |
| **Acceptability of treatment** | | | | | | |
| Gevensleben,200933  (Gevensleben, 201034  Wangler, 201135)  102  Good  RCT  b | Neurofeedback training | Attention skills training | 2 months | Effectiveness of treatment  Mean = 3.19 (SD = .82)  Parent-rated motivation of their children to participate in treatment  Mean = .64 (SD = .77) | Effectiveness of treatment  Mean = 3.13 (SD = .90)  Parent-rated motivation of their children to participate in treatment  Mean = .56 (SD = 1.13) | P= .77  P= .71 |
| **Behavior changes** | | | | | | |
| Dovis, 201540  89  Good  RCT  b | 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 Inattention  Mean=12.9 (SD=4.1)  P-DBDRS Hyperactivity/Impulsivity  Mean = 12.6 (SD = 6.4)  Teacher DBDRS Inattention  Mean = 12.2 (SD = 5.8)  Teacher DBDRS Hyperactivity/Impulsivity  Mean = 9.3 (SD = 4.9) | Parent DBDRS Inattention  Mean = 14.6 (SD = 5.3)  P-DBDRS Hyperactivity/Impulsivity  Mean = 13 (SD = 5.1)  Teacher DBDRS Inattention  Mean = 13.3 (SD = 6.6)  Teacher DBDRS Hyperactivity/Impulsivity  Mean = 11.5 (SD = 7)  Parent DBDRS Inattention  Mean = 14.1 (SD = 4.7)  P-DBDRS Hyperactivity/Impulsivity  Mean = 12.5 (SD = 5.7)  Teacher DBDRS Inattention  Mean = 11.3 (SD = 5.1)  Teacher DBDRS Hyperactivity/Impulsivity  Mean = 6 (SD = 9.1) | NS  NS  NS  NS  NS  NS  NS  NS |
| **Changes in standardized symptom scores** | | | | | | |
| Chacko, 201439  85  Good  RCT  b | 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 symptoms  Parent Disruptive Behavior Disorder Rating Scale – Hyperactive symptoms  Teacher Disruptive Behavior Disorder Rating Scale – Inattention symptoms  Teacher Disruptive Behavior Disorder Rating Scale – Hyperactive |  | Treatment effect = 1.98 (SE = 1.17) p = .2  Treatment effect = 1.88 (SE = 1.15) p = .2  Treatment effect = 1.84 (SE = 1.49) p = .22  Treatment effect = 1.94 (SE = 1.54) p = .21 |
| Egeland, 201341  (Hovik, 201342)  75  Good  RCT  b | Cogmed RoboMemo program | Waitlist control | 8 months | ADHD-RS Total Score Teacher  Mean=20.1 (SD=9.8)  ADHD-RS Parent  Mean=27 (SD=11.5) | ADHD-RS Total Score Teacher  Mean=22.6 (SD=12.3)  ADHD-RS Parent  Mean=28.1 (SD=11) | NS  NS |
| Gevensleben, 200933  (Gevensleben, 201034  Wangler, 201135)  102  Good  RCT  b | 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)  104  Good  RCT  b | Neurofeedback | Cognitive training  Waitlist control | 5 months | Conner 3 Parent Inattention  Within-group effect size = -0.8  Conners 3 Parent Executive Functioning  Within-group effect size = -0.49  Conners 3 Parent Global Index  Within-group effect size = -0.37  Conners 3 Teacher Inattention  Within-group effect size = -0.25 | Conner 3 Parent Inattention  Within-group effect size = -0.46  Conners 3 Parent Executive Functioning  Within-group effect size -0.12  Conners 3 Parent Global Index  Within-group effect size = -0.09  Conners 3 Teacher Inattention  Within-group effect size = 0.24  Conner 3 Parent Inattention  Within-group effect size = -0.15  Conners 3 Parent Executive Functioning  Within-group effect size = -0.09  Conners 3 Parent Global Index  Within-group effect size = -0.05  Conners 3 Teacher Inattention  Within-group effect size =0 | p<.05  NS  p<.05  p<.05  p<.001  p<.001  p<.001  NS |
| van Dongen-Boomsma, 201443  51  Good  RCT  c | Cogmed training program | Cogmed training program without adjustment for patient skill level (control group) | 5 weeks | ADHD-RS Total Investigator Score  Mean=32.4 (SE=5.7)  ADHD-RS Teacher  Mean=27.5 (SE=10.1) | ADHD-RS Total Investigator Score  Mean=30.3 (SE=7.4)  ADHD-RS Teacher  Mean=25.5 (SE=7.7) | NS  NS |
| Beck, 201044  52  Fair  Observational  b | 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 Parent  Mean = 68.37 (SD = 15.98) /  Mean = 59.59 (SD = 14.89)  Conners Oppositional Parent  Mean = 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 Teacher  Mean = 59.59 (SD = 15.17) /  Mean = 56.31 (SD = 13.47)  Conners Oppositional Teacher  Mean = 56.52 (SD = 8.93) /  Mean = 52.35 (SD = 10.12)  BRIEF Metacognition Index Parent  Mean = 72.96 (SD = 8.06)/  Mean = 64.19 (SD = 9.24)  BRIEF Metacognition Index Teacher  Mean = 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 Parent  Mean = 65.7 (SD = 16.5) /  Mean = 62.75 (SD = 13.73)  Conners Oppositional Parent  Mean = 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 Teacher  Mean = 55.36 (SD = 13.2) /  Mean = 55.64 (SD = 11.14)  Conners Oppositional Teacher  Mean = 52.92 (SD = 8.93) /  Mean = 50.58 (SD = 8.71)  BRIEF Metacognition Index Parent  Mean = 71.38 (SD = 7.73) /  Mean = 69.61 (SD = 7.19)  BRIEF Metacognition Index Teacher  Mean = 60.2 (SD = 13.04) /  Mean = 60.79 (SD = 12.76) | p=.01  p<.01  p=.04  p=.10  p=.43  p=.23  p=.25  p=.59  p=.01  p=.22 |
| Van der Donk, 201545  105  Fair  RCT  b | Cogmed Working Memory Training | Paying Attention in Class (experimental, combined working memory and compensatory training) | 6 weeks  6 months | CBCL Attention Problems Scale  CBCL Externalizing Problems Scale | CBCL Attention Problems Scale  CBCL Externalizing Problems Scale | NR  NR |
| **Functional impairment** | | | | | | |
| van Dongen-Boomsma, 201443  51  Good  RCT  c | 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