Effectiveness of child training for children exhibiting disruptive behavioural problems, including attention deficit/hyperactivity disorder (AD/HD) and oppositional defiant disorder (ODD), when compared with other treatment methods for this population

Jenna Gordon

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Disciplines
Occupational Therapy | Pediatrics

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Critically Appraised Topic (CAT)

Effectiveness of child training for children exhibiting disruptive behavioural problems, including attention deficit/hyperactivity disorder (AD/HD) and oppositional defiant disorder (ODD), when compared with other treatment methods for this population

Prepared by; Jenna Gordon, OTS (jenna.noonan.gordon@gmail.com)
Date: November 11, 2010
Review date: November 11, 2012

CLINICAL SCENARIO:
Mental illness has recently become the leading cause of disability for all persons 5 years of age and older (U.S. Public Health Service, 2000). In 2009, one in 10 children were diagnosed with a behavioral disorder with attention-deficit hyperactivity disorder (ADHD) exhibiting the highest prevalence rates. Clinically, children exhibiting symptoms of ADHD have high comorbidity rates with disorders such as oppositional defiant disorder (ODD) and conduct disorder (CD). Furthermore, evidence suggests that without early intervention, behavioral problems such as aggression, oppositional behavior, or conduct problems may become crystallized patterns of behavior by age 8 (Webster-Stratton, C., Jamila Reid, M., & Hammond, M, 2004).

Children with early onset of behavioral problems, including ODD and ADHD symptoms, are at increased risk of peer rejection, parental abuse, and at the later stages, poor school adaptation and dropout, substance abuse, and juvenile delinquency. Such outcomes have a direct impact on additional demands on an already inadequate mental health system. The long-term consequences of untreated or mistreated childhood disorders have both a monetary and humanistic impact on society. Identifying effective treatments for children who suffer from emotional and behavioral disorders has become a growing concern in the United States.

Current treatments for children exhibiting behavioral or conduct problems typically include a multi-disciplinary approach with a heavy focus on familial involvement. A treatment plan may include education about the disorder, behavior and family counselling, educational interventions, and medication. Ideally, a combination of treatments is used because of the multiple aspects of the child’s life that are affected by behavioral problems including deficits in executive, language, social, academic, and adaptive functions as well as possible problems with sleep patterns and motor coordination (Glanzman & Blum, as seen in Batshaw, Pelligrino, & Roizen, 2007).
Occupational therapists are often involved in the treatment of children exhibiting behavioral problems as a result of their inability to function in their “occupation”: school enrollment. Evidence demonstrates that treatments for children exhibiting ADHD, ODD, and CD primarily revolve around parent-training. In having a hyperfocus on parent-training, other treatments options may be overlooked such as behavioral training and teacher training.

**FOCUSED CLINICAL QUESTION:**
What are the effects of child training on children exhibiting disruptive behavioral problems when compared with other treatment methods for this population?

**SUMMARY of Search, ‘Best’ Evidence’ appraised, and Key Findings:**
- A multi-disciplinary approach may be most beneficial for treating a child exhibiting disruptive behavioral problems
- A Norwegian study demonstrates the effectiveness of ‘The Incredible Years Program’ in a randomised controlled trial thereby providing statistical evidence for utilizing this program to treat families who have children exhibiting disruptive behavioral problems which includes both parent-training and child-training. Overall, treatment outcomes showed reductions of child aggressive behaviours at home, improvement of parental practices and reductions of parental stress; however, though PT and PT + CT reduced some aggressive behavior problems at home, other areas of function were still at risk, including problems in socialization (Larsson, B., Fossum, S., Clifford, G., Drugli, M. B., Handegard, B. H., & Morch, W.T, 2009).
- Perreau-Linck, et al (2010) concluded that results of their preliminary study regarding the effects of neurofeedback training on inhibitory capacities in ADHD children and suggest that factors such as motivation, expectations and parental support might contribute to the outcome of NF training in children with ADHD.
- Cheng & Boggett-Carsjens (2005) suggest that children exhibiting affect dysregulation may have issues with sensory processing and therefore may benefit from occupational therapy or occupational therapy based resources
- When comparing child, parent, family characteristics in usual care versus evidence based treatment methods for children with disruptive behavior problems there is evidence that there may be a gap between evidence supported care and clinical treatment (Baker-Ericzén, M. J., Hurlburt, M. S., Brookman-Frazee, L., Jenkins, M. M., & Hough, R. L., 2010).

**CLINICAL BOTTOM LINE:** Recent evidence supports the need for child-parent and parent-teacher training for families with children exhibiting disruptive behavioral problems; however, there is limited support for child-based therapy approaches for children exhibiting behavioral problems. Typically, paediatric occupational therapists have a role in treating children who have a disruption in occupational tasks as a result of a variety of conditions. Unfortunately, children exhibiting disruptive behaviors may not qualify for occupational therapy treatment due to a significant lack of research supporting the effects of occupational therapy on children exhibiting occupational therapy. The aim of this critical appraisal is to explore research that supports the benefit of child training in order to promote further exploration of child specific
Limitation of this CAT: Critical appraisal of this topic was performed by a masters of occupational therapy student and reviewed by a university professor. It is not a peer reviewed paper and is not intended to be used as such.

SEARCH STRATEGY:
- **Patient/Client Group:** Children exhibiting disruptive behavioural problems
- **Intervention (or Assessment):** Child training
- **Comparison:** Other treatment methods (including but not limited to parent-training and teacher-training)
- **Outcome(s):** Improved scores on behavioural child assessments
## Search Strategy: Table-1

<table>
<thead>
<tr>
<th>Databases and sites searched</th>
<th>Search Terms</th>
<th>Limits used</th>
<th>Approx. Search Date</th>
<th>Relevant Articles Retrieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinahl</td>
<td>Oppositional Defiant Disorder (ODD) + treatment</td>
<td>English + Full Text + &gt;1997</td>
<td>09/2010</td>
<td>2/79</td>
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<td>09/2010</td>
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<tr>
<td></td>
<td>Child Psychiatric Disorders + behavior + treatment</td>
<td>English + Full Text + &gt;1997 + Intervention</td>
<td>09/2010</td>
<td>0/12</td>
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<tr>
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<td>English + Full Text</td>
<td>10/2010</td>
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<td>Child Development + Mental Health + Physical Treatment</td>
<td>English + Full Text</td>
<td>10/2010</td>
<td>5/78</td>
</tr>
<tr>
<td>Occupational Therapy Quick Reference</td>
<td>Developmental Disorders (Attention Deficit/Hyperactivity Disorder; Oppositional Defiant Disorder)</td>
<td>None</td>
<td>11/2010</td>
<td>N/A</td>
</tr>
<tr>
<td>Children with Disabilities</td>
<td>Developmental Disorders (Attention Deficit/Hyperactivity Disorder; Oppositional Defiant Disorder)</td>
<td>None</td>
<td>11/2010</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**INCLUSION and EXCLUSION CRITERIA**

- **Inclusion:**
  - English
• Full-text;
• Published after 1995;
• Intervention based therapies for children exhibiting disruptive behavioral problems (including ODD, CD, ADHD);
• Evaluation of the behavioral differences between disruptive behavioral disorders (including ODD, CD, ADHD);
• Population under ≤18 years old

**Exclusion:**
• Non-intervention based treatments;
• Medication-based treatments;
• Children exhibiting Axis I disorders on the DSM-IV (including early-onset schizophrenia)

**RESULTS OF SEARCH**

**Table 2:** Summary of Study Designs of Articles retrieved. Five relevant studies were located and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998)

<table>
<thead>
<tr>
<th>Study Design/ Methodology of Articles Retrieved</th>
<th>Level</th>
<th>Number Located</th>
<th>Author (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic reviews/Meta-analyses of homogenous case-control studies; Individual case-control studies</td>
<td>Level 3</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Case series and poor quality cohort and case-control studies</td>
<td>Level 4</td>
<td>N/A</td>
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<tr>
<td>Expert opinion without explicit critical appraisal, or based in physiological or bench research</td>
<td>Level 5</td>
<td>I</td>
<td>Cheng, M. &amp; Boggett-Carsjens, J. 2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total = 6</td>
<td></td>
</tr>
</tbody>
</table>
BEST EVIDENCE

The following article was identified as the ‘best’ evidence and selected for critical appraisal:


Reasons for selecting this paper include:
- Encompasses the highest level of evidence in which an individual randomised trial with narrow confidence intervals provides finite research and clinically relevant results
- Provides comparison results for treatment methods including multiple parties related to the affected child including control trials
- Results provide insight into treatment methods & contexts in which treatment may be most effective for this population

SUMMARY OF BEST EVIDENCE

**Aim of Study:** To evaluate the generalizability and clinical effectiveness of interventions focused in two or more risk domains for conduct problems versus one risk domain. These domains included: parent training alone (PT), child training alone (CT), parent training plus teacher training (PT + TT), parent and child training (PT + CT), and parent and child training combined with teacher training (PT + CT + TT), and a waiting list control group.

**Study Design:** This study is a randomised controlled trial (RCT). Participants were either self-referred or referred by professionals within the community. Recruitment was administered by having families entering into the study in three separate cohorts during the falls of 1995, 1996, and 1997. Each family participated in the assessment period which included parent (P) and teacher (T) report of child and adult behavior, independent observations of children with parents at home, with peers during structured play session in the lab, and observations with teachers and peers in the classroom. Children’s social and problem-solving skills were also assessed.

Participants were placed into one of six groups (including a control group) by a lottery system for random assignment. At each assessment phase, five trained observers observed each parent-child dyad for 60-minutes. All children were subsequently observed in the classroom for 60-minutes for structured and 60-minutes of unstructured time on four separate occasions at each assessment phase. Lastly, children were observed for 30-minutes in a playroom at the clinic with a same-sex peer. Teacher training included mandatory four full days (32 hours) of group training sequenced throughout the school year, providing credits for attendance incentive.
Setting: All aspects of the intervention occurred at the Parenting Clinic, the research clinic at which the author’s are employed in the United States.

Participants: The participants in this study included the children exhibiting disruptive behaviors, the parents of the participating children, as well as the teachers of the participating children. Participants included children between the ages of 4 and 8 with no debilitating physical impairments, intellectual deficits, or history of psychosis, and not receiving any form of psychological treatment at the time of referral. The primary referral problem was child misconduct that had been occurring for at least 6 months prior. Parents also typically reported more than 10 child behavior problems on the Eyberg Child Behavior Inventory (ECBI), child meeting DSM-IV criteria for ODD, and the child had to be enrolled in a preschool or elementary school.

Intervention Investigated: There existed 6 different cohorts within this randomised-controlled trial. These included child training (CT), parent training (PT), teacher training (TT), and each cohort varied in the combination of comprehensive training.

Control = No treatment from the Parenting Clinic and control participants had no contact with therapists during the 8-9 month period. Post-assessments were conducted at the end of the school year and one year later the assessments were repeated. After both post-assessments were completed, the participants were offered the parent training (PT) program only.

Experimental = 5 experimental cohorts + 1 control group
- Child Training (CT) only = “Incredible Years Dinosaur Program” directly addresses interpersonal difficulties with young children who have ODD. Weekly letters were sent home to parents and teachers reporting on the child’s progress including good weekly behavior charts. Child received bonuses if returned with letters next week.
- Parent Training (PT) only = Parents met at the Parenting Clinic weekly in groups of 10 to 12 parents and 2 therapists for a 2 hour treatment session following the Incredible Years structured program. These sessions included videotaped programs on parenting & interpersonal skills to reduce parents’ coercive interactions & strengthen their positive interactions and relationships with their children.
- Teacher Training (TT) only = 32 hour group training session sequenced throughout the school year equating to 4 full days of training.
- Other Conditions include:
Outcome Measures: There were multiple outcome measures used in this study including:

- **Parenting Practices Interview**: Questionnaire adapted from Oregon Social Learning Centers discipline questionnaire and revised for young children. Internal consistency $\alpha$ coefficients were .71 for harsh discipline and .66 for supportive parenting.
- **Coder Impressions Inventory for Parents (CII)**: Adapted from OSCL Impression Inventory and is completed follow a ½ hr parent-child DPICS-R observation. Critical parenting had acceptable internal consistency ($\alpha = .89$) and Interrater reliability at .54. Nurturing supportive parenting had a Cronbach’s $\alpha$ of .88 and interrater reliability of .67.
- **Observational measures included Dyadic Parent-Child Interactive Coding System-Revised (DPICS-R)**: observational measure for recording behaviors of children & their parents in the home. Interrater reliability for mother summary scores were .96 for critical statements and .98 for positive parenting. Cronbach’s $\alpha$ for positive parenting was .78.
- **Daily Discipline Inventory (DDI)**: list of 19 negative and 19 prosocial behaviors commonly exhibited by children; parents select the behaviors they perceive as a problem. Test-retest reliability for the critical verbal discipline summary score was $r = .46$, and the $\alpha = .50$, and the ICC for Interrater reliability was .90.
- **ECBI**: 36 item behavioral inventory of child conduct problem behavior for children 2-16 years old; Total child deviance plus noncompliance had an ICC = .97, Cronbach’s $\alpha = .73$, and a one-item rating of child affect had an ICC = .95.
- **TASB**: Teacher report measure asked teachers to compare the target child with all of his or her classmates on four behavioral dimensions. For each behavioral dimension it scored a Cronbach’s $\alpha$ between .62 to .91. Significant correlations found between the teacher assessments and peer sociometric measures.
- **Teacher Rating Scales for the PCSC**: teacher’s independent assessment of the children’s competence & acceptance in 4 domains; Reliability ranged between .70 to .90 for subscales.
- **MOOSES**: classroom observation coding system codes children’s interactions with parents and teachers; Cronbach’s $\alpha = .71$.
- **SHP**: revised version of Teacher Observation of Classroom Adaptation; completed by school observers; Poor authority acceptance summary score had a Cronbach’s $\alpha$ of .79 and Interrater reliabilities of .73.
- **DPIS**: evaluate children’s social skills & conflict management strategies; Internal consistency for the Inappropriate Play scale was .88, ICC=.71

The results of these assessments were used to determine the composite scores for negative and positive parenting, child conduct problems at home, child conduct problems at school with peers, child social competence with peers, and teacher classroom management.

Main Findings: The findings of this study are presented in the composite scores listed above.

The composite score for Negative and Positive Parenting was significant (p<.05) for the father’s negative parenting treatment that included PT, especially with the combination of PT and TT. However,
the mother’s negative parenting showed significant effects PT in which child behavior improved as the mother participated in the Incredible Years parent training program.

The composite score of Child Conduct Problems at School with Peers showed treatment effects were positive (p<.01) in which all five treatment groups showed significant effects with mothers involved in parent training as compared with the control. Only three out of the five treatment groups showed significant effects with fathers involved in parent training.

There were no differential effects for child conduct problems at school, inclusive of all TT conditions. However, the composite score for teacher classroom management only showed significant treatment effects for the parent training and the parent training combined with teacher training treatments. There was no significant effect on teacher classroom management with the sole teacher training condition.

Lastly, the composite score for child social competence with peers was significant for three treatment conditions that included child training showing the most significant effects; however, there were no significant differences between each condition.

Follow-up assessments did not show significance changes; however, there was no follow-up with controls due to their future involvement in the study following the first follow-up assessment.

Original Author’s Conclusions: Webster-Stratton, et al. (2004) conclude that parent training leads to parenting improvements thereby having a direct effect on child behavior at home. Child training alone and parent training combined with teacher training both have an impact on the mother’s parenting response, thereby having a cumulative effect on the child’s behavior at home (as stated above). Also, only child training lead to improved child-teacher interactions even without direct intervention with the teacher.

All of these results demonstrate the importance of child training and parent training under all conditions for improvement in children’s behavior in school setting. Even more, the effects of child training at 1 year follow-up versus other conditions demonstrates that direct instruction with the child is necessary for learning the skills needed for the replacement of negative behaviors with prosocial interactions with their peers.

Critical Appraisal:

Validity: Webster-Stratton (2004) adequately identified reliability and validity measures for each assessment used within the study. Reliability and validity scores were dependent on a composite score for at least one relative domain, to the greater study, within the assessment. Rigour was maintained throughout the study design because the researchers insured treatment integrity in which each therapist conducting training sessions (including all domains) co-led their first group with the study.
supervisor and continued to follow strict manual guidelines for each treatment session, setting identical training sessions (often including videotape) and identical homework assignments for the participants. The four teacher training sessions were directly administered by the supervisor of the study and one other “highly” trained therapist.

Findings were based on results obtained from a number of well-established, reliable, and valid assessment tools and observations. See outcome measures for reliability and validity scores according to each assessment used. On a gross level, reliability checks were randomly conducted on 20% of all home observations at pre-treatment, posttreatment, and follow-up assessment (in both conditions). Observers were blind to condition and coded equally in all conditions.

Ethical guidelines were followed in that all participants, including the children, agreed to participate in the study. However, full ethical guidelines were sacrificed due to the fact that the control group could not be post-tested at follow-up due to their limited involvement in the study.

Biases within the study design are relevant to the administration of assessments to children between the ages of four and eight. There exists separate developmental age groups within this range (from 4-6 years of age and 6-8 years) and many developmental assessments target these specific age groups for normative values; therefore, the lack awareness of this developmental age gap may have an effect on assessment results and application of these results.

Not rated on Physiotherapy Evidence Database (PEDro).

Interpretation of Results: Treatment effects for each measure were examined using a six-group analysis of covariance (ANCOVA) with pretest scores as covariates for corresponding posttest scores. Then planned comparisons were conducted on post scores adjusted for pretest scores contrasting each treatment condition with the control condition. The study then examined whether TT added to parent training or child training by contrasting CT versus CT + TT and PT versus PT + TT. Lastly they examined PT+CT+TT condition, which addressed all three risk factors, produced benefits beyond those that addressed only two risk factors.

Relevant conclusions of this study include that PT lead to parenting improvements, thereby leading to improved child behavior at home. Chid training and CT + TT reduces child negative behavior and has an effect on the mother’s parenting response to the child. Teacher training is effective in changing teacher interaction with target students as well as in general classroom management. Child training-only cohort showed that improved child behavior lead to improved teacher interactions even without direct intervention with the teacher. On a global level, results demonstrate strength in CT + PT domains for improved child behavior in school settings, thereby having a positive effect on the parent-child interaction. Though the number of treatment conditions had an effect on the child’s behavior, there is significant evidence demonstrating that direct instruction with children is necessary for learning the
skills needed for the replacement of negative behaviors with prosocial interactions with their peers. Also supporting child-specific training is the results from the one year follow-up. Results showed that only the three conditions that included CT continued to improve over time versus the conditions without CT which deteriorated over time.

Summary/Conclusion: The significance of this study’s results may have a direct impact in the development of treatment programs for children exhibiting disruptive behaviors which has a tendency to directly affect their occupational function. Current research places an emphasis on parent-training and then teacher training when intervening for children exhibiting disruptive behaviors. However, this study demonstrates that for long-term effects on child behavior, it is critical to provide direct child intervention. Cheng & Boggett-Carsjens’ (2005) qualitative study on a single case directly supports the theory of placing an emphasis on child training, specifically to develop awareness and methods in appropriately regulating emotion and behavior.

Implications for Practice, Education, and Future Research: In 1979, Jean Ayres, an occupational therapist, coined the term sensory integration dysfunction to describe atypical social, emotional, motor and functional patterns of behavior related to poor processing of sensory stimuli (Ayres, 1979). Theories regarding sensory integration have gradually developed over time but are generally applied to the autistic child population; however, the behaviors observed in children exhibiting ADHD and ODD may be related to the behaviors noted in sensory integration dysfunction.

Currently, sensory integration typically falls under the domain of occupational therapists, in which therapy attempts to focus on how to promote improved occupational functioning in order to have a direct effect on the quality of life of an individual. This perspective hopes to enable children to function within their environment, typically a school setting. This presents a divide while treating children exhibiting disruptive behaviors because there is not a universal approach in treating this population. The split resides between who should administer treatment: occupational therapy or psychologists.

Recent research and intervention approaches demonstrate that this population is typically administered treatment via psychologists and the majority of treatments focus on parent training techniques in order to promote improved behavior within the child. However, as this study supports, child training techniques promote improved child behavior for both short term and long term effects, possibly independent of parent training and teacher training. Therefore, future research should continue to determine the efficacy of child training. There exists a gap in research for the effect of sensory integration techniques on children exhibiting behavioral problems, therefore future research may focus on applying Jean Ayres theories towards different populations, including children with ADHD, ODD, or CD.
If further research is conducted and provides further evidence to support improved behavior as a result of sensory integration theories, it could directly lead to the expansion of the occupational therapy field. This, in turn, could have a direct effect on societal rates of juvenile delinquency and crime.

Table 3: Characteristics of included studies (purpose of study, comparison, intervention, outcomes used, findings)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Summary</th>
</tr>
</thead>
</table>
| Gadow, et al. (2002) | **Purpose:** Examines the differences between children (ages 3 to 6 years) who have symptoms of oppositional defiant disorder (ODD) with or without attention-deficit/hyperactivity disorder (ADHD), ADHD alone, and a non-ODD/ADHD comparison group.  
**Method:** Single-case design designed around rating scales that were distributed to parents of all the children and participating teachers.  
**Outcome Measures:** Early Childhood Inventory-4, a DSM-IV referenced rating scale; however, does not include other diagnostic criteria therefore rating scale does not provide a clinical diagnosis  
**Results:** Differences between symptom groups varied depending on how they were configured (teacher versus parent ratings) and setting (clinic versus community). Generally, ODD+ADHD group received most severe symptoms of other disorders, difficulties with peers, and developmental deficits.  
**Recommendations:** Findings provide preliminary evidence for the notion that ODD and ADHD may constitute distinct clinical entities in preschool-aged children and suggest that informant may be an important consideration in the formulation of diagnostic criteria. |
| Baker-Ericzen, et al. (2010) | **Purpose:** To compare child, parent, and family characteristics in usual care and empirically supported treatment research samples for children with disruptive behavior disorders in order to determine whether empirically developed theories are applicable and applied to clinical populations.  
**Method:** Systematic review that compares data from 34 research trails of five empirically supported treatments with one large usual care sample on child, parent, and family characteristics for children with disruptive behavior disorders.  
**Outcome Measures:** Criteria of EST studies includes (1) published in a peer reviewed source; (2) persons in study including 6 to 7 year olds; (3) diagnosed or showed symptoms of disruptive behavior disorders; and (4) intervention involved a parent training modality. These included Parent Management Treatment Studies (PMT), Incredible Years Studies (IY), Parent-Child Interaction Therapy Studies (PCIT), Problem Solving Skills Training Plus Parent Management Training Studios (PSST+PMT), and Multisystemic Therapy (MST).  
**Results:** Results indicate that the backgrounds of youths and families served in the usual care are complex with multiple child, parent, and family issues and these characteristics are not consistently reported in empirically supported treatments.  
**Recommendations:** This study emphasized the importance of assessing factors associated with the psychotherapy process because they are quite prevalent in treatment and outcomes, especially parent and family |
characteristics in both research studies and community practice.

| Cheng & Boggett-Carsjens (2005) | **Purpose**: To expose the idea that children with affect dysregulation may have issues with sensory processing and therefore may benefit from occupational therapy or occupational therapy based resources.  
**Method**: Individual case study in which the data was collected via documentation and observation.  
**Outcome Measures**: N/A  
**Results**: Sensory processing techniques may have had a direct impact on the dysregulation issues that were believed to be directly related to the client’s disruptive behaviors.  
**Recommendations**: There is a need for research demonstrating the validity of sensory processing disorders concept as well as the clinical utility of sensory processing approaches and interventions. |
|---|---|
| Perreau-Linck, et al. (2010) | **Purpose**: To support the evidence of neurofeedback (NF) training on ADHD, both the inattentive- and the impulsive-type in order to isolate specific effects of NF training on ADHD children.  
**Method**: Randomized, placebo-controlled study by trainers to blind participants; however, neuropsychological testing performed by main author who was not blind to the control and non-control groups.  
**Outcome Measures**: Range of measures were used to assess specific cognitive abilities associated with ADHD including Connors CPT-II, Digit & Spatial Span, Verbal Fluency and Color Work Interference Test, Key Search, Zoo Map, Six Part test, Bells and Mesulam’s Cancellation Task, Child CAT, and TEA-ch. Skills including attention, motor, inhibition, working memory, planning were assessed via these outcome measures.  
**Results**: Only a single participant out of the 13 participants demonstrated improved hyperactivity after NF training.  
**Recommendations**: Intrinsic and extrinsic motivational factors may be a key factor in NF training because the chemical dopamine is crucially involved in ADHD and motivation. Previous studies demonstrate motivation to perform on a task has shown to positively correlate with inhibitory capacities. |

**REFERENCES**


Reed, K. L. (2001). Developmental disorders: Attention Deficit/Hyperactivity Disorder, Quick Reference to Occupational Therapy (pp. 6-14). Austin, TX: Pro-Ed.


