

Sensory Strategies Appear to Improve Classroom Behaviours and Attention in Children with Psychiatric Disabilities

Prepared by: Kim Borden, MSc OT Candidate, Queen's University

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CLINICAL SCENARIO :

Children with psychiatric disabilities such as Pervasive Development Disorder (PDD), Autism, Attention Deficit Hyperactivity Disorder (ADHD), and learning disabilities often have difficulties processing and interpreting sensory information. These difficulties may contribute to problems attending to schoolwork, behavioural problems or overall decreased productivity in a given task. Occupational therapists within the school system can provide sensory strategies to compensate for sensory difficulties. These strategies often appear as odd or strange to those unfamiliar with sensory awareness and modulation such as teachers and classroom support workers. Teachers may view the strategies as difficult to implement if little information and evidence is provided regarding the benefits on a child's behaviour and attention.

CLINICAL QUESTION:

Does the use of sensory strategies within a structured activity and school setting improve the behaviours and attention of preschool and school age children with psychiatric disorders with attention difficulties?

SUMMARY of Search, 'Best Evidence' appraised and Key Findings:

- 3 studies were found that met inclusion/exclusion criteria
- No systematic reviews, randomized control trials or cohort studies were found
- All studies appraised were single subject design studies
- One study used therapy balls for seating as a sensory strategy and found the use of balls facilitated in-seat behaviour and legible word productivity in children with ADHD (Schilling, et al., 2003)
- Two studies used weighted vests as a sensory strategy. One study found the weighted vests increased on-task behaviour during fine motor activities in children with ADHD (Vandenberg, N., 2001). The other study found the use of the vest to increase duration of attention to task, decrease the number of distractions and decrease self-stimulatory behaviours in preschoolers with PDD (Fertel-Daly, et al., 2001).

CLINICAL BOTTOM LINE:

- Sensory strategies involving therapy balls for seating or wearing a weighted vest appears to improve classroom behaviours and attention in children with psychiatric disabilities with attention difficulties
- Higher quality research with rigorous design and analysis is required to determine specific guidelines and protocols for such sensory strategy interventions

Limitation of this CAT: This summary has been individually prepared and has not undergone peer review.

SEARCH STRATEGY:

| Data Bases and sites searched | Search Terms | Limits used |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| CINAHL | <ul style="list-style-type: none">- ADHD- Attention- Attention(keyword)- Learning disorders exp- Child behaviour exp- Child Developmental Disorders exp- Sensory (keyword)- Pediatric occupational therapy- Classroom (keyword)- Education, Special | <ul style="list-style-type: none">- Preschool 2 to 5 years- Child 6 to 12 years- 1995-2005 |
| PsycINFO (1967-2005) | <ul style="list-style-type: none">- ADHD exp- Learning disabilities exp- Sensory integration exp- School environment exp- School based intervention exp- Special education exp- Occupational therapy exp- Behaviour modification exp- Classroom behaviour exp | <ul style="list-style-type: none">- Preschool 2 to 5 years- Child 6 to 12 years- 1995-2005 |
| AMED | <ul style="list-style-type: none">- Child mental disorders exp- Students- Sensory (keyword)- Occupational therapy exp- Education exp | <ul style="list-style-type: none">- 1995-2005 |
| ERIC via IES | <ul style="list-style-type: none">- ADHD- Learning disabilities- Sensory strategies- Sensory- Environment- Classroom- Behaviour | <ul style="list-style-type: none">- 1995-2003 |
| ERIC via CSA | <ul style="list-style-type: none">- ADHD- Environment- Sensory- Classroom- Attention- Behaviour | <ul style="list-style-type: none">- 1995-2003 |

INCLUSION and EXCLUSION CRITERIA

Inclusion:

- studies from 1995-2005
- studies published in English
- studies of children ages 2 to 12
- studies involving compensatory sensory strategies
- studies within a classroom setting

Exclusion:

- studies located in environments other than a classroom setting
- studies involving sensory integration treatment sessions
- studies not available at Queen's University

RESULTS OF SEARCH

Eight related studies were located but were not appraised, as they did not meet inclusions and exclusion criteria (Table 1).

TABLE 1: Summary of Related Articles Retrieved and Not Appraised

| Source | Number Located |
|----------------------------|-----------------------|
| AMED (4, 5, 6, 8, 10) | 5 |
| CINAHL (4, 5, 6, 8, 9, 10) | 6 |
| PsycINFO (4, 5, 6) | 3 |
| ERIC via CSA (6, 7, 11) | 3 |
| ERIC via IES (6, 7, 11) | 3 |

BEST EVIDENCE

Three relevant studies were located, appraised and categorized as shown in Table 2 (Oxford Centre for Evidence-based Medicine Levels of Evidence, May 2001 retrieved March 2, 2005, from www.cebm.net/levels_of_evidence.asp#levels).

TABLE 2: Summary of Study Designs of Articles Retrieved

| Level of Evidence | Study Design | Number Located | Sources |
|--------------------------|---------------------|-----------------------|----------------------------------------------------------|
| Level 4 | Single case study | 3 | CINAHL (1, 2, 3) PsycINFO (1, 2, 3) AMED (1, 2, 3) |

These articles were identified as the 'best' evidence and selected for critical appraisal because of their applicability and clinical usefulness.

1. An ABA single subject design to examine the effectiveness of wearing a weighted vest for increasing attention to a fine motor task and decreasing self-stimulatory behaviours of 5 preschool children with pervasive developmental disorder (Table 3).
2. A single subject, A-B-A-B interrupted time series design to investigate the effects of therapy balls as seating on in seat behaviour and legible word production of students with ADHD (Table 4).
3. A quasi-experimental, single system AB design to measure on-task behaviour in 4 children with attention difficulties while wearing a weighted vest (deep pressure sensory input) while engaged in classroom fine motor activities (Table 5).

SUMMARY OF BEST EVIDENCE

TABLE 3: Description and appraisal of case study by Fertel-Daly, D et al. 2001.

Purpose of the study: to examine the effectiveness of wearing a weighted vest to increase attention during a fine motor task and decrease self-stimulatory behaviours of 5 preschool children with pervasive developmental disorder, using an ABA single subject design.

Intervention Investigated: Study consisted of three phases: initial baseline (A), intervention phase (B) and intervention withdrawal phase (A). All observation and data collection occurred during structured fine motor activities in the classroom. Three separate 5-min observation sessions, one for each measure, per participant and per phase resulted in 9 observation periods per each participant across all phases. Data collection for each phase lasted 2 weeks. During intervention phase B, 1 lb weighted vest were worn three times a week. Data was collected after participants had worn the vest for 1.5 hours.

Outcomes Measures

Duration of Attention: length of time a child looked at and simultaneously engaged in some deliberate manipulation of fine motor objects or materials related to activity within a 5-min period.

Number of Distractions: number of times the participant turned his or her head or eyes away from the task within a 5 min period.

Duration of self stimulatory behaviours: the type and the summed duration of self-stimulatory behaviours within a 5-min period was observed.

Results: All participants displayed a decrease in the number of distractions and an increase in the duration of focused attention while wearing the weighted vest. All but one participant demonstrated a decrease in the duration of self-stimulatory behaviour while wearing the weighted vest; however the type of self-stimulatory behaviour changed and became less self-abusive for this child while wearing the weighted vest. During the intervention withdrawal phase 3 participants experienced an increase in the number of distractions and a decrease in the duration of focused attention. The increase or decrease never returned to baseline levels for these behaviours.

Conclusions: The use of a weighted vest for these 5 children with PDD resulted in an increase in attention to task and decrease in self-stimulatory behaviours. The most consistent improvement observed was the decreased number of distractions. Additional research is necessary to build consensus about the effectiveness of wearing a weighted vest to increase attention to task and decrease self-stimulatory behaviours for children with PDD.

Reviewer's Critical Appraisal

Validity: Strengths: Withdrawal phases used to examine latent effects of wearing the weighted vest. Weaknesses: Interobserver agreement was only determined at baseline, small number of participants, one classroom and no second intervention phase to validate latent effects of wearing vest.

Importance of Results: Results provide preliminary support for the use of a weighted vest in children with PDD. Results are represented visually in graph form and means are provided. Statistical analysis was not used. Further research is needed to determine more specific guidelines for intervention, such as the weight of the vest and the amount of time needed to wear the vest for effects to be observed.

Implications for Practice / Applicability: Weighted vests (1 lb) appear to be beneficial for clinical use with children with PDD to increase duration of attention to task, decrease the number of distractions and decrease self stimulatory behaviour. The study provides some support for the clinical question.

Level Of Evidence: 4 (Oxford Centre for Evidence-based Medicine, 2001).

TABLE 3: Description and appraisal of case study by Shilling, D.L. et al. 2003.

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| <p>Purpose of the study: to investigate the effects of therapy balls as seating on in seat behaviour and legible word production of students with attention deficit hyperactivity disorder (ADHD) using a single subject, A-B-A-B interrupted time series design across three participants. Additionally, social validity was assessed to evaluate teacher and student opinions regarding the intervention</p> <p>Intervention Investigated: During baseline phases (A), participants and all other class members sat on chairs during language arts; during intervention phases (B) participants and all other class members sat on balls during language arts. The total study was 12 weeks in length; each phase was three weeks long.</p> <p>Outcomes Measures:</p> <p><i><u>In-seat behaviour:</u></i> In-seat behaviour data collection occurred at 10-second intervals. Each participant was observed for five 2-minute periods, resulting in 60 observations per participant per session. Percentage of in-seat behaviour was calculated by the number of in-seat observations divided by the total number of observations.</p> <p><i><u>Legible word productivity:</u></i> the percentage difference between the participants' legible word production and the class mean for legible word production. Five writing samples were randomly selected per participant to be assessed by the primary investigator. A second evaluator blind to the study evaluated two randomly selected papers per participant.</p> <p><i><u>Social validity:</u></i> was evaluated via questionnaires to participants as well as participants and teacher writing their opinions of sitting on the balls.</p> <p>Results</p> <p><i><u>In-seat behaviour:</u></i> improvements in sitting behaviour were evident for all participants when using therapy balls for seating</p> <p><i><u>Legible word productivity:</u></i> all three participants' legible word productivity was generally higher when seated on therapy balls</p> <p><i><u>Social Validity:</u></i> all three participants reported preferring balls to chairs for comfort, writing and productivity. The teacher's responses also supported the use of balls for classroom seating</p> <p>Conclusions: The use of therapy balls for classroom seating is one strategy that therapist in school system practice might consider when working with children with ADHD who are having difficulties meeting school expectations of staying on task and remaining seated.</p> |
| <p><u>Reviewer's Critical Appraisal</u></p> <p>Validity: <i><u>Strengths:</u></i> The use of two raters although not blinded but made independent observations. <i><u>Weaknesses:</u></i> Small sample chosen without randomization, no concurrent control group, short study duration, only one classroom. No statistical tests were used to analyze the data or to indicate whether or not the findings are significant.</p> <p>Importance of Results: All three students in the study demonstrated improvements in both in-seat behaviour and legible word productivity while using the therapy balls for chairs. Results are represented visually in graph form and no raw data or means are provided. Statistical analysis was not used.</p> <p>Implications for Practice / Applicability: Results provides relevant information to the clinical question and an important issue in occupational therapy of collaborating with teachers to develop strategies to improve behaviour and classroom performance of children with ADHD. The results from the study will likely influence future clinical decision making as the potential benefits have little or no harm and are of little cost to implement this intervention.</p> <p>Level Of Evidence: 4 (Oxford Centre for Evidence-based Medicine, 2001).</p> |

Table 5: Description and appraisal of case study by VandenBerg. N. 2001.

Purpose of the study: to measure on-task behaviour in 4 children with attention difficulties while wearing a weighted vest (deep pressure sensory input) while engaged in classroom fine motor activities using a quasi-experimental, single system AB design.

Intervention Investigated: The baseline phase (A) spanned six different days within a 15 day period during which on-task behaviour was measured in seconds during a 15 min activity, totaling six observations per child. The intervention phase (B) followed in which observations were also completed within 15 days. Intervention involved wearing a weighted vest calibrated at 5% of each child's body weight for a 15 min period during fine motor activities.

Outcomes Measures

On-task behaviours: mean number of minutes that each child was on task. On task behaviour was defined as engagement in those processes that were necessary to complete that activity assigned such as visual focus or reaching for required material.

Qualitative Information: informal interviews with classroom teachers and aides were conducted regarding the outcomes of using a weighted vest

Results: On task behaviour increased by 18% to 25% in all four students while wearing the weighted vest. Additionally, 3 out of the 4 students frequently asked to wear the vest other than during observation times. Statistically, using a 2 standard deviation band method, 3 out of 4 students demonstrated 2 consecutive data points more than 2 standard deviations above the mean difference indicating that a significant change ($p < 0.05$) occurred from baseline to intervention. Using a celeration line approach all 4 students met the criteria of the necessary number of data points falling above the celeration line to indicate significant change ($p < 0.05$) due to the intervention.

Conclusions: The use of a weighted vest as a means of applying deep pressure sensory input is practical and convenient for classroom use. Visual analysis indicated that all students demonstrated an increase in on-task behaviour when wearing the weighted vest. Two different methods of statistically analysis support the finding of significant benefit due to the intervention ($p < 0.05$).

Reviewer's Critical Appraisal

Validity: Strengths: Two methods of data analysis are used to combine the strengths of several methods while avoiding some of their limitations. Weaknesses: Small sample size, the use of an AB design vs. an ABA design limits the generalizability and increases any effects due to maturation and practice.

Importance of Results: Findings indicate a clinically significant increase in on-task behaviours at the $\alpha < 0.05$ level. Results suggest that the need for further inquiry and rigorous analysis to determine further effects of weighted vests and specific protocol design for optimal effects.

Implications for Practice / Applicability: The results suggests that the use of a weighted vest calibrated at 5% of a child's body weight for a 15-min period for sensory input is practical and convenient for classroom use during fine motor activities. The weighted vests are low cost and easy to transport, therefore a useful strategy in a clinical setting to increase on-task behaviour in children with ADHD. This study provides initial evidence relevant to the clinical question.

Level Of Evidence: 4 (Oxford Centre for Evidence-based Medicine, 2001).

REFERENCES

Articles critically appraised:

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Additional Related Articles:

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