“It’s a Sensory Thing…” Classroom Based Sensory Processing Intervention for Children with Autism

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What are we talking about?

- What do we mean by Sensory Processing?
- Research in Sensory Processing
- Our research with sensory processing in ASD
  - Method
  - Intervention
  - Results
  - Discussion
What is Sensory Processing?

**Sensory Processing: (lay terms)**
- Taking in information from all the senses and processing these effectively
- Taking in information from the right senses at the right time
- Using the information effectively in day to day activities

**Sensory Integration:**
“the neurological process that organises sensations from one’s own body and from the environment and makes it possible to use the body effectively within the environment.” (Ayers, 1972)

*Sensory Integration VS Sensory Processing*
The Seven Senses

Inside Senses
- movement and balance (vestibular)
- body awareness (proprioception)

Outside Senses
- touch (tactile)
- sound (auditory)
- sight (visual)
- smell
- taste
How common is it really?

- **70.5%** of those with ASD showed ‘definite differences’ on Short Sensory Profile (SSP) (Adamson, O’Hare & Graham, 2006)
- **84%** showed definite differences on SSP (Tomcheck & Dunn, 2007), compared with 3.2% of controls
- **95%** had definite or probable differences (Tomcheck & Dunn, 2007)
Sensory Processing in Autism

- Sensory differences are more prevalent in ASD than typically developing children or children with other types of developmental disabilities. (Tomchek & Dunn, 2007; Baranek et al 2007; Ben-Sasson et al, 2009; Boyd et al, 2010)

- Sensory differences vary between individuals with autism (Grandin, 2009)

- Greater severity of ASD correlated with greater severity of sensory difficulties (Adamson et al, 2006; Ben-Sasson et al, 2009)
Sensory Sub-Types in Autism

- ‘Hyper’ (over responsive), ‘Hypo’ (under responsive) (Dunn, 2014)
- Behavioural responses (seeking/avoiding) (Dunn, 2014)
- Over focused/pre-occupied/Inattentive (Liss, et al, 2006; Lane, et al, 2010)
- Links with specific modalities (taste/smell or movement) (Lane et al, 2011)
- Links with motor planning and praxis (Roley et al, 2015)
- Enhanced Perception- linked with weak central coherence account (Baron-Cohen et al, 2009)
Impact on Participation

- Sensory difficulties have been associated with emotional concerns (Baker et al, 2008).
- Hyper-responsive (over-responding) sensory style in Autism was correlated with repetitive behaviours and a tendency for sameness (Boyd et al, 2009), decreased participation in activities (Little, et al, 2015) and anxiety (Green & Ben-Sasson, 2010).
- Auditory filtering and under responsive/seeks sensation greatest impact on school functioning (Ashburner, Ziviani and Roger, 2008).
What do people with autism say?

- Choice to avoid certain situations because of sensory experiences
- “Integrated” nature of sensory processing (Kirby, et al 2015)
- Prefer sensations which are controlled and predictable (Ashburner, et al 2013)
- Meta-cognitive strategies- planning, focus, self talk
Is it Sensory or is it Behaviour?

- All sensory responses are behavioural
- What is the function of the behaviour?
- Some behaviours have multiple functions
What about intellectual disability?

- Children with ASD have ID up to 70% of the time, different needs to those with ASD alone (Matson & Goldin, 2013; Matson & Shoemaker, 2009)

- “Confounding variables”

- Need for an evidence base for children with Autism and ID with sensory processing difficulties
There is no single instrument which can comprehensively measure the range of sensory features in autism. (Schaaf & Lane, 2015)

Sensory Interventions are inconsistently defined. (Case-Smith et al, 2015)

...insubstantial treatment outcomes, weak experimental designs, or high risk of bias. ...insufficient evidence exists to support their use. (Barton et al, 2015)

...but what can we do to help these children?
So what did we do?
Background to the Research

Why is he doing that?

How can I help him to meet his sensory needs so he can learn?

Sensory based behaviour happens for a reason

Sensory activities or opportunities

The need for suitable replacement behaviours
Background

- Children with ASD, ID, autism specific special school in Sydney
- Pilot Study

**Research Question:** What is the impact of an In-Class Sensory Activity Schedule (SAS) on task mastery and cognitive strategy application children with autism?
## Meet the Participants  
*n=5, mean age= 6.6yrs*

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Diagnosis</th>
</tr>
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<tbody>
<tr>
<td>M</td>
<td>7 y 10 mo</td>
<td>Autistic Disorder, moderate intellectual disability, severe language delay</td>
</tr>
<tr>
<td>B</td>
<td>5 y 7 mo</td>
<td>Autism spectrum disorder, intellectual disability</td>
</tr>
<tr>
<td>L</td>
<td>6 y 3 mo</td>
<td>Autistic disorder, moderate intellectual disability</td>
</tr>
<tr>
<td>C</td>
<td>6 y 8 mo</td>
<td>Autistic disorder, moderate intellectual disability</td>
</tr>
<tr>
<td>A</td>
<td>6 y 9 mo</td>
<td>Autistic Disorder, moderate intellectual disability</td>
</tr>
</tbody>
</table>
Method

• Single System AB design: non-concurrent, repeated measures

<table>
<thead>
<tr>
<th>Phase A (Baseline)</th>
<th>Phase B (Intervention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best practice teaching for ASD</td>
<td>Best practice teaching for ASD +</td>
</tr>
<tr>
<td>(Curriculum, structure, routine,</td>
<td>Sensory Activity Schedule (SAS)</td>
</tr>
<tr>
<td>visual supports)</td>
<td></td>
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• Teacher designed desk work tasks were rated including cutting, sticking, put in tasks, puzzles and matching.

• Sampling of class task performance was videotaped by school staff
Assessment for Inclusion

**Informal Assessment:**
- Teacher report and classroom observation
- ‘Off task’ behaviour- sensory seeking- climbing on furniture/staff or sensory avoiding function- hiding from the group, frustrated, fixed in routine- quite upset with changes, difficulties transitioning

**Formal Assessment:**

Short Sensory Profile (McIntosh, Miller & Shyu, 1999) findings summary: All total scores showed definite difference
Intervention: Sensory Activity Schedule (SAS)

- Terminology should be clarified (QLD DET, 2011)
- Difficulties with sensory aspects of task performance
- Based on the ‘sensory diet’ (Wilbarger & Wilbarger, 1991)
- Brushing (Deep Pressure Proprioceptive Technique) was not used (Wilbarger & Wilbarger, 1991)
Sensory Activity Schedule (SAS)

- Administered by teacher’s aide and teacher.
- Morning session - after morning circle, before desk work.
- Used classroom based equipment
- 10-15 mins
## Example of Sensory Activities

**Movement activities while wearing tight lycra**

- Jumping on a mini-tramp and crashing into cushions

**Tactile activities**

- Squashing games with a bean bag
- Rolled over a therapy ball, bouncing on therapy ball
- Jumping on a mini tramp
Sensory Activity Schedule (SAS)
Key Components

Evidence of Need- assessment of sensory differences (formal and informal)

Use of Sensory Activities- deep touch, proprioception, vestibular, selected as they appeared to benefit the student

Task Specific- Activities were used before specific tasks to improve performance in those tasks.

Teacher Directed- Consultation- sensory activities and classroom tasks

Contextual Fit- Considers the child’s school environment
Outcome Measure:
PRPP System of Task Analysis

- Criterion referenced
- Four processing areas (Quadrants)
- Cognitive disorder-mismatch between task, person’s capacity, environment

Perceive, Recall, Plan, Perform (PRPP) System of Task Analysis (Chapparo & Ranka, 2011)
Data Collection Procedures

- Task performance was videotaped by school staff
- 125 videos were rated using PRPP Stage One and Two Analysis (55 Baseline and 70 Intervention)
- Videos were randomly ordered and scored by researchers
- PRPP Stage One and Two Analysis was completed
Data Analysis- PRPP Stage One

- Procedural task analysis for teacher designated desk work tasks in the classroom.
- Steps containing errors were recorded.
- Percentage of error free performance was calculated.

<table>
<thead>
<tr>
<th>PRPP Stage One Put in Task</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sit down</td>
<td></td>
</tr>
<tr>
<td>Take plastic bottle</td>
<td></td>
</tr>
<tr>
<td>Take bottle cap</td>
<td></td>
</tr>
<tr>
<td>Place in bottle</td>
<td>X</td>
</tr>
<tr>
<td>Put bottle in finish tray</td>
<td>X</td>
</tr>
</tbody>
</table>

**ERROR FREE- 5/7**

71.4%
Results - PRPP Stage One

Performance Mastery

Task Performances

Phase A - Baseline
Phase B - SAS Intervention

Percentage Score

p = 0.038, p < 0.05

Two band standard deviation method (Ottenbacher, 1986)
Performance Mastery

Phase A Baseline

Phase B SAS Intervention

p=0.01, p<0.05
Performance Mastery

Phase A Baseline vs Phase B SAS Intervention

p=0.502, p>0.05
Performance Mastery

Percentage Scores

Task Performances

Phase A  Phase B

p<0.001
A Performance Mastery

Phase A

Phase B

p=0.01, p<0.05
## Results Summary PRPP Stage One

<table>
<thead>
<tr>
<th>Child</th>
<th>Stage One Task Mastery Result</th>
<th>Statistics*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (A)</td>
<td>Intervention (B)</td>
</tr>
<tr>
<td>M</td>
<td>69.5%</td>
<td>82.64%</td>
</tr>
<tr>
<td>B</td>
<td>86.67%</td>
<td>95.88%</td>
</tr>
<tr>
<td>L</td>
<td>81.32%</td>
<td>84.39%</td>
</tr>
<tr>
<td>C</td>
<td>85.2%</td>
<td>98.18%</td>
</tr>
<tr>
<td>A</td>
<td>73.23%</td>
<td>85.24%</td>
</tr>
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*Mann Whitney U statistic  
** Significance at the 0.05 level, *** Significance at the 0.01 level
Discussion- PRPP Stage One

• 4 out of 5 showed improved task mastery following a classroom based SAS as measured by Stage One PRPP
• Why was intervention effective for 4 out of 5 children?
  • A targeted opportunity to meet a child’s sensory needs contributed to better self regulation prior to completion of work tasks in the classroom.
• L’s results were not significant- baseline not stable, trend lines showed improvements
• L needed a longer baseline
Outcome Measure:
PRPP System of Task Analysis
- Criterion referenced
- Four processing areas (Quadrants)
- Cognitive disorder-mismatch between task, person’s capacity, environment

Perceive, Recall, Plan, Perform (PRPP) System of Task Analysis (Chapparo & Ranka, 2011)
PRPP Stage Two

- Cognitive Task Analysis - How cognitive strategies were used

- The four quadrants are further divided into 12 Sub-Quadrants.

- Cognitive strategies are scored based on observation of task performance.
  ✓ 3- no errors and no assistance.
  ✓ 2- some prompting.
  ✓ 1- deficit or excessive prompting.

- Total sub-quadrant raw scores are converted to percentage scores.
Results- PRPP Stage Two
Sub-quadrant Analysis- PRPP

Significant Improvements in Recalling Facts (p=0.028):

“knowing what you need to know to do what you need to do”

A displayed more labelling during task performance. Recognition of tasks-spelling words

Recall
- Recall Facts
- Recall Schemes
- Recall Procedures
PRPP Recall Quadrant Scores

Phase A - baseline

Phase B - intervention
Results- PRPP Stage Two
Sub-quadrant Analysis

Significant improvements in Plan:

“coping with novel, complex and difficult situations, knowing the goal and keeping it in mind”

Plan- Mapping (p= 0.012), Programming (p= 0.017), Evaluating (p= 0.012)

Both M and B self correcting-matching task (evaluating), A- questioning when asked to spell out words.
PRPP Plan Quadrant Scores

PRPP Plan Quadrant Percentage Score

Phase A - baseline
Phase B - intervention

Task Performances
## Results

### PRPP Stage Two Quadrant Analysis

<table>
<thead>
<tr>
<th>PRPP Quadrant</th>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceive</td>
<td>Z=-1.68, p= 0.093</td>
</tr>
<tr>
<td>Recall**</td>
<td>Z=-2.521, p= 0.012**</td>
</tr>
<tr>
<td>Plan**</td>
<td>Z= -2.521, p= 0.012**</td>
</tr>
<tr>
<td>Perform</td>
<td>Z= -1.82, p= 0.069</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Z= -2.521, p= 0.012**</td>
</tr>
</tbody>
</table>

** Statistically significant differences between baseline and intervention

Wilcoxon signed ranks test
PRPP Stage Two: Improvements in Plan and Recall, but not Perceive

- Significant improvements in Plan (all sub-quadrants) and Recall (recalling facts).
- No Significant improvements in Perceive
- Perceive traditionally associated with sensory processing (Attending, sensing, discriminating)
- Discriminating is a strength for children with ASD
PRPP Stage Two Discussion

• Improved cognitive strategy application as measured by Stage Two PRPP
• Statistically significant improvement in planning and recall, not perceive or perform.
• We hypothesise:
  – Children didn’t get better at perceiving information,
  – they got better at using the information for task performance
Overall Discussion

- Benefits observed in specific sensory intervention
- Key components that make up SAS intervention
- Qualitative feedback from teachers confirmed statistical results

- PRPP is a suitable tool to use to measure task mastery and cognitive strategy use in context
- Small pilot study, many limitations
- Real life research
Where to Next?

- Randomised Control Trial (RCT)- in progress
- Seven autism specific schools
- Approximately 40 students and 30 teachers
- Sensory Activity Schedule intervention for least one school term (9 weeks)
- Quantitative and qualitative measures of occupational performance in the classroom
- Guidelines for practice
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References


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References


References


Start where you are.
Use what you have.
Do what you can.

Arthur Ashe

Questions…

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