

There is insufficient evidence (level 4) to support or refute sensory integration as an intervention to increase functional play behaviours and decrease non-engaged behaviours in pre-school children with autism

Prepared by; Melissa de Rooy (derooy131@hotmail.net.au)
4th year undergraduate occupational therapy student,
University of Western Sydney

Date: May 2004

Review date: May 2006

CLINICAL SCENARIO:

Sensory integration activities, involving suspended swings, trampolines, a variety of textured mediums and other equipment, are commonly used in paediatric practice with children with autism (or autism spectrum disorder). How effective is such a treatment approach in changing the behaviour of children with autism?

FOCUSSED CLINICAL QUESTION:

What is the evidence that sensory integration therapy elicits behavioural changes in children with autism (or autism spectrum disorder) compared to other/no therapy?

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

- 12 citations were located that met the inclusion/exclusion criteria.
- 2 single case series (level 4 evidence) studies and 10 descriptive/expert opinion (level 5 evidence) studies.
- One study (single case series) by Case-Smith and Bryan (1999) was appraised. This study evaluated the frequency of specific behaviours, elicited by five children with autism, before and after sensory integration therapy.
- The study found that four children decreased their frequency of non-engaged behaviours, and three children increased their frequency of mastery (functional) play behaviours. However due to the methodology of the study, results have little generalisability and external validity, and thus cannot provide conclusive evidence for sensory integration therapy with children with autism.

CLINICAL BOTTOM LINE:

There is currently insufficient evidence to support or refute sensory integration as an intervention to increase functional play behaviours and decrease non-engaged behaviours in pre-school children with autism. Current studies are of low level methodologies. More rigorous studies are required to support the use of sensory integration to elicit behavioural changes in children with autism.

Limitation of this CAT: This critically appraised paper has been individually prepared as part of a university subject, reviewed and marked by a lecturer, but has not been externally peer-reviewed.

SEARCH STRATEGY:

Terms used to guide Search Strategy:

- **P**atient/Client: autism, autistic disorder, autism spectrum disorder, pervasive developmental disorder
- **I**ntervention: sensory integration, therapy, intervention
- **C**omparison: other/no treatment
- **O**utcome(s): behavioural changes

Databases and sites searched	Search Terms	Limits used
Clinical Guideline Sites - National Health and Medical Research Council - NSW Health - Medical Journal of Australia - New Zealand Guidelines Group - Scottish Intercollegiate Guidelines Network - UK Guidelines - National Guidelines Clearing house	['autism' or 'autism spectrum disorder' or 'pervasive developmental disorder'] and ['sensory integration' or 'sensory intervention']	N/A
Systematic Review Sites Cochrane Library OTseeker PEDro Joanna Biggs Institute	['autism' or 'autism spectrum disorder' or 'autistic disorder' or 'pervasive developmental disorder'] and ['sensory integration']	N/A
General Databases CINAHL ERIC PsychINFO PsychARTICLES PubMed Medline	['autism' or 'autis*' or 'pervasive developmental disorder' or 'autism spectrum disorder' or 'autistic disorder'] and ['sensory integration' or 'sensory integrat*' or 'sensory integration intervention'] and ['behaviour' or 'behavior' or 'behavio*']	English & Peer Reviewed "" "" "" English & 1970+

INCLUSION and EXCLUSION CRITERIA

- Inclusion: *Studies published in English
*Studies that involved sensory integration intervention with children with autism.
*Studies that included behavioural changes as the outcome of intervention.
- Exclusion: *Guidelines/systematic reviews/studies that did not provide information to answer the clinical question
*Studies looking at Auditory Integration Training.
*Studies that involved sensory integration with children with conditions other than autism (or associated disorders).
*Studies published prior to 1970 & those published in journals that are not peer reviewed.

RESULTS OF SEARCH

12 relevant studies were located and categorised as shown in Table 1. The levels of evidence are based on those produced by the Oxford Centre for Evidence Based Medicine. (Phillips et al, 1998).

Table 1: Summary of Study Designs of Articles retrieved

Level of Evidence	Study Design/ Methodology of Articles Retrieved	Number Located	Source(s)
N/A	Clinical Guidelines	0	
Level 1a or 2a	Systematic Reviews	0	
Level 1b or 2b	Randomised Control Trials	0	
Level 3	Cohort Studies	0	
Level 4	Case series, single-subject	2	PsychINFO, CINAHL, Pubmed & Medline
Level 5	Descriptive, expert opinion	10	PsychINFO, CINAHL, ERIC, Pubmed & Medline

BEST EVIDENCE

The following article was identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting this paper were:

- Equal highest level of evidence methodology available to answer clinical question.
- Both level 4 studies used similar interventions and thus have a similar applicability to practice. The study by Case-Smith & Bryan (1999) had a greater number of participants (5 as opposed to 2) and so is hypothesised to have slightly more power. Additionally, the study by Linderman & Stewart (1999) reports a high chance of co-intervention bias.

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of a single case series design by Case-Smith and Bryan (1999).

Aim of the Study

To examine the effects of sensory-integrative occupational therapy with 5 preschool children with autism.

Intervention Investigated

Sensory integration-based occupational therapy consisting of *one-on-one treatment sessions* and *consultations to pre-school teachers*. *One-on-one treatment sessions* were approximately 30 minutes and occurred over the 10-week intervention phase (number of sessions per week not mentioned). Such treatment sessions included sensory integration activities specifically designed to meet the unique needs and goals of the child. These activities included vestibular stimulation using suspended swings & other equipment that provided linear movement, as well as tactile (brushing) and proprioceptive input to trunk and limbs applied at the beginning and end of sessions. The activities were 'playfully implemented', ranged from highly to loosely structured, and balanced activities that provided somatosensory input with those that addressed motor planning and generalisation of new skills.

Consultations to the preschool teachers included recommending sensorimotor activities and the use of classroom equipment that provided children with vestibular, tactile and proprioceptive input (Slides, beanbag chairs, rocking equipment, sensory [sand and water] table). The authors note such recommendations were routinely implemented, but frequency and duration were not stated.

Outcome Measures

Primary outcomes were: frequency of mastery (functional) play behaviours; frequency of nonengaged behaviours; frequency of adult interactions and frequency of peer interactions. These were measured with the Engagement Check (Parsons, et al, 1989 cited in Case-Smith & Bryan, 1999). Each participant was videotaped once a week for 10 minutes during a free play session. These video clips were then taped onto a master tape in a random order, which allowed for scoring without knowledge of the sequence of the clips. The clips were then rated using the Engagement Check, which gave the frequency of each of the four behaviours a score between 0 and 20. The authors of the study report the Engagement Check has evidence of validity and reliability but no figures are given. Additionally, the authors of the study evaluated interrater reliability by comparing two raters on 18 of the video clips. They achieved an interrater reliability of 0.9.

Table 2: Results

Subject	Baseline mean	Intervention mean	Mean Difference	P Value
<i>Mastery Play</i>				
A.C.	2.0	9.0	7.0	.025 *
T.D.	2.5	8.0	5.5	.206
J.F.	2.5	9.0	6.5	.13
J.M.	0	8.5	8.5	.011 *
J.S.	0	7.0	7.0	.003 *
All participants	1.4	8.3	6.9	Not given
<i>Nonengaged Behaviours</i>				
A.C.	4.33	1.0	3.33	.011 *
T.D.	7.5	3.43	4.07	.036 *
J.F.	3.75	3.0	0.75	.148
J.M.	8.0	2.8	5.2	.024 *
J.S.	4.7	1.3	3.4	.031 *
All participants	5.65	2.3	3.35	Not given
<i>Adult Interaction</i>				
A.C.	.33	5.82	5.49	.015 *
T.D.	0	3.71	3.71	.082
J.F.	0	1.33	1.33	.13
J.M.	1.33	2.5	1.17	.068
J.S.	.33	8.5	8.17	.146
All participants	.40	4.37	3.97	Not given
<i>Peer Interaction</i>				
A.C.	0	1.64	1.64	.146
T.D.	0	0	0	.50
J.F.	0	0	0	.50
J.M.	0	.5	.5	.256
J.S.	0	4.0	4.0	.469
All participants	0	1.23	1.23	Not given

Note: * indicates statistical significance

Original Authors' Conclusions

“Although the study method has limited external validity, the results support the beliefs of others regarding the potential behavioural changes that can occur in children with autism during intervention using a sensory integration approach” (Case-Smith & Bryan, 1999, p. 496, final paragraph).

Critical Appraisal:

Validity (*Methodology, rigour, selection, bias*)

- Due to the study method (single case series, 5 subjects) the external validity and generalisability of the study's findings are weak.
- There was no control group (and therefore no random allocation), and thus no comparisons could be made between subjects receiving intervention and those receiving different/no intervention. This reduces the certainty that observed changes are due to the experimental intervention.
- Subjects serve as their own control (comparing baseline to intervention) however it is difficult to conclude observed differences result from treatment alone as other factors may change over time (eg. speech).
- Reason subjects were selected not given, therefore possibility of selection bias cannot be ruled out.
- The evaluator was not independent (being an author of the study) which could lead to a measurement bias, likely to favour the finding of a significant change.
- There is also the potential for intervention bias, with co-interventions such as physiotherapy/speech therapy/medications not addressed. Such co-interventions could favour the finding of a significant change.
- For a number of the outcome measures, subjects did not show a stable baseline before intervention was initiated. This reduces the certainty that observed changes are due to the experimental intervention.
- Small sample size reduces power of study, no power calculations reported.
- Intervention consisted of two parts – one-on-one sessions and teacher consultation - , therefore one is unable to conclude which (or both) intervention elicited change.
- Outcome measure used is a published measure, it quantified behaviour, however whilst reliability and validity are reported to be established, specific figures not given. If a tool does not have validity and reliability it reduces the validity of the study's findings.

Results (*Favourable or unfavourable, specific outcomes of interest, size of treatment effect, statistical and clinical significance; minimal clinically important difference*)

- When baseline and intervention means were compared for each individual subject, four showed a statistically significant decrease in frequency of nonengaged behaviours ($p = .011, .036, .024, .031$); three showed a statistically significant increase in frequency of mastery play behaviours ($p = .025, .011, .003$); one showed a statistically significant increase in frequency of adult interactions ($p = .015$) but no subjects showed a statistically significant increase in frequency of peer interactions. Group means and statistical significance of group changes were not reported
- Clinical significance of results was not addressed, nor was a minimal clinically important difference recommended. One hypothesises that a minimal clinically important difference would be a change of 10% of the total score of the outcome measure, that is, a change of 2 for each behaviour as their frequency is ranked out of 20. Going by this estimation, all five participants showed a clinically significant change in frequency of mastery play behaviours, four in frequency of nonengaged behaviours, three in adult interactions, and one in peer interactions. The mean difference for the group as a whole is clinically significant for all except peer interactions.
- Authors did not calculate confidence intervals and standard deviations are not given, therefore cannot be calculated (reading data off line graphs could be inaccurate).
- No information on program costs provided.

IMPLICATIONS FOR PRACTICE/ APPLICABILITY

According to the levels of evidence published by the Oxford Centre for Evidenced-Based Medicine (1998), this study provides level 4 evidence, which is insufficient to conclude for or against sensory integration as an intervention to elicit behavioural changes in children with autism.

The intervention activities differed somewhat for each subject as activities were designed to meet the specific needs of the child. Whilst some examples of the activities are given, it would be difficult for a therapist to replicate such activities in practice without further knowledge of sensory integration activities, and how to select activities that will fulfil the needs of their client. Additionally, their client's needs may be different to those addressed in the study, and thus the study may not be valid in supporting such therapy. In order to replicate the activities in practice the therapist would also need access to the specific sensory integrative equipment (eg. suspended swings, tactile brushes).

Due to the study methodology, this study has limited generalisability and external validity and so it is not recommended that therapists base their interventions on this study alone. However, in the absence of higher level evidence, therapists should acknowledge an awareness of this study (and that it is the highest level evidence available to date) when making clinical decisions about to the use of sensory integration with children with autism to elicit behavioural changes.

If a therapist is seeking an outcome measure that quantifies behaviour, they may consider the Engagement Check used in this study. However it is recommended that they gain further information on its validity, reliability and standardisation before implementing it in practice.

REFERENCES

Phillips, B., Ball, C., Sackett, D., Badenoch, D., Straus, S., Haynes, B., Dawes, M. (1998). Levels of evidence and grades of recommendations. <http://cebm.jr2.ox.ac.uk/docs/levels.html>. Accessed May 2001.

Article critically appraised:

1. Case-Smith, J., & Bryan, T. (1999). The effects of occupational therapy with sensory integration emphasis on preschool-age children with autism. *American Journal of Occupational Therapy*, 53(5), 489-497.

Related Articles (not individually appraised)

Level 4 Evidence

1. Linderman, T.M., & Stewart, K.B. (1999). Sensory integrative-based occupational therapy and functional outcomes in young children with pervasive developmental disorders: A single-subject study. *American Journal of Occupational Therapy*, 53(2), 207-213.

Level 5 Evidence

1. Baranek, G.T. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal of Autism and Developmental Disorders*, 32(5), 397-422.

2. Case-Smith, J., & Miller, H. (1999). Occupational therapy with children with pervasive developmental disorders. *American Journal of Occupational Therapy*, 53(5), 506-513.
3. Cook, D.G. (1990). A sensory approach to the treatment and management of children with autism. *Focus on Autistic Behaviour*, 5(6), 1-19.
4. Dempsey, I., & Foreman, P. (2001). A review of educational approaches for individuals with autism. *International Journal of Disability, Development and Education*, 48(1), 103-116.
5. Ferraro, F.R. (2001). Survey of treatments for childhood autism. *Psychology and Education: An interdisciplinary Journal*, 38(2), 29-41.
6. Gerardot, J.M., & Dossett, R. (1977). Autism: An approach to learning. *Physical Therapy*, 57(7), 814-820.
7. Gresham, F.M., Beebe-Frankenberger, M.E., & MacMillan, D.L. (1999). A selective review of treatments for children with autism: Description and methodological considerations. *School Psychology Review*, 28(4), 559-575.
8. King, L.J. (1987). A sensory-integrative approach to the education of the autistic child. *Occupational Therapy in Health Care*, 4(2), 77-85.
9. Larrington, G.G. (1987). A sensory integration based program with a severely retarded/autistic teenager: An occupational therapy case report. *Occupational Therapy in Health Care*, 4(2), 101-117.
10. Walting, R. (1999). Current practice of occupational therapy for children with autism. *American Journal of Occupational Therapy*, 53(5), 498-505.
