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What is the evidence of the use and effectiveness of sensory integration theory with adults who have chronic mental illness?

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What is the evidence of the use and effectiveness of sensory integration theory with adults who have chronic mental illness?

Prepared by;  
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Date:  
November 30, 2009

CLINICAL SCENARIO: Sensory integration (SI) theory and intervention techniques were developed by Jean Ayers, PhD, OTR in the late 1960s. SI provides a framework of the impact of sensation on occupational performance on how one synthesizes, organizes, and processes incoming sensory information. Ayers work was developed in mind for a pediatric population. However, it is suspected that sensory processing disorders do not end in childhood or adolescence and can continue into adulthood; these adults lack treatment for their sensory needs. Little research exists on the use of SI theory and treatment with adults, often many of them showing symptoms of mental illness, yet many practitioners in the field are using this approach with their clients. Another problem in the research is that there is a lack of specificity in treatment approaches between which sensory processing model is being discussed in the sensory integration realm. Clinical anecdotal evidence shows there to be a relationship between sensory defensiveness (SD) and adults who have a mental illness; such as anxiety and depression. SD is defined as a negative reaction to certain sensory inputs which would not normally be interpreted as aversive (Wilbarger & Wilbarger, 1991; as cited in Pfeiffer & Kinnealey, 2003) that is a behavioral manifestation of over-responsively, a sensory modulation dysfunction. Clinically, therapists say that SD is thought to affect 15% of the population (Kinnealey, Oliver, & Wilbarger, 1994). Therapists report those with SD may have lower thresholds for sensory stimuli that typically lead to heightened responses with less habituation. This, in turn, may lead to behaviors associated with sensory sensitivity such as fearfulness, cautiousness, or sensory avoiding. Adults often take on avoidance as a coping mechanism with SD (Pfeiffer & Kinnealey, 2003). Adults who display symptoms of sensory integration disorders or SD can affect their lives in negative ways, such as their interpersonal relationships, earning a living, and social participation. Anxiety is a common symptom of many mental illnesses adults present with, including anxiety disorders, depression, post traumatic stress disorder (PTSD) and repercussions of trauma and abuse. This CAT explores the evidence of sensory integration in the adult population with mental illness and its effects of their recovery.

FOCUSED CLINICAL QUESTION: Is a sensory integration approach effective at decreasing symptoms in adults with chronic mental illness?

SUMMARY of Search, ‘Best’ Evidence’ appraised, and Key Findings:

- 6 articles were located which addressed the focused clinical question.  
- The before and after design by Pfeiffer & Kinnealey (2003) was deemed the “best” evidence and appraised further on in this CAT.  
- Kinnealey & Fuiek (1999) found a statistical difference that adults with sensory defensiveness had more symptoms of anxiety, depression, and mal adaptation than
those adults without sensory defensiveness, pain was not found in both groups to be significant.  Although sample sizes were small and effect sizes could be considered weak.

- Brown, Tollefson, Dunn, Cromwell, & Filion (2001) examined the parametrics of the Adult Sensory Profile (ASP), an assessment based on 4 patterns of Dunn’s model of sensory processing. The ASP is statistically significant (p< .05), reliable, and valid testing sensory seeking, sensory sensitivity, sensation avoiding, and low registration of stimuli.
- A qualitative study by Moore & Henry (2002) looked at the effects of using the Wilbarger protocol and a sensory diet with adult women with trauma history, dissociation, and self injurious behaviors. They found some positive influences on SD symptoms, but had a small sample size of 3.
- Another qualitative study by Kinnealey, Oliver & Wilbarger (1994) looked at adults with sensory defensiveness to develop a conceptual framework for further study of the topic. Tactile defensiveness was seen in all 5 participants and coping strategies were helpful for adults to overcome daily challenges of SD.
- A recent article in OT Practice magazine (May-Benson, 2009) identified adults with sensory processing problems to instate a program of intervention. This article compares adults having similar symptoms of sensory processing problems of children, lists assessments and interventions to use in the clinic and home with adults experiencing sensory processing problems. They reported their adult program to have positive outcomes and improved mental health through decreased stress and anxiety with increased interpersonal relationships. Yet a deeper look into their references shows little evidence for their claims.
- However, all articles were methodically flawed and there was not much evidence to review.

CLINICAL BOTTOM LINE: The results of this evidence based-literature review indicate that there may be a relationship between adults and sensory defensiveness, but the proper action of treatment in unknown. Sensory integration intervention lacks evidence of effectiveness with the adult population and consequently therapists should use caution when implementing this approach with clients as current research shows it to be inconclusive at this time.

Limitation of this CAT: The writer of this CAT is a novice practitioner and not an expert in the topic. In addition, this is not an exhaustive literature review on the topic. This critically appraised topic has not been peer-reviewed by one other independent person.

SEARCH STRATEGY:

Terms used to guide Search Strategy:

- Patient/Client Group: Adults with chronic mental illness; such as depression, anxiety disorders, & PTSD.

- Intervention (or Assessment): Sensory integration approach.
- **Comparison:** No treatment or other treatment versus sensory approach.

- **Outcome(s):** Decreased symptoms of mental illness in order to live a functional life.

<table>
<thead>
<tr>
<th>Databases and sites searched</th>
<th>Search Terms</th>
<th>Limits used</th>
</tr>
</thead>
</table>
 “Relationship between sensory defensiveness, anxiety, depression and perception of pain in adults” | None          |
| AJOT                                                              | “Adult sensory profile: measuring patterns of sensory processing”  
 “A phenomenological study of sensory defensiveness in adults” |               |
| Google Scholar                                                    | Oliver, B. Author SI newsletter  
 [Treatment of sensory defensiveness in adults] |               |
| Ovid Database                                                     | Sensory Integration  
 Sensory Modulation  
 Sensory Processing  
 Adults  
 Mental Illness  
 Mental Health  
 Psychiatric  
 Psychological |               |

**INCLUSION and EXCLUSION CRITERIA**

- **Inclusion:** Individuals diagnosed with a mental illness, use of sensory integration theory or treatment techniques. Non-peer reviewed articles and all potential articles were included.
- **Exclusion:** Children & adolescence population. Treatments other than sensory integration. Conditions other than mental illness.
RESULTS OF SEARCH

6 relevant studies were located and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998)

Table 1: Summary of Study Designs of Articles retrieved

<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-analysis, randomized controlled trials</td>
<td>I</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Two groups, nonrandomized studies (e.g. cohort, case control)</td>
<td>II</td>
<td>2</td>
<td>Kinnealey &amp; Fuiek (1999) Brown et al. (2001)</td>
</tr>
<tr>
<td>One group, non randomized (e.g. before &amp; after, pre-post test)</td>
<td>III</td>
<td>1</td>
<td>Pfeiffer &amp; Kinnealey (2003)</td>
</tr>
<tr>
<td>Descriptive studies that include analysis of outcomes (e.g. single subject design, case series)</td>
<td>IV</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Case reports and expert opinion, which include narrative literature reviews and consensus statements</td>
<td>V</td>
<td>1</td>
<td>May-Benson (2009) [OT Practice article]</td>
</tr>
</tbody>
</table>

BEST EVIDENCE

The following study/paper was identified as the ‘best’ evidence and selected for critical appraisal. Reasons for selecting this study were:

- This study is recent and has the strongest study design of the articles found.
- This study focuses on adults with sensory defensiveness, which is directly related to the clinical question, and eliminates participants with co-occurring disorders that may skew the results of sensory defensiveness treatment due to any co-morbidity.
- This study examines the link between anxiety, which many clients who experience mental illness display, and sensory defensiveness; by examining if a sensory defensiveness treatment is effective at remediating these traits of anxiety and sensory defensiveness.

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of Treatment of Sensory Defensiveness in Adults by Pfeiffer & Kinnealey, 2003.
Aim/Objective of the Study/Systematic Review: The purpose of this before and after study was to explore the relationship between sensory defensiveness and anxiety to determine if treatment of sensory defensiveness reduces both sensory defensiveness and anxiety. Researchers hypothesized that if sensory integration treatment could reduce the effects of sensory defensiveness and anxiety, it would allow individuals to function more effectively within their environment for an improved quality of life.

Study Design: Researchers used a quasi-experimental pilot study design to measure before and after effects of treatment. Participants were pre-tested to determine their baseline and then participants implemented a self-treatment program for one month, after which they were re-tested. Researchers attempted to eliminate bias by using multiple measures to collect data, as well as many researchers. Contamination or co-intervention was not prevented in this study.

Setting: Interventions took place in participants home and a small private OT clinic in north east America.

Participants: A convenient sample of 14 females and 1 male volunteers between the ages of 26-46 years, N=15 participated in the study. Participants had a mean age of 36 years and were identified as professionals. Articles were printed in a newspaper targeted at occupational therapists treating those with sensory defensiveness and fliers were posted in clinics; most subjects were self-referred due to these recruiting methods. In order to participate in the study, participants had to meet inclusion criteria of: 1) between the ages of 20 and 60; 2) have no history of sexual or physical abuse; 3) have no clinically diagnoses psychopathology or medical condition; 4) normal intelligence; and finally 5) be self-identified as having sensory defensiveness in one or more sensory system. All participants were screened with the Adult Sensory Questionnaire (ASQ); with a score of 9 or more they were also given the Adult Sensory Interview (ADULT-SI) to deem if there was for sure sensory defensiveness to be included in the study.

Intervention Investigated:

Control: N/A for this study.

Experimental: The focus of the intervention for the group was to decrease sensory defensiveness and anxiety. Researchers and evaluators were all graduate OT students completing their Master’s thesis, had training in SI theory and treatment, and completed a one day training session on the study protocol. Treatment protocol was developed based on 1) patient insight into sensory defensiveness, 2) regular and daily sensory input, and 3) engaging in physical activities of the patient’s choice which provided tactile, vestibular and Proprioceptive input. See table below for equipment and its sensory properties.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Sensory Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy ball</td>
<td>Proprioception &amp; vestibular</td>
</tr>
<tr>
<td>Rocking chair</td>
<td>Vestibular</td>
</tr>
<tr>
<td>Brush</td>
<td>Deep pressure touch</td>
</tr>
<tr>
<td>Air pillow</td>
<td>Ventral deep pressure touch &amp; vestibular</td>
</tr>
<tr>
<td>Trampoline</td>
<td>Proprioception &amp; vestibular</td>
</tr>
<tr>
<td>Platform swing</td>
<td>Vestibular</td>
</tr>
<tr>
<td>Morfam vibrator</td>
<td>Deep pressure touch and vibration</td>
</tr>
<tr>
<td>Floor mat</td>
<td>Deep pressure touch</td>
</tr>
</tbody>
</table>

Intervention and self-treatment techniques were explored for each to create their sensory diet (activities providing regulated sensory input into the nervous system to incorporate into daily routine). Participants described how each piece of equipment made them feel and ranked it...
from 1 to 10, 1 being negative and 10 being very positive. Participants kept a log of their daily activities and reactions. Participants were contacted weekly by phone and interviewed and adjustments made if necessary. Participants had four weeks of self treatment, and then completed the Beck Anxiety Inventory (BAI) and another Adult Sensory Interview (ADULT-SI).

**Outcome Measures:** Researchers were looking for outcome measures of correlations of anxiety and sensory defensiveness. Participants were screened by the researchers using the Adult Sensory Questionnaire (ASQ) and the ADULT-SI, participants were pre-tested and re-tested one month post intervention of their self-treatment program. Measures used in this study are described below:

- **ASQ:** consists of 26 true/false items to screen for sensory defensiveness in adults; this is a self-administer questionnaire. A score of 10 or more indicates sensory defensiveness.
- **ADULT-SI:** measures sensory defensiveness in adults using 82 semi-structured items in an open ended format to elicit information on one’s perceptions and responses to various sensory stimulation. Scores range from 0-82, each with a score of 1 (defensive) or 0 (non-defensive). This assessment is shown to be reliable.
- **BAI:** assesses subjective, somatic of pain-related symptoms of anxiety with 21 items that is self-administered (administration ~15 minutes) for those 17-80 years old. Scores are classified as minimal, mild, moderate, or severe levels of anxiety. This assessment is shown to be both reliable and valid.

**Interviews:** researchers looked at life patterns regarding sensory defensiveness and coping skills the participants had during individual interviews. This provided an opportunity for participant education on sensory defensiveness and how it may influence their lives.

**Sensory Diet:** participants were given materials providing sensory inputs to be used in treatment see table above for details.

**Main Findings:** There was a positive relationship between sensory defensiveness and anxiety (p= .027). As shown in the table below from Pfeiffer & Kinnealey, there was a significant difference (p= .048) in scores on the ADULT-SI pre-test and post-test mean scores. There was also a significant difference (p= .048) between pre-test and post-test scores on the BAI.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADULT-SI Pre-test</td>
<td>37.53</td>
<td>12.22</td>
<td>2.17</td>
<td>0.048</td>
</tr>
<tr>
<td>ADULT-SI Post-test</td>
<td>33.00</td>
<td>9.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI Pre-test</td>
<td>10.93</td>
<td>10.75</td>
<td>2.20</td>
<td>0.0453</td>
</tr>
<tr>
<td>BAI Post-test</td>
<td>6.93</td>
<td>6.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Original Authors’ Conclusions:** Question one that examined the relationship of SD and anxiety found a positive relationship, which supports previous research that individuals who experience sensory defensiveness have higher levels of anxiety. Question two of examining the difference in scores on the ADULT-SI following self-treatment of SD was found to have a statistical difference pre-test and post-test. Question three examined the amount of anxiety as a result of self-treatment of SD in adults, finding statistically differences between scores showing mean anxiety levels were reduced from a moderate/mild to minimal post treatment (p. 181-182).
Critical Appraisal

Validity: The calculated score on the PEDro scale for this study was 4/11 total. Eligibility criteria were specified and ethical considerations. Results from this study may not generalize to other populations other than sensory defensiveness. There was no mention of blinding participants. Contamination or co-intervention was not prevented in this study. There was no blinding of assessors; however researchers attempted to eliminate bias by using multiple measurements as well as many different researchers. Limitations of the study include a small, convenient sample size and a lack of control group. Treatment effect was not calculated by the researchers, the author of this CAT calculated the treatment effect.

Interpretation of Results: The study was statistically significant with a medium effect size (d=.463) of reducing anxiety as a result of self-treatment of SD and a small effect size (d=.417) for scores on the ADULT-SI following self-treatment by adults. This study further supports clinical observations by Ayers and other studies of sensory defensiveness that correlate as having higher levels of anxiety. The study shows the importance of client education and self-treatment/home programs for the success of remediating symptoms of sensory issues. This study also provided an availability of assessments to use with adults who are experiencing sensory integration problems.

Summary/Conclusion: This study supported the hypothesis that there is a significant relationship between sensory defensiveness and anxiety. This connection has been shown to have high social emotional costs and may limit occupational performance, poor coping skills and avoidance in activities. In addition, in OT practice it is important to be aware that sensory integration issues can affect more people than just children and may negatively interfere with one’s ability to functionally live one’s life.

Table 3: Characteristics of included studies

| Study 1: Brown, Tollefson, Dunn, Cromwell, & Filion (2001) | Intervention investigated: The focus of this study was to provide the reliability and validity of the Adult Sensory Profile (ASP). The intervention was a revision of the ASP, in order for more measures to be used with the adult population with sensory processing issues. The ASP was administered once to a group of adults.  
Comparison intervention: None  
Outcomes used: Final revisions were made to the ASP based on the previous reliability and validity tests to look at sensory sensitivity, sensation seeking, sensation avoiding, and low registration based off of Dunn’s Sensory Processing theory.  
Findings: The ASP is an assessment that could be given in OT practice that is shown to be both reliable and valid for those with sensory processing issues. The ASP can also give insight into personal behavior, responses to different environments, increase understanding for families, friends, co-workers, etc., regarding one’s behaviors and response to stimuli, and explain areas of conflict when having sensory preferences. |
The OT can provide more effective interventions being aware of the problem areas and may enhance decision-making process, and adopting coping strategies for adverse environments.

| Study 2: Kinnealey & Fuie (1999) | Intervention investigated: The focus of the intervention was on adults with or without SD and any related symptoms of anxiety, depression and/or pain. Various assessments were given to both groups of participants (SD and non SD) and results of all assessments were compared between groups. Assessments were conducted once by the researcher (with whom no details are given in the article). These are assessments that could be replicated in OT practice setting, all are standardized.  
Comparison intervention: Those without SD, given the same assessments.  
Outcomes used: Anxiety, depression, pain perception, & SD— all of which can interfere with all areas of occupation by using the following:  
1. Counselling Evaluation Test  
2. Adult Sensory Interview (ADULT-SI)  
3. Institute for Personality and Ability Testing Anxiety Scale (IPAT Anxiety)  
4. IPAT Depression Scale  
5. Pain Apperception Test  
Findings: There is a statistical difference (.005 - .05) between SD and non SD groups for maladjustment, anxiety, and depression. No differences were found with pain perception. |
Comparison intervention: None  
Outcomes used: Interviews, Sensory Defensiveness Screening for Adults (SDSA), client education, use of the Wilbarger brushing protocol and sensory diet.  
Findings: No direct causal connections can be made between sensory treatment and functional gains made by all 3 participants. Further research on the relationship between dissociation and sensory treatment is warranted. Appears that response to treatment develops over time, this is consistent with the Wilbarger Protocol research as well. There is an unclear benefit if negative symptoms were remediated by the brushing itself, sensory diet, educational component focused on understanding and monitoring one's sensory experiences or the support of the provider. |
| Study 4: Kinnealey, Oliver, & Wilbarger (1994) | Intervention investigated: Phenomenological qualitative measures looked at adults across the lifespan with sensory defensiveness; as well as to develop a conceptual framework for future study.  
Comparison intervention: None  
Outcomes used: Adult Sensory History Interview  
Findings: Tactile defensiveness was identified by all 5 participants; oral defensiveness seemed to be more related to tactile sensation than gustation. Vestibular, visual, and olfactory defensiveness described, vestibular was identified in 3 of the 5 adults was most apt to influence |
activity choices. Coping strategies are helpful to adults experiencing sensory defensiveness and can with day to day survival, but does not diminish their defensiveness. Feelings of unpleasantness and coping strategies seem to be time and energy consuming and emotionally exhausting; and can interfere with the quality and quantity of interpersonal experiences with others. Strategies of avoidance, counteraction, and confrontation influenced their choices of activities. Strategies of predictability, mental preparation, and talking through seemed to strongly influence the degree of spontaneity one allowed oneself in personal and interpersonal activities. The conceptual framework seeks to enhance further understanding and guide further research in the area of sensory defensiveness.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Comparison intervention: None</td>
<td><strong>Outcomes used:</strong> Treatment approaches such as sensory diets, environmental modifications, and remedial activities to promote changes to the nervous system. Stages of preparatory, sensory and integrative, and praxis activities were used.</td>
</tr>
<tr>
<td>Findings: The researchers program of activities with adults was reported to have positive outcomes that included a general decrease in defensiveness to auditory input, touch, and movement, as well as improved health through decreased stress and anxiety with increased interpersonal skills.</td>
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</tr>
</tbody>
</table>

**IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH**

- Mental health occupational therapists are increasingly applying sensory integration theory in mental health settings in America. However, there needs to be further exploration of sensory integration validity in the mental health realm for those with psychiatric conditions. In addition, there is confusion in the terminology of sensory interventions and SI treatments. Researchers need to distinguish between sensory processing disorder (the umbrella term) and sensory modulation (Beins, 2009). Researchers need to choose whether they will use a more traditional Ayres SI model and use those categories versus other proposed models. In addition, practitioners must be trained in sensory integration, if they claim to use Ayres SI approach.

- Training in the SI approach using Ayres SI approach is warranted to ensure fidelity.

- Ayers’s sensory integration theory and treatment was never meant to be used with adults, yet researchers quote her with links to the adult population, as seen in the OT Practice magazine. The article states, “Adults with sensory processing problems present with the same patterns of sensory integrative dysfunction as children. They tend to seek professional intervention when they are so overwhelmed by some aspect of defensiveness, or they are experiencing significant problems in mental health or occupational performance” (May-Benson, 2009, p. 15). It is suggested that clients are seen five times per week, for five weeks of treatment for the most effective outcomes. The article does a good job of listing assessments appropriate for testing the adult population as well as a list of suggested interventions based on Ayer’s
sensory integration. Yet, the same problems persist with a pediatric population: treatment is intensive and varied results are seen. Again, practitioners must be cautious because the article is suggesting the treatment method as a standard of care for those with sensory processing disorders; when in reality there is little evidence to support this.

- A positive relationship between SD and anxiety was found, supporting Ayers work, by Pfeiffer & Kinnealey (2003), Kinnealey & Fuiek (1999), and May-Benson (2009), overall there was a positive effect of decreasing anxiety with SD treatment. Anxiety is a common symptom of many mental illnesses adults present with, including anxiety disorders, depression, post traumatic stress disorder (PTSD) and repercussions of trauma and abuse.

- May-Benson (2009) argues that there are few standardized assessments for the adult population, and that many adults find these tests threatening and challenging. The article lists several assessments to test for developmental/sensory histories, including the Adult Sensory Profile that Brown, Tollefson, Dunn, Cromwell, & Filion (2001) examined in their article stating it to be reliable and valid to use with the adult population experiencing sensory defensiveness. In addition May-Benson lists several assessments in the motor skills, sensory and clinical observation categories for clinicians to note.

- Interviews and client education play a major role in understanding and ensuring success with treatments, as seen in Moore & Henry (2002), Kinnealey & Fuiek (1999), and Kinnealey, Oliver, & Wilbarger (1994).

- Adults with SD present themselves in a variety of ways and severities in various sensory areas such as vestibular/motor, visual, olfactory, tactile, and auditory; all of which could potentially impact multiple areas of occupation. A sensory approach may be helpful in remediating the negative symptoms that interfere with daily life. Identifying coping strategies may also be helpful for adult clients with SD to manage their life (Kinnealey, Oliver, Wilbarger 1994).

- SI can have a calming effect for is clients, many adults with mental illness are overwhelmed by external and internal stimuli and often have a challenging time regulating control over their body and/or mind by feeling hopeless, confused. A SI approach may provide a self-soothing regulation that is a medication-free approach to reduce negative symptoms of mental illness. In addition, it is important to establish healthy habits for clients to aid them in challenging times for optimal success.

- From the results of this CAT, it can be seen that the results concerning the clinical effectiveness of using sensory integration therapy are inconclusive. Although, there shows to be a small effect for some clients, there is a general lack of research using a sensory integration approach with the adult population, specifically with those who have a mental illness.

- There is a need for further research into sensory integration therapy with adults with mental illness; studies with larger sample size and control groups compared with the standard of care treatment with adults with mental illness.
REFERENCES


