Bridging neuroscience, function & intervention: A scoping review of sensory processing & mental illness

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Overview

1. Methods
2. Findings
    1. Atypical sensory processing in adults with serious mental illness
    2. Gap in the literature
3. Implications for occupational therapy interventions

Methods

Search Terms

"sensory" AND "mental health"

Databases Searched

PsycINFO

PubMed

CINAHL Plus

OTseeker

Cochrane Library

Records Identified Through Search

PsycINFO (*n* = 2,488)

PubMed (*n* = 1,752)

CINAHL Plus (*n* = 142)

OTseeker (*n* = 6)

Cochrane Library (*n* = 2)

Abstracts screened

Records Excluded (*n* = 4,189)

- Lack of relevance to research question
- Exclusion criteria
- Duplicate references

Studies Retained (*n* = 201)

Full text assessed for eligibility

Studies Excluded (*n* = 52)

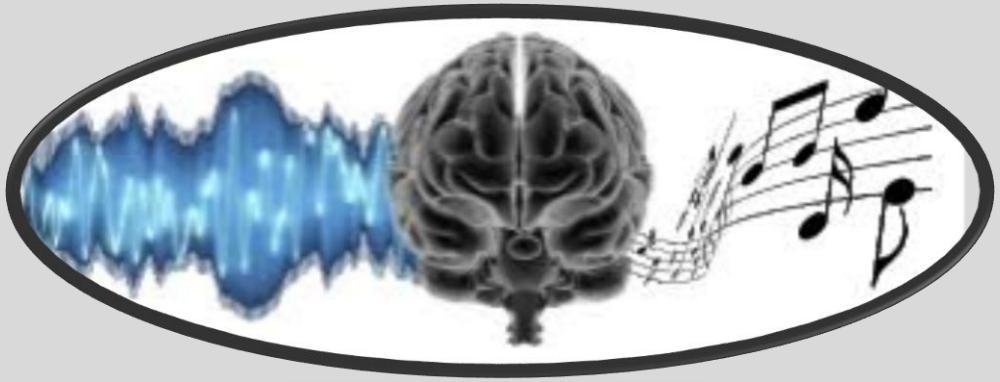
- Lack of relevance to research question
- Exclusion criteria

Studies Included in Final Review (*n* = 149)

Exclusion criteria

- Research on animals, children, older adults, chronic pain, somatoform disorder, ASD, People who are deaf/blind
- Literature from non peer-reviewed journals

Sensory Deficits Auditory



- Sensory Gating
  - P50 (norm is 80-90% reduction - for SMI it is only 10-20% reduction)
  - Habituate to auditory stimuli to remain vigilant for new stimulus
  - **Difficulty filtering out extraneous information**

- Mismatch Negativity
  - Recognizing acoustic irregularity within a predictable pattern of stimuli
  - Related to affective prosody – reading tone
  - **Deficits increase likelihood of missing information**

Sensory Deficits - Visual

- Dimmer perception of world
- Difficulty with
  - contrast (Kantrowitz, Butler, Schecter, Silipo, & Javitt, 2009)
  - tracking slow-moving objects (saccades) (Tien, Ross, Pearlson, & Strauss, 1996)
  - maintaining a steady gaze (Benson et al., 2012)
- Diminished neural response to low-frequency targets (Martınez et al., 2012)
- Atypical scanning during free scan tests (Benson et al., 2012)
- Bias towards negative visual stimuli (depression) (Victor et al., 2012)

Other Forms of Atypical Sensory Processing

Olfactory

- Deficits in smell identification (Gill et al., 2014)

Proprioceptive

- Link to disorders of self-awareness (Arnfred et al., 2015)

Sensory processing patterns

Adults with OCD

- Higher scores on low registration, sensory sensitivity, & sensation avoiding
- Lower on sensation seeking
  - (Rieke & Anderson, 2009)

Adults with Schizophrenia

- Higher scores on sensation avoiding & low registration
- Lower scores on sensation seeking
  - (Brown, Cromwell, Filion, Dunn, & Tollefson, 2002)

Adults with Bipolar Disorder

- Higher on sensation avoiding
- Adult tend to miss information & avoid environments with particular sensory qualities
  - (Brown, Cromwell, Filion, Dunn, & Tollefson, 2002)

Adults with a major affective disorder

- 2x more likely to experience atypical sensory sensitivity, sensation avoiding, & low registration
- 5x more likely to experience lower sensation seeking
  - (Engel-Yeger et al., 2016)

Sensory processing patterns

Adults with schizophrenia

- Sensory modulation dysfunction
- Underresponsiveness
- Low satisfaction with activity performance
- Low frequency of activity participation
- NO significant correlation between sensory modulation & participation
  - (Lipskaya-Velikovsky, Bar-Shalita, & Bart; 2015)

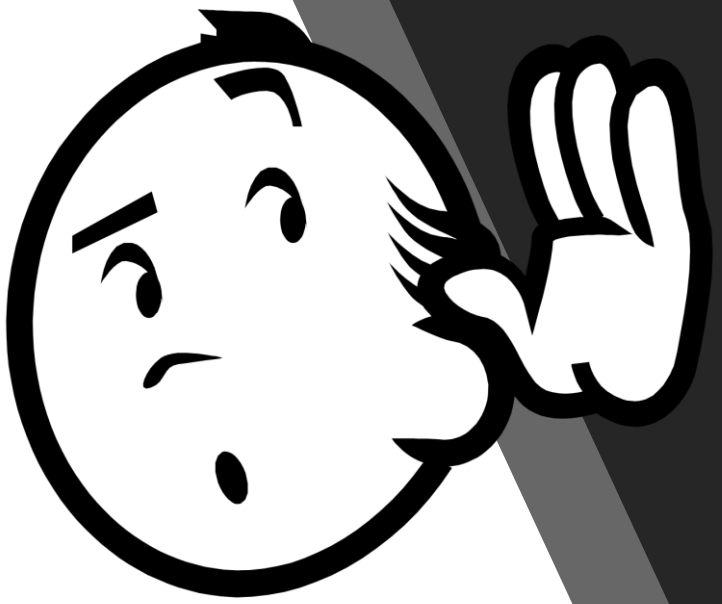
Adults with SMI

- Significant relationship between low levels of participation & high scores on *low registration* & *sensory sensitivity*
  - (Pfeiffer, Brusilovskiy, Bauer, & Salzer; 2014)

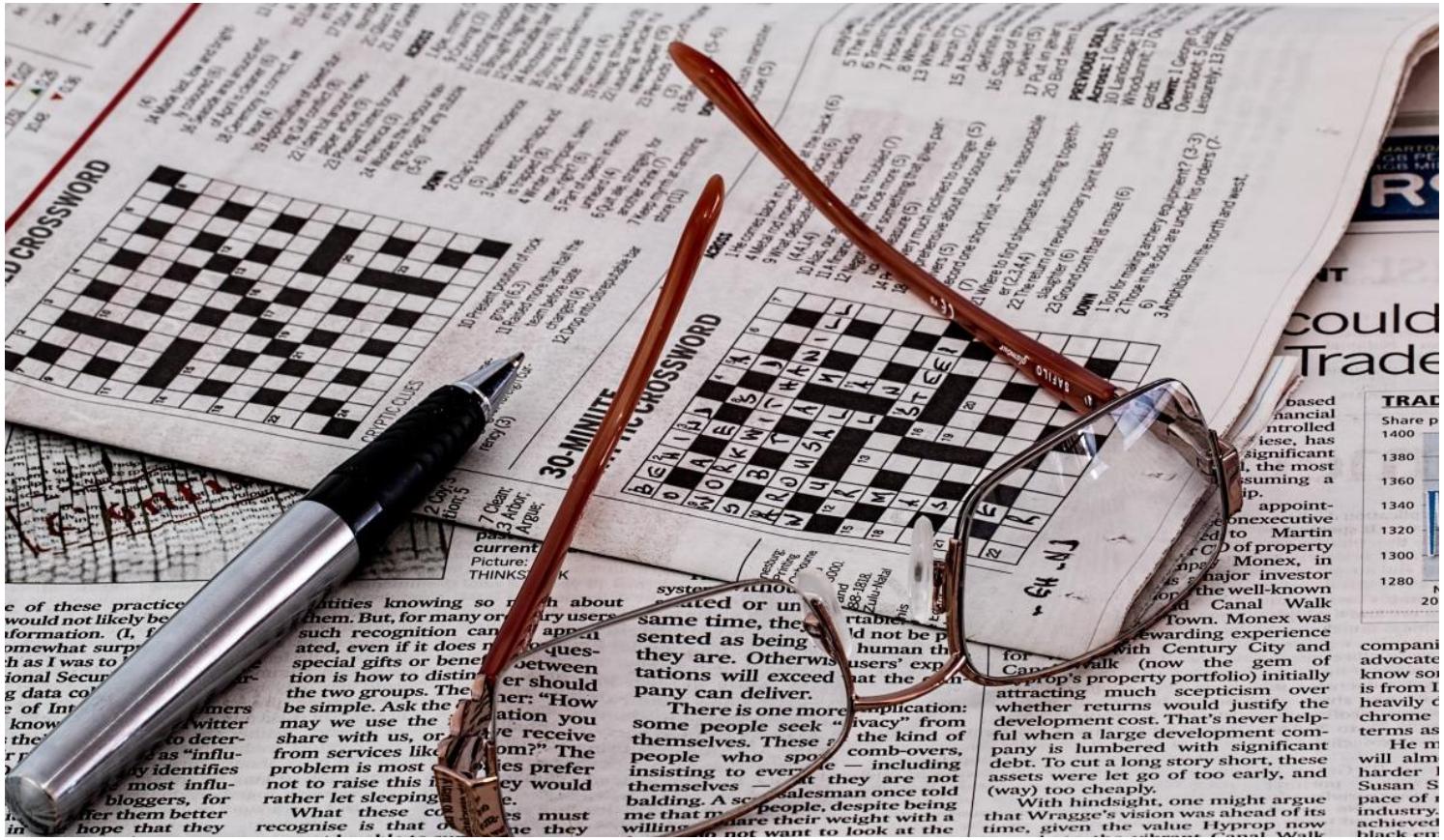
Women with major depression or anxiety (N=5)

- High scores on *low registration* were associated with low motivation to cook
- Low scores on *sensation seeking* were associated with a lack of leisure activities
- High scores on *sensation avoiding* were associated with extended periods of staying in bed or avoiding treatment
  - (Good, Stanger, & McNulty, 2012)

Auditory deficits & social participation



- Social Cognition (de Jong, de Gelder, & Hodiamont, 2013; Green, Olivier, Crawley, Penn, & Silverstein, 2005)
  - Difficulty modulating competing stimuli
  - Affective prosody – reading tone (Jahshan, Wynn, & Green, 2013)
  - Difficulty perceiving sarcasm (Kantrowiz, Hoptman, Leitman, Silipo, & Javitt, 2014)
  - Theory of mind & empathy
- Forming intimate relationships
  - Sensory processing difficulties may impede adults with PTSD (Engel-Yeger, Palgy-Levin, & Lev-Wiesel, 2015)
- Responding to anger situations or interpersonal conflict
  - High scores on *low registration* associated with aggression
  - High scores on *sensation avoiding* associated with anger suppression (Stols, van Heerden, van Jaarsveld, & Nel, 2013)



Functional implication of visual deficits

Proficient in single-word reading

- Difficulty reading paragraphs from real-world materials (Revheim et al., 2006)

Deficits in visual contrast

- Impairment discerning nuanced information during complex tasks (Kantrowitz et al., 2009)

Broader recognition of importance of sensory processing in mental health

Cognition!

- Sensory processing contributes to higher order cognitive deficits
  - Difficulty concentrating
  - Regulating oneself in environments that are rich with competing sensory stimuli (Wexler, Ikezawa, & Corbera, 2014)
- Remedial interventions targeting sensory processing skills can contribute to cognitive gains
  - Support for a bottom-up approach to target sensory processing has increased (Jahshan et al., 2013; Moritz et al., 2014).

Interventions – In other fields

- Intensive auditory training using computer exercises
  - Improved verbal cognitive processes related to psychosocial functioning (Fisher, Holland, Merzenich, & Vinogradov, 2009)
- Blue-light–blocking glasses to a patient with bipolar disorder (case study)
  - Rapid improvement in symptoms & sleep hygiene (Henriksen et al., 2014)
- Cognitive training with a focus on sensory experiences can normalize auditory sensory gating processes (Popov et al., 2011)

Interventions – Occupational Therapy

- Sensory rooms in inpatient psychiatry
  - Reduced seclusion & restraint
  - Manage aggression

  (Novak, Scanlan, McCaul, MacDonald, & Clarke, 2012; Sutton, Wilson, Van Kessel, & Vanderpyl, 2013).
- 6-week Sensory Integration program with 14 adults with schizophrenia
  - No statistically significant improvements in outcome measures

  (Blakeney, Strickland, & Wilkinson, 1983)
- SI treatment with patients with PTSD
  - Generated significant improvement.

  (Kaiser, Gillette, & Spinazzola, 2010)
- Wilbarger protocol had a positive impact on sensory defensiveness for 3 women with a history of self- injurious behavior.

  (Moore & Henry, 2002)

Interventions – Occupational Therapy

Sensory modulation program

- Generated positive improvement in occupational engagement & work performance in a single case study (Champagne, 2011)

Sensory modulation program

- Introduced patients to the concept of sensory modulation
- Provided specific sensory strategies to address levels of arousal (Gardner, 2016)

Summary

- Adults with mental illness
  - Experience atypical neurophysiological responses to auditory & visual sensory stimuli
- Atypical sensory processing is associated with deficits in
  - Emotional prosody (i.e., recognition of emotion through tone)
  - Social cognition & social participation
  - Cognitive performance (e.g., task attention & self-regulation)
- Evidence supports the efficacy of sensory rooms in inpatient settings
  - Reduce the incidence of seclusion & restraint
- Remedial interventions targeting sensory processing skills can contribute to cognitive gains & improved occupational performance.

Implications

- Clinicians should incorporate visual supports & adapt materials in intervention
  - Communication/education strategies
- Sensory qualities of the physical environment can be adapted to promote the occupational engagement of adults with mental illness
- Gap in literature
  - Testing the efficacy of current sensory-based approaches in occupational therapy psychiatry
  - Understanding the real-world functional implications

Moving Forward

- Quantitative Measures
  - Participant Objective Participant Subjective (POPS)
  - Adult/Adolescent Sensory Profile (AASP)
  - Brief Psychiatric Rating Scale (BPRS)
  - Positive and Negative Syndrome Scale (PANSS)
- Photo-elicitation
- Video-elicitation
  - Walking with video
- Interviews

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