

# “Sensory” Interventions for Individuals with ASD: What Does the Research Say?

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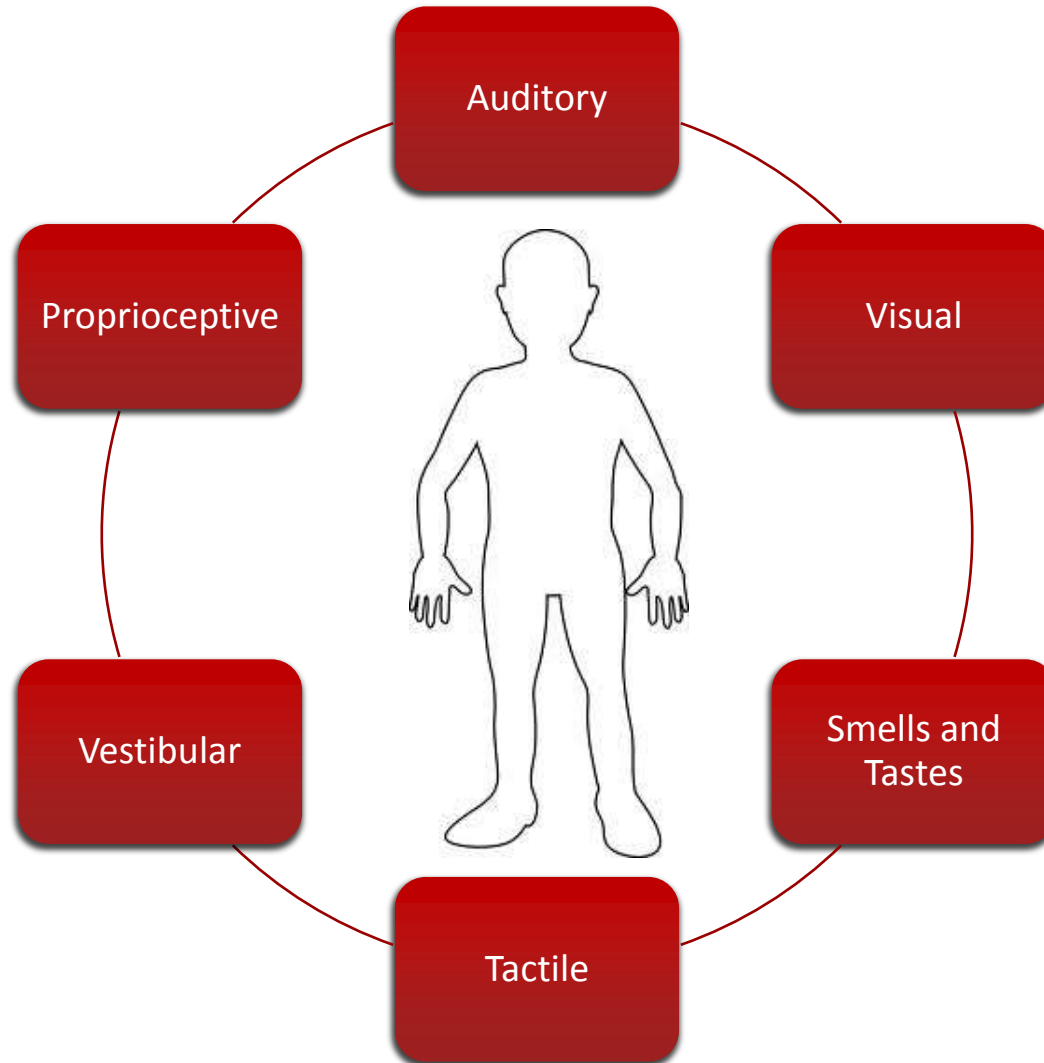
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# Goal for Today

- To provide an up-to-date overview of research on interventions designed to address the sensory needs or challenges experienced by individuals with ASD
- Assumption: In 21<sup>st</sup> century schools, we aim to deliver and promote evidence-based practices

# Sensory System



# Temple Grandin





# Interventions



# Occupational Therapy

Canadian Association of Occupational Therapists position statement on ASD (2008):

“Occupational therapists work with parents and teachers to provide strategies to prevent reactions to sensory experiences from limiting daily activities. **By adapting the tasks and environments as well as working with the families to teach new skills**...occupational therapists can make a difference in the family’s day to day life.

In particular, occupational therapy focuses on **self care issues such as feeding, bathing, hygiene and sleep**, which are significant issues for children with ASD and enormous stressors for the family.

In the school setting...occupational therapists may **adapt classroom tasks and the school environment to promote a child’s participation**. Occupational therapists can also assist teaching assistants and teachers [to understand]...**how they can modify activities to maximize the child's participation and reduce behavioural difficulties** [through the use of] environmental supports and structures...”

# Sensory Integration Therapy (SIT)

- First proposed in the 1970s by Dr. Jean Ayres, an occupational therapist
- Theory is that the tactile, vestibular, and proprioceptive systems are dysfunctional:
  - inappropriate responses to sensory input
  - difficulty organizing/analyzing sensory information
  - reduced ability to integrate and respond to sensory information
  - difficulty using sensory information to plan and execute actions



# Everything Sensory is Not SIT!

- Parham et al. (2011) validated a measure of treatment fidelity for Ayers' Sensory Integration® that includes the following elements:
  - Child safety
  - Opportunities to obtain tactile, vestibular, and/or proprioceptive sensory stimulation to support self-regulation, sensory awareness, and/or movement
  - Appropriate levels of participant alertness
  - Challenges to postural, ocular, oral, or bilateral motor control
  - Novel motor behaviors and efforts to organize movements in time and space
  - Child preferences in the choice of activities and materials
  - Activities that are not too easy or too difficult (“just right”)
  - Activities in which the participant experiences success
  - Support for intrinsic desire to play
  - A therapeutic alliance



# SIT and ASD

- While Ayres didn't originally develop SIT for children with ASD, she applied the theory to this group and reported decreased tactile and other sensitivities following SIT (Ayres & Tickle, 1980)
- SIT is a common practice among occupational therapists (OTs) who work with individuals with ASD :
  - 95%-99% of OTs in the USA said that they use SIT with children with ASD and find it to be effective (Case-Smith & Miller, 1999; Watling, Deitz, Kanny, & McLaughlin, 1999)
  - 78%-80% of Canadian and Australian OTs said the same thing (Brown et al., 2005)

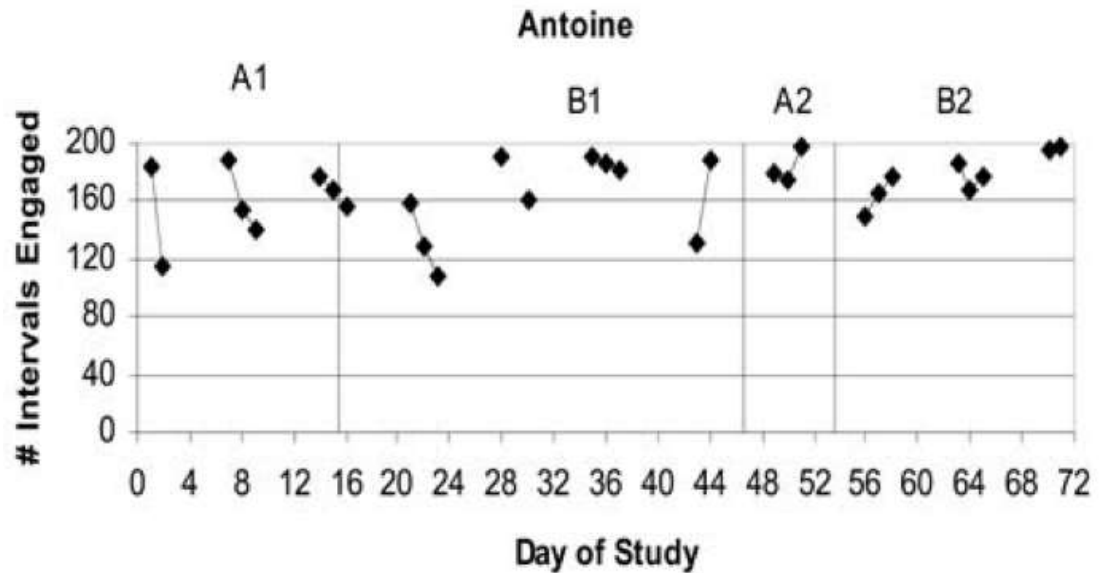
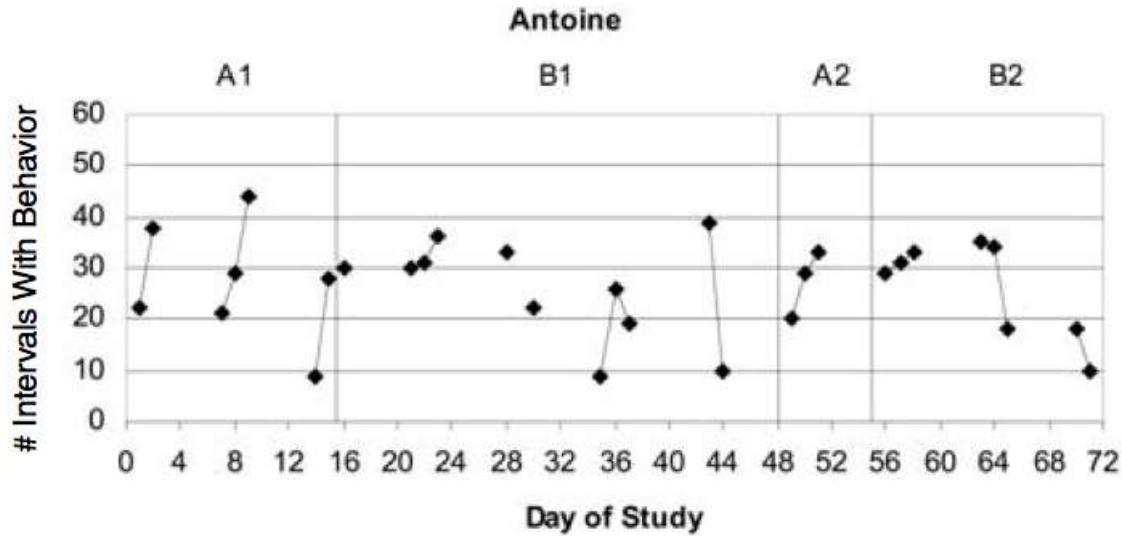
# What Does the Research Say About SIT?

- May-Benson & Koomar (2010) conducted a systematic review of SIT research with children, published between 1972-2007
- Located 27 studies; only 2 included children with ASD (n = 3)
- Rated the studies as Level I-V:
  - Level I (best) : Systematic reviews, meta-analyses, randomized controlled trials
  - Level II: Two groups, nonrandomized studies
  - Level III: One group, nonrandomized (e.g., pretest and posttest)
  - Level IV: Descriptive studies that include analysis of outcomes
  - Level V: Case reports and expert opinions
- Both ASD studies showed slight positive effects of SIT but the research designs were very weak (Level IV)

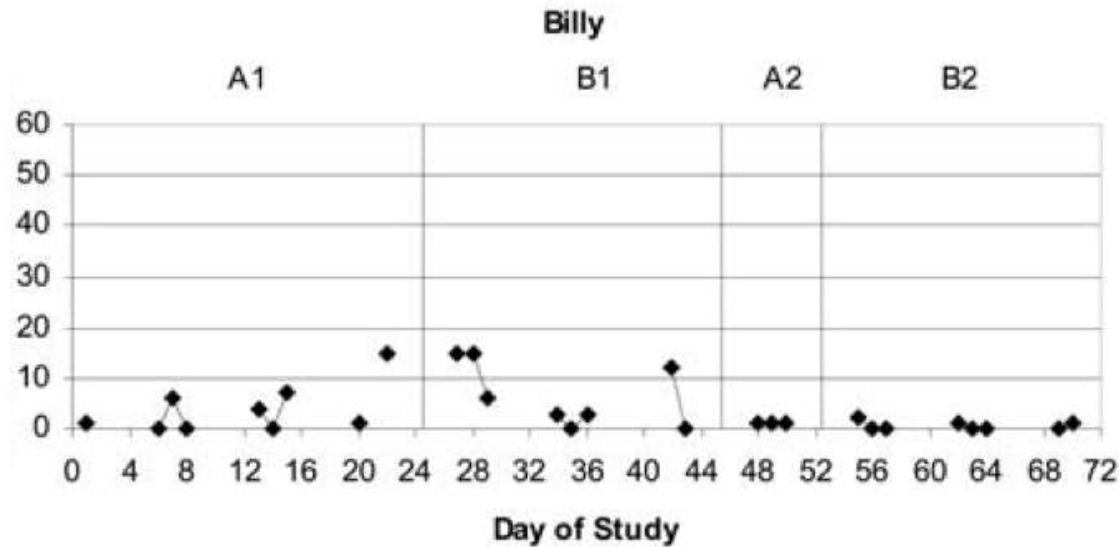
# Post-2007

- Watling & Dietz (2007) compared child performance in no-treatment and treatment conditions
  - Treatment was provided to 4 preschool-aged boys with autism by an OT with 12 years experience, following Ayres' SIT program
- Dependent variables were **undesired behavior** (e.g., aggression, mouthing objects, lining up items, repetitive movements, etc.) and **engagement** (defined as “intentional, persistent, active, and focused interaction with the environment”)
- **Data showed little to no difference between the two conditions across all children**

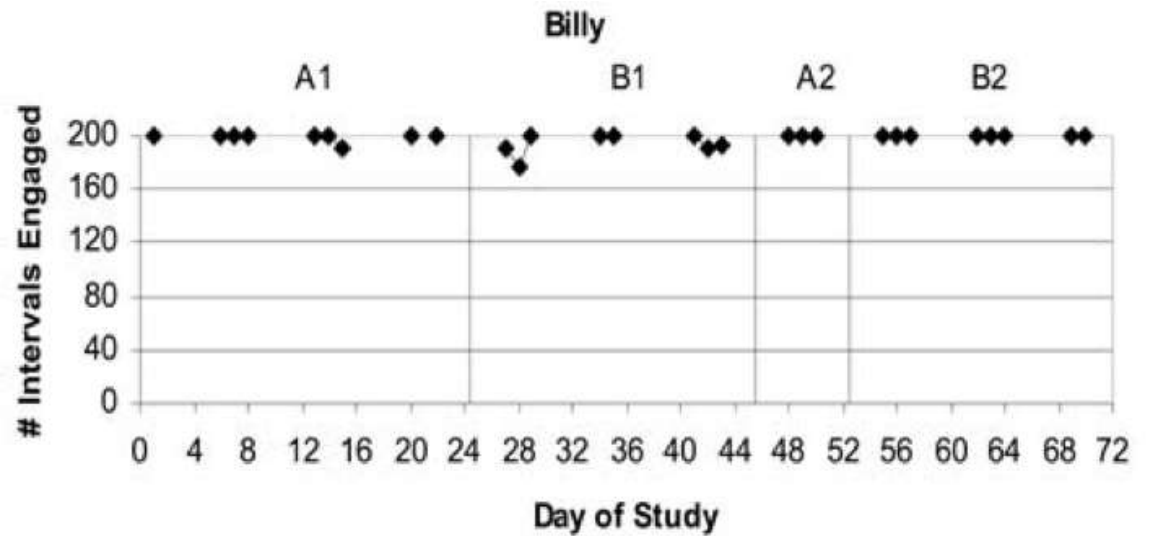
# Watling & Dietz (2007)



# Intervals With Behavior

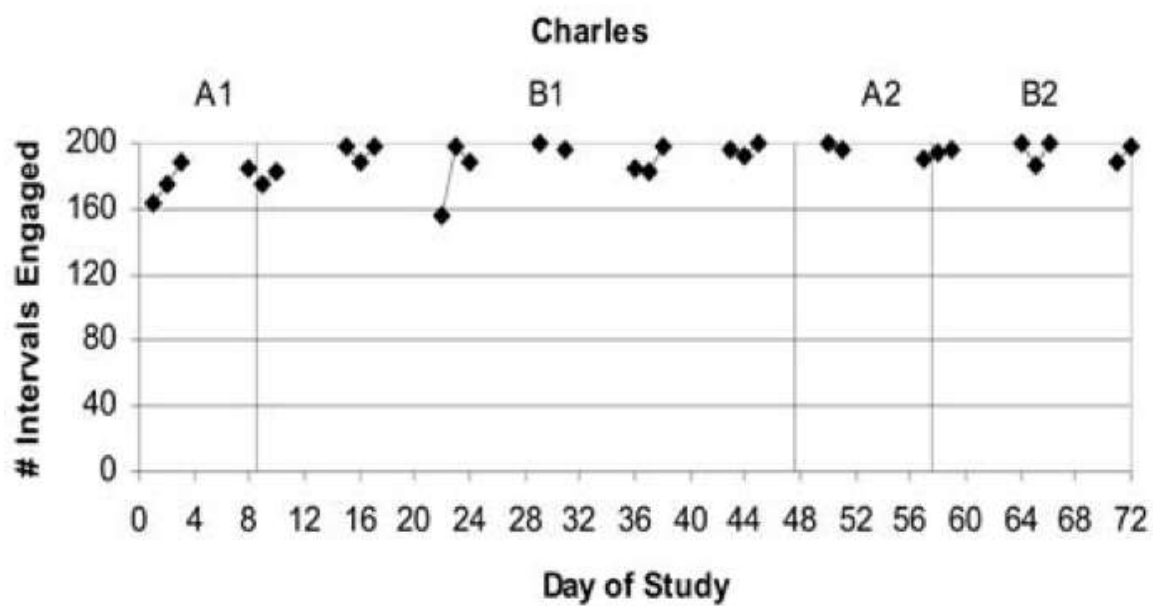
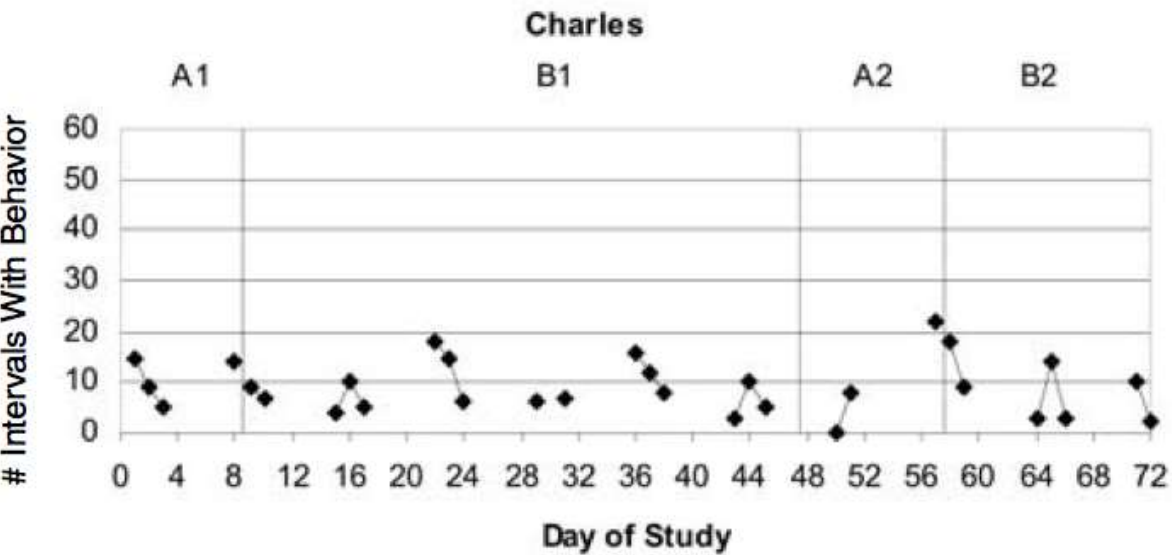


Watling & Dietz (2007)

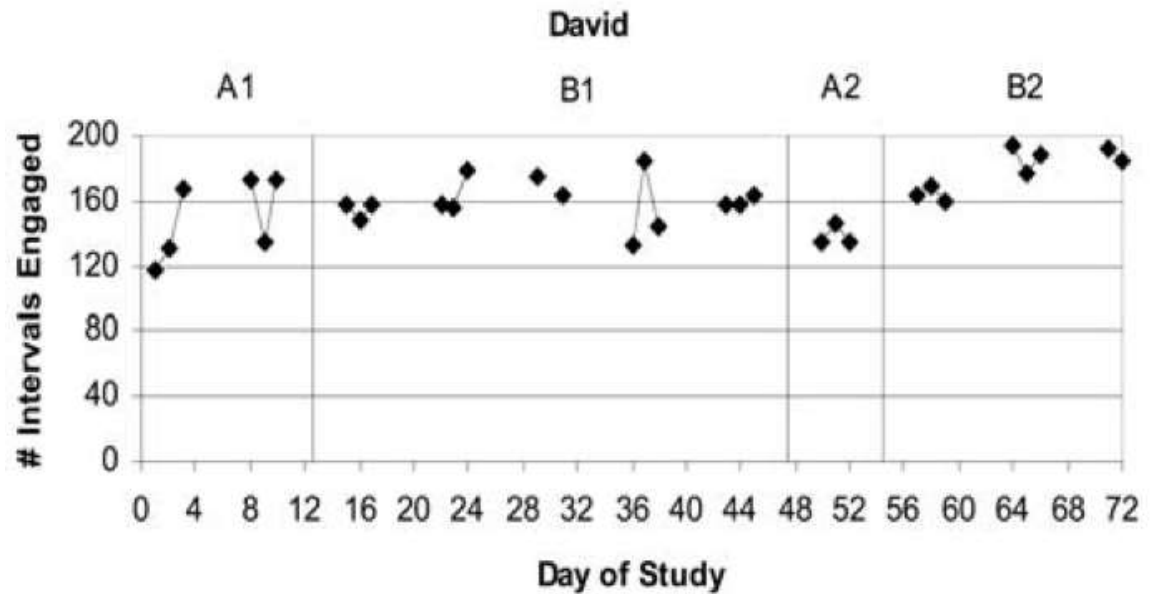
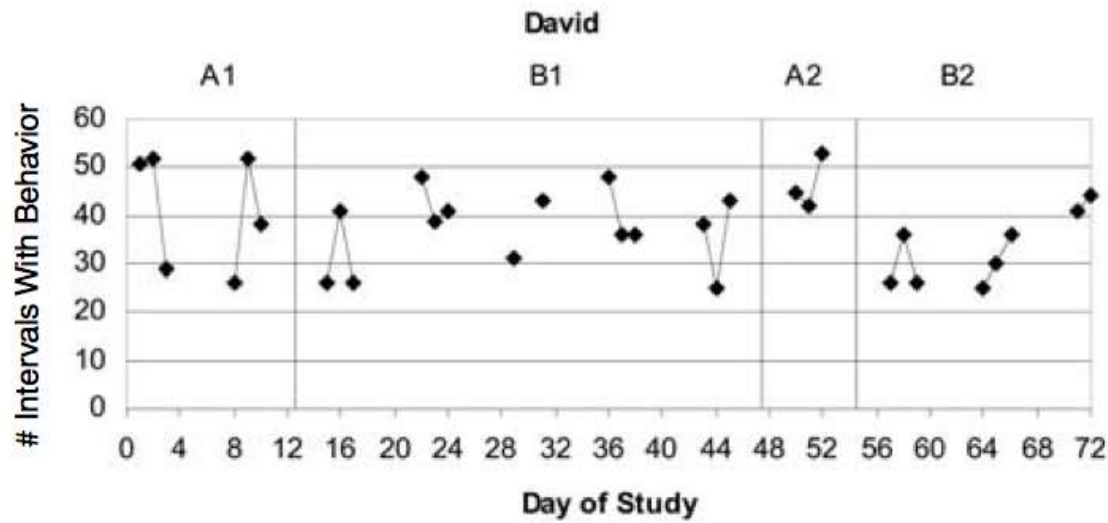




Watling & Dietz (2007)



# Watling & Dietz (2007)



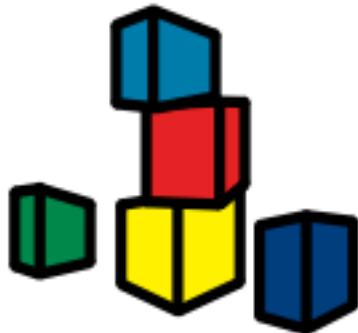
# What Does the Research Say About SIT?

- Schaaf & Nightlinger (2007): **non-experimental** case study of SIT with a 4-year-old child with ASD
  - Received weekly SIT and consultation with mother and preschool teacher
  - Progress measured with Goal Attainment Scaling
  - Positive impact on:
    - Ability to complete 4-6 step activity sequences
    - Participation in age-appropriate vestibular activities (swings, etc.)
    - Tolerance of non-preferred and new foods
    - Ability to play and interact with peers
    - Ability to use scissors to cut
    - Ability to throw and catch a ball from 15-20 feet



# What Does the Research Say About SIT?

- Pfeiffer et al. (2011) conducted a randomized control pilot study to compare the effectiveness of SIT with a Fine Motor treatment
  - 37 children diagnosed with PDD-NOS or autism (32 boys, 5 girls), ages 6-12
  - SIT intervention was based on Ayres's program
  - Fine Motor treatment involved construction-based activities, drawing and writing, and crafts



# What Does the Research Say About SIT?

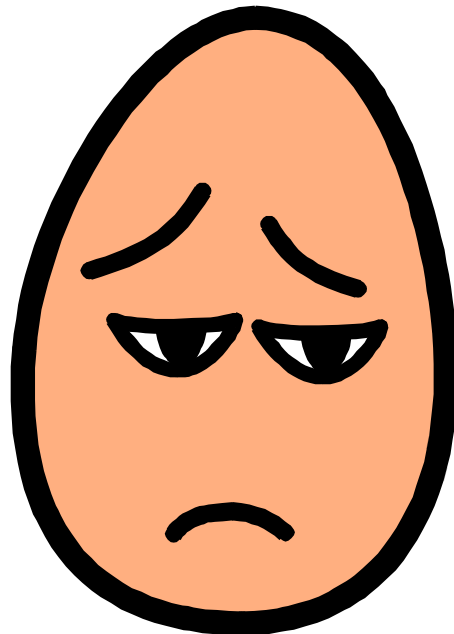
- Pfieffer et al. (2011) compared measures pre- and post-SIT intervention:
  - No significant differences between pre- and post-treatment scores for EITHER SIT or Fine Motor interventions on measures of sensory processing, social responsiveness, or adaptive behavior
  - However, the SIT group displayed significantly fewer stereotyped behaviors
  - Both groups demonstrated significant improvement toward individual goals in the fine motor and social-emotional areas
    - Parents of children in the SIT group reported more improvement than parents of children in the FM group

# Pollack (2009)

- “There has been more effectiveness research conducted on sensory integration therapy [SIT] than any other intervention in the field of occupational therapy. **To date, the evidence of its effectiveness is weak at best.** We can continue to argue that the supportive evidence is limited due to methodological limitations and attempt to address these weaknesses in future trials, or we can accept that the results are valid and that classical SIT, used with the populations that have been studied, is not supported by the evidence.”
- “Remember that you are occupational therapists, not sensory integration therapists. Focus first and foremost on the occupations identified by the child and family that are of concern.”

# The Punchline for SIT Interventions

- Only one well-controlled study to date (Pfeiffer et al., 2011)
- Little to no improvement following SIT interventions



# “Sensory Diet” Studies

- ➔ “Sensory diet” techniques include two or more procedures that are used in SIT, such as brushing, weighted vests/blankets, vestibular input (i.e., swinging, rocking, bouncing), and massage
- ➔ **But all elements of SIT are not included**, as per Parham et al. (2011)



# What Does the Research Say About a Sensory Diet?

- Fazlioglu & Baran (2008): 30 children with ASD, ages 7-11; randomly assigned to SD + instruction and control (SPED class) groups; SD + instruction included brushing + individualized sensory activities for 45 min, twice weekly, for 24 sessions
  - Improvements on a Sensory Evaluation Form for the SD group, but difficult to interpret because of simultaneous implementation of instruction that directly targeted the skills that were measured
- Van Rie & Heflin (2009): 4 boys, ages 6-7; compared swinging on a swing, bouncing on a therapy ball, and listening to a story (control) for 5 minutes before an academic task
  - One child, no difference in performance; one child, better performance after bouncing; two children, better performance after swinging

# What Does the Research Say About a Sensory Diet?

- Bongatt & Hall (2010); 1 preschooler with ASD; compared a “sensory diet” (Wilbarger brushing + therapy ball + hammock swinging + stretching) to an attention control condition (puzzles, ball play, storybook reading) for 10 minutes before 1:1 and independent activities
  - No difference in on-task behavior across the two treatment conditions
- Murdock et al. (2013): 30 children with ASD, randomly assigned to two groups.
  - Group A had 5 min of independent tabletop activities (puzzles, stringing beads, coloring), spent 5 min slowly swinging on a platform swing, and then spent a second 5 min in the activities. Group B did the same but watched a brief movie during the 5 min activity break
  - Data were coded for on-task, in-seat, engaged, and stereotyped/repetitive behaviours
  - No differences between the two groups on any measure; no effect of the swing

# What Does the Research Say About a Sensory Diet?

- Devlin, Leader, & Healy (2009) compared behavioral intervention and SD to treat self-injurious behavior in a 10 year old boy with ASD:
  - Results of a functional analysis revealed that the SIB was primarily maintained by escape from academic tasks
  - SD: gross motor activities, oral motor activities, brushing and joint compression; materials included a net swing, therapy ball, beanbag, lycra blanket, T-shaped “chewy tube,” and a trampoline
  - Behavioral intervention: interspersed requests, dense schedule of reinforcement, and extinction
- An alternating treatments design revealed that the **frequency of SIB INCREASED on SD days and DECREASED on behavioral intervention days**
- A best treatment (behavioral) phase showed a reduction of SIB to 2-4/day, compared with 15/day at the start of the study



# What Does the Research Say About a Sensory Diet?

- Devlin et al. (2011): replication with four 6-11 year-old boys with ASD and aggression, tantrums, SIB
- SD designed by a SIT-trained OT
- Data included analysis of saliva samples for cortisol (an indicator of responsivity to stress)
  - Again, individualized behavioral interventions based on FBA were more effective than SD
  - Best treatment (behavioral) reduced problem behaviors to near-zero
  - No mean difference in cortisol levels across the two conditions

# Lang et al., 2012 Systematic Review

- ➔ “The results...were that SIT/SD had no consistently positive effect as a treatment for children with ASD. These findings are in agreement with previous reviews of SIT/SD involving individuals with ASD and/or other populations said to have ‘sensory integrative dysfunction’”

# Weighted Vests

- Several studies and one research review on the use of weighted vests were published between 2005-2011, to assess the effects on:
  - Stereotypy and arousal
  - Attention to task/in-seat behaviors
  - Self injury
  - Social attention
  - Engagement
  - Problem behaviors



# Weighted Vests

➤ **ONE study** found positive effects:

- Fertel, Bedel, & Hinojosa (2001): Five 2-3 year olds with ASD wore weighted vests during structured fine motor activities for 2 hours, 3 times/week for 2 weeks in an ABA preschool. When vests were worn:
  - All 5 had slight decreases in the number of distractions (“look-aways”) and slight increases in time on task
  - 3 had fewer self-stimulatory behaviors
  - BUT: concurrent behavioral interventions were in place, so unable to discern the impact of weighted vests alone

# Weighted Vests

- **ALL OTHER studies found NO effect** of weighted vests:
  - No reduction in stereotypy or increase in attention to task (Collins & Dworkin, 2011; Kane et al., 2005)
  - No decrease in self injury (Doughty & Doughty, 2008)
  - No effect on in-seat behavior (Cox et al., 2009; Hodgetts et al., 2011a)
  - No improvement in social attention (Leew, Stein, & Gibbard, 2010)
  - No changes in engagement or stereotypic behavior (Hodgetts et al., 2011b; Leew et al., 2010; Reichow et al., 2009, 2010)
  - No or negative effect on problem behavior (Davis et al., 2013; Quigley et al., 2011; Reichow et al., 2009)

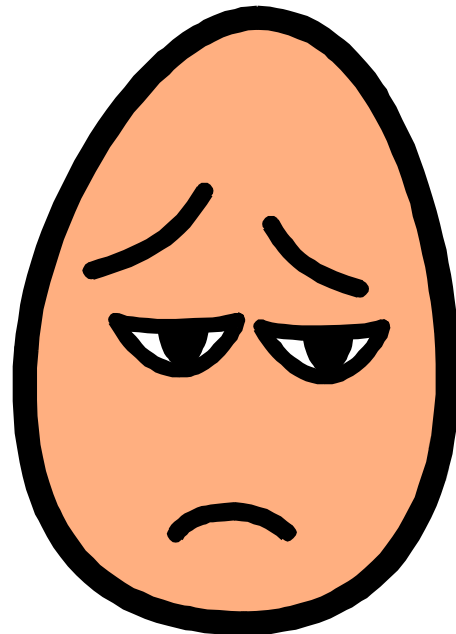
# Weighted Vests

➔ Stephenson & Carter (2009):

“Until such time as well-conducted studies can provide replicated evidence to the contrary, weighted vests cannot be recommended for clinical application...In terms of this specific intervention, the evidence reviewed in this paper unequivocally establishes that researchers should have no ethical concerns about withholding [this] treatment for the purposes of scientifically evaluating the intervention” (p. 113).

# The Punchline for Weighted Vests

- Few well-controlled studies
- No improvements following weighted vest interventions





# Wilbarger Protocol

- Use only a Clipper Mills or Therapressure brush
- Brush with a specific amount of pressure and fluency in strokes
- Follow up with joint compressions to upper- and lower-extremity joints
- Administer every 90-120 minutes throughout the day

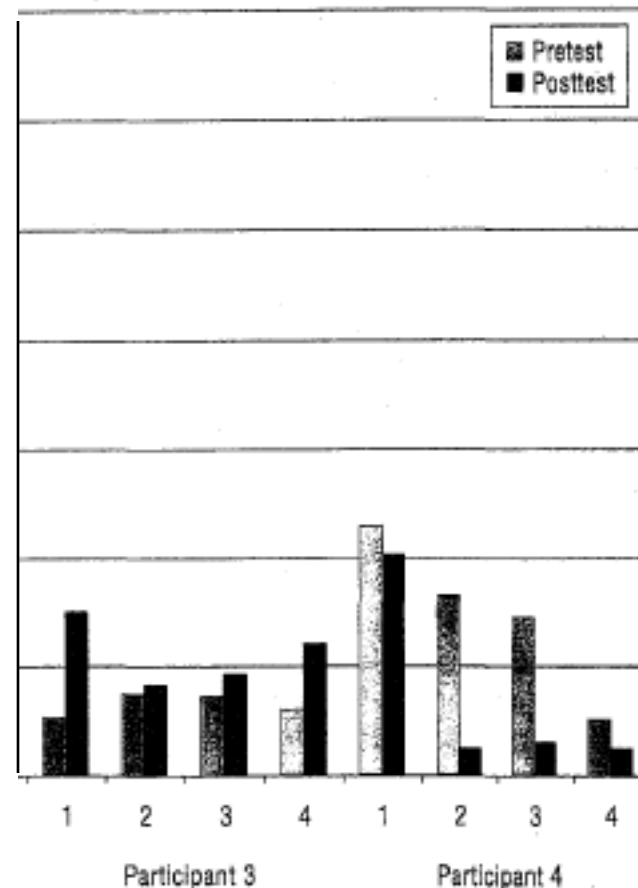


# Wilbarger Protocol

- Kimball et al. (2007) administered the Wilbarger protocol to 4 children, 2 of whom had ASD and were 5 years old
- Protocol was implemented once weekly over 4 weeks during therapy sessions
- Measured problem behaviour and responses to sensory events with standardized assessment tools
- Also measured cortisol levels in saliva

# Wilbarger Protocol

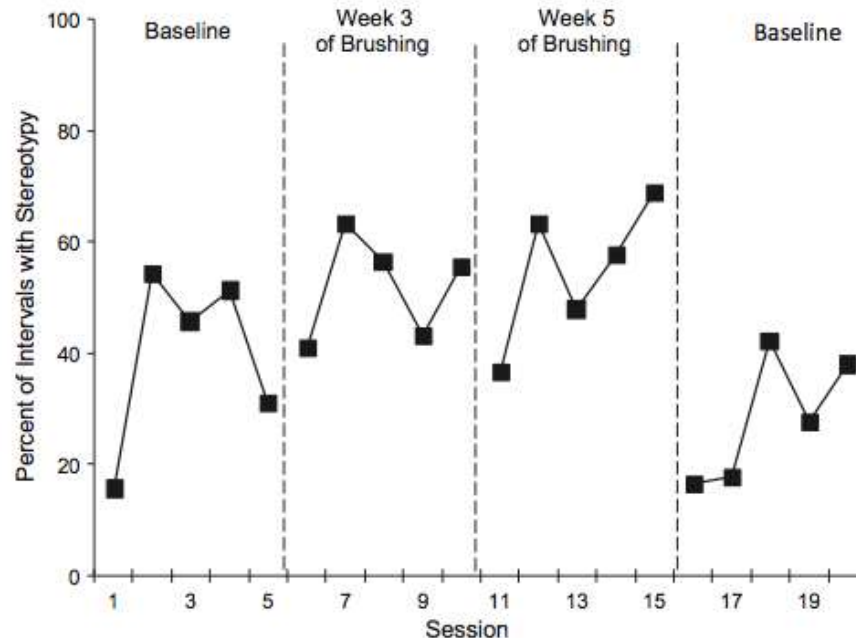
- No changes in problem behaviour or responses to sensory events for either child
- One child had increased cortisol levels and one had decreased cortisol levels
- “Until [there is more research], occupational therapists should take care in using the WP and WP-based protocols and should systematically observe and document the behavioral changes they see in their clients” (p. 412)



Cortisol levels

# Wilbarger Protocol

- ➔ Davis et al. (2011) investigated the effects of the Wilbarger protocol on the stereotypic behaviors of a 4-year-old boy with autism, showing **no effect**



# Wilbarger Protocol

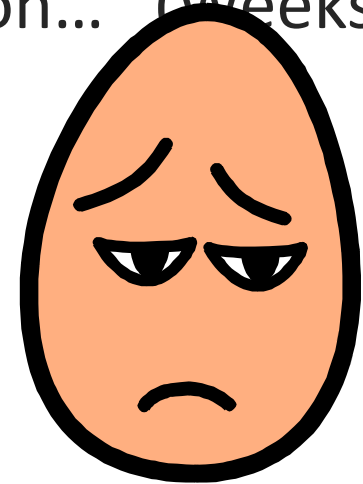
- Benson et al. (2012) compared brushing via the Wilbarger protocol with nonspecific brushing in two 5-year-olds with autism
  - Wilbarger: done every 90-120 minutes across the day
  - Nonspecific brushing: done once daily, when agitated, or upon request
- The “Wilbarger” boy showed a 0%-3% improvement and the “nonspecific brushing” boy showed a 0%-11% improvement on subscales of the School Function Assessment (SFA) instrument
- BUT:
  - The same OT who did the brushing intervention administered the SFA, which is an observational rating system that uses a “judgment-based” format
  - Both children received multiple, other interventions during the course of the study

# Wilbarger Protocol

- Bhojti and Brown (2013): 5 children ages 3-4, 4 with ASD
  - 6 week home program of Wilbarger brushing every 2 hours, combined with sensory diet activities 3 times daily (SD components were not specified)
  - Sensory Profile (parent report) and Goal Attainment Scaling assessments were completed before and after intervention
    - One child refused the brushing intervention
    - Significant improvements in SP subscales that measure *sensitivity* and *avoiding*
    - GAS showed that several individual goals were achieved
  - BUT: it was not possible to say that brushing was responsible, as the children all received more parental attention and planned interaction during SD activities than they had before the study commenced

# The Punchline for Wilbarger Protocol

- “A lack of high quality evidence currently exists to support or refute the use of the Wilbarger protocol with children....[T]he grade of recommendation...suggests that the Wilbarger protocol should be applied with caution...” (Weeks et al., 2012)



# Massage or Touch Pressure

- Lee et al. (2011) conducted a systematic review of massage therapy interventions (including acupressure and other types of massage) with individuals with ASD, with published research through 2010
- Only studies at Level III or above (one group, pretest-posttest) were included
- Of 132 articles reviewed, only 6 met the inclusion criteria



# Massage or Touch Pressure

➤ “...[U]ncontrolled observational studies, case studies, and qualitative studies...suggest that massage improves symptoms of autism. However, **these data are highly susceptible to bias, and hence...provide little useful information on the value of massage as a therapeutic intervention for autism....[Similarly], our systematic review provides limited evidence for the effectiveness of massage as a symptomatic treatment of autism. However, the risk of bias in the primary data is high, and firm conclusions cannot be drawn”** (p. 410)

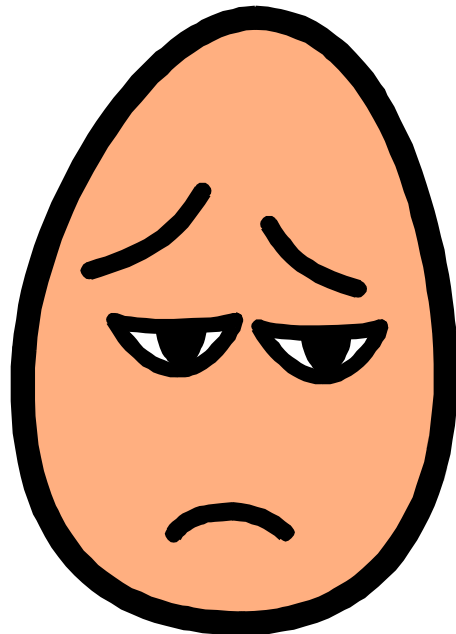


# And...Beware!

- McGinnis et al. (2013) identified deep pressure activities (swaddling in a blanket, etc.) as highly preferred by three children with ASD
- They also demonstrated experimentally that deep pressure functioned as positive reinforcement for all three children
- They noted that “occupational therapists who design ‘sensory diets’ ... should be made aware of the potential reinforcing effects that deep pressure activities may have upon the behavior it follows. Clinicians should be careful that deep pressure activities are not provided contingent upon problem behavior. In addition, parents and clinicians may need to refrain from using activities such as hugging or swaddling to calm or re-direct an individual who is engaging in problem behavior. Activities like those used in this study may have an immediate abative effect, but in the future, the individual might be more likely to engage in the same problem behavior” (p. 55).

# The Punchline for Massage

- No well-controlled studies
- Additional studies are needed



# Snoezelen/Multisensory Rooms

- “Snoezelen” multi-sensory rooms were first used in the Netherlands in 1975
  - Comes from *snufflen* meaning to seek out or to explore, and *doezelen* meaning to relax or to be in a wonderful place
- Contain tactile, visual, olfactory, auditory, vestibular, and proprioceptive sensory equipment
  - Designed to “facilitate increased awareness, environmental exploration, mental and physical relaxation, enjoyment, social skills, choices, feelings of restoration, and refreshment in participants”
- In North America, these are usually referred to simply as “sensory” or multisensory rooms” and are usually used according to Snoezelen principles

# A Snoezelen Room



# Meta-Analysis

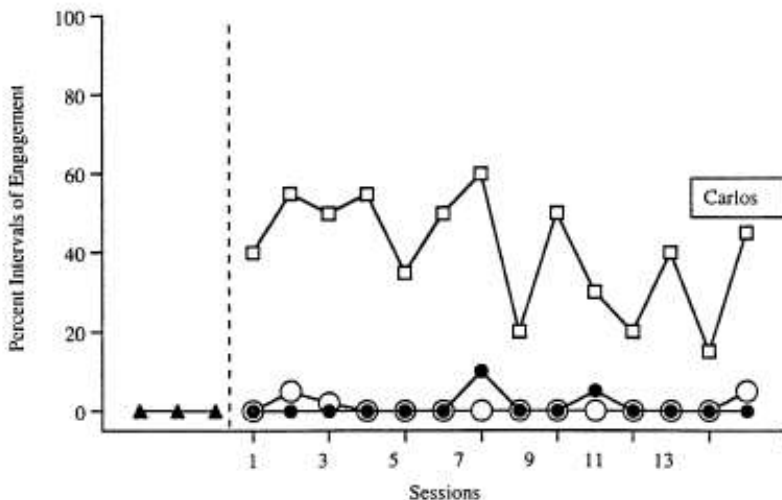
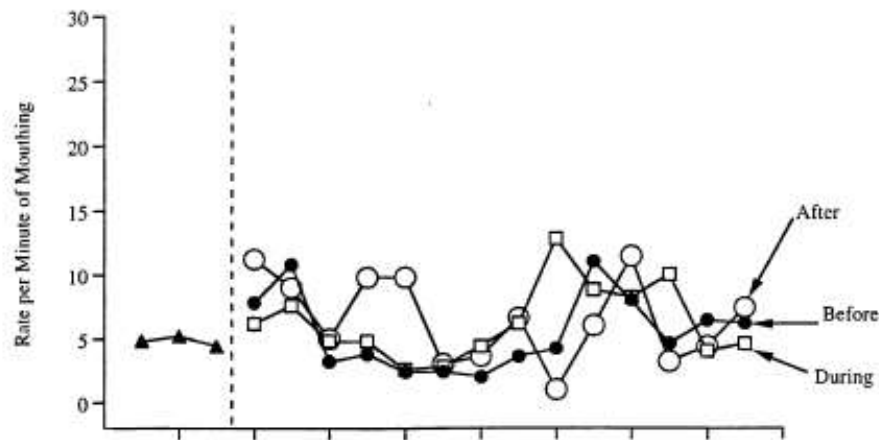
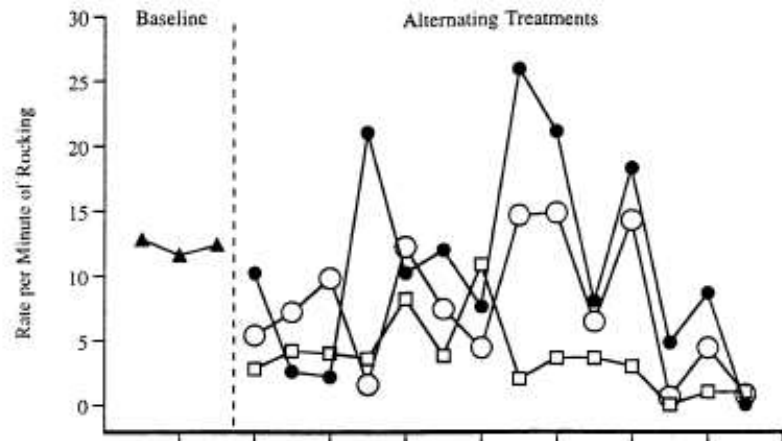
- ➔ In a review of the research to 2004, Lotan and Gold (2009) concluded that: “the accumulating evidence...provides only preliminary support to the assumption that the...Snoezelen could be used as a therapeutic milieu to enhance adaptive behaviours of individuals with IDD when applied as an individual intervention” (p. 213).

# What Does the Research Say About Snoezelen Rooms?

- Cuvo et al. (2001) examined the effects of a Snoezelen Room (SR) on 4 institutionalized adults with profound MR, one of whom also had autism (Carlos, age 55)
- Measured stereotypic behaviour (body rocking, mouthing) and engagement (using/touching materials appropriately, participating in scheduled activities, looking at visual stimuli)
- Observations were conducted in the SR during a 20 minute exposure session and in a living room at baseline and before and after each SR exposure



# Carlos 1



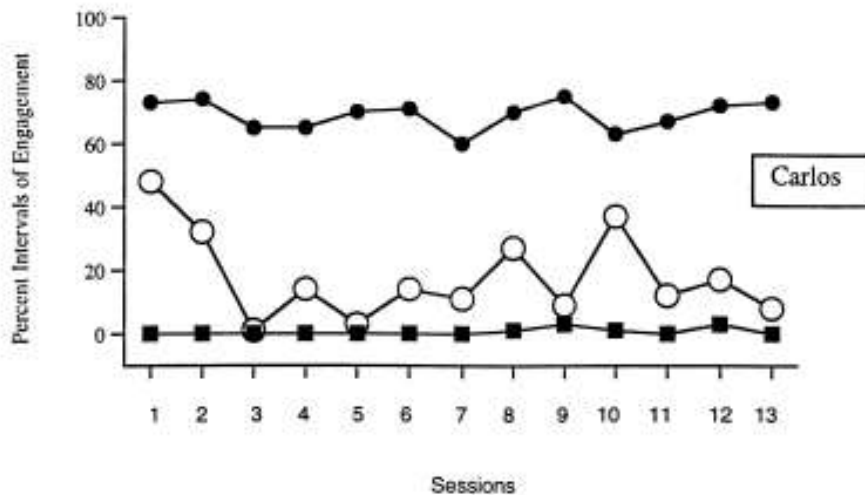
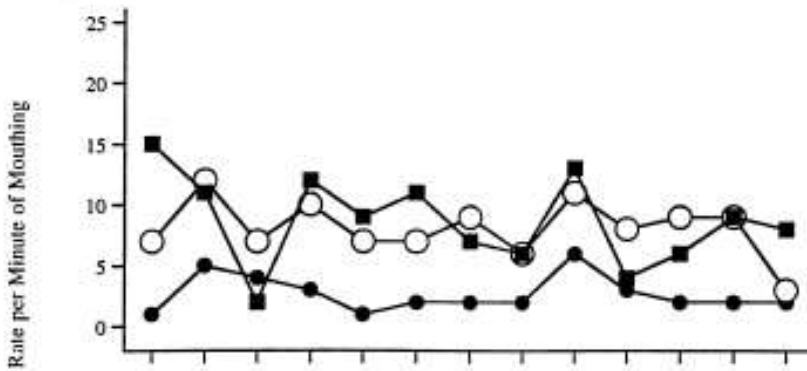
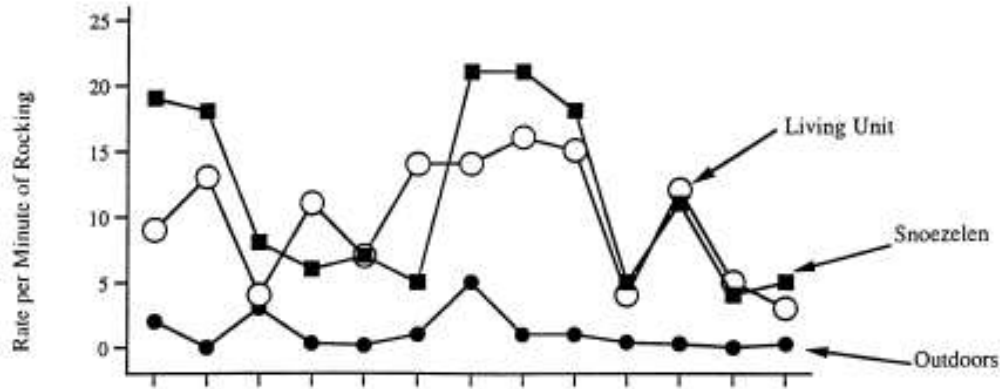
- Rate of rocking less in the SR
- No apparent effect for mouthing
- Engagement was 40% higher in the SR than in the living room

# Experiment #2

- Compared the SR and an outdoor condition in which Carlos went for a walk with the researcher for 20 minutes and sometimes sat on a bench
- This time, observations were conducted during the SR, outdoor, and living room (no treatment) conditions







# Carlos 2

- ➔ Rate of rocking and mouthing were both less outdoors; SR and living rooms were equal
- ➔ Engagement was much higher outdoors, followed by living room and SR
- ➔ So, outdoors was *better* than SR!

# But.....

- Fava and Strauss (2010) compared a standard SR with a room that contained sensory stimuli that were selected based on a preference inventory of each participant
- Participants included 27 institutionalized adults with profound MR, 9 of whom also had a diagnoses of autism (mean age 38 years)
  - Randomly assigned to living room, SR, or sensory preference room; 25 minutes/session, 3 sessions/week for 7 weeks (20 sessions in total)
- Measured disruptive, stereotypic, and prosocial behaviours

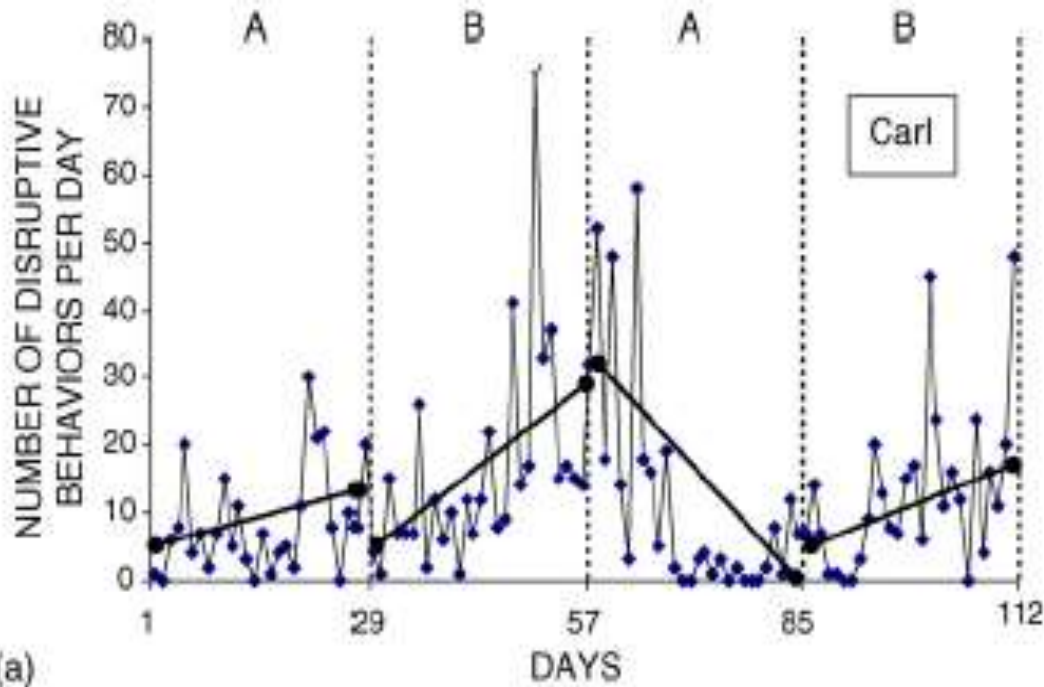
# Fava and Strauss (2010)

- Disruptive behaviour and stereotypic behaviour decreased significantly for participants with autism in the SR only
  - Both effects carried over (short term) to the living room after exposure
- No effect of either sensory environment on prosocial behaviours

# What Does the Research Say About Snoezelen Rooms?

- McKee et al. (2007) examined the effects of SR exposure on 3 institutionalized adults with autism and moderate MR, using an ABAB design
- All observations were conducted in the living unit, 24/7
  - Phase A: activities as usual, 28 days
  - Phase B: SR for 45 minutes/day, 28 days
- Measured disruptive behaviour (hitting, property destruction, spitting, head banging, throwing objects) and prosocial behaviours (speaking, assisting staff, appropriate gestures, eye contact)

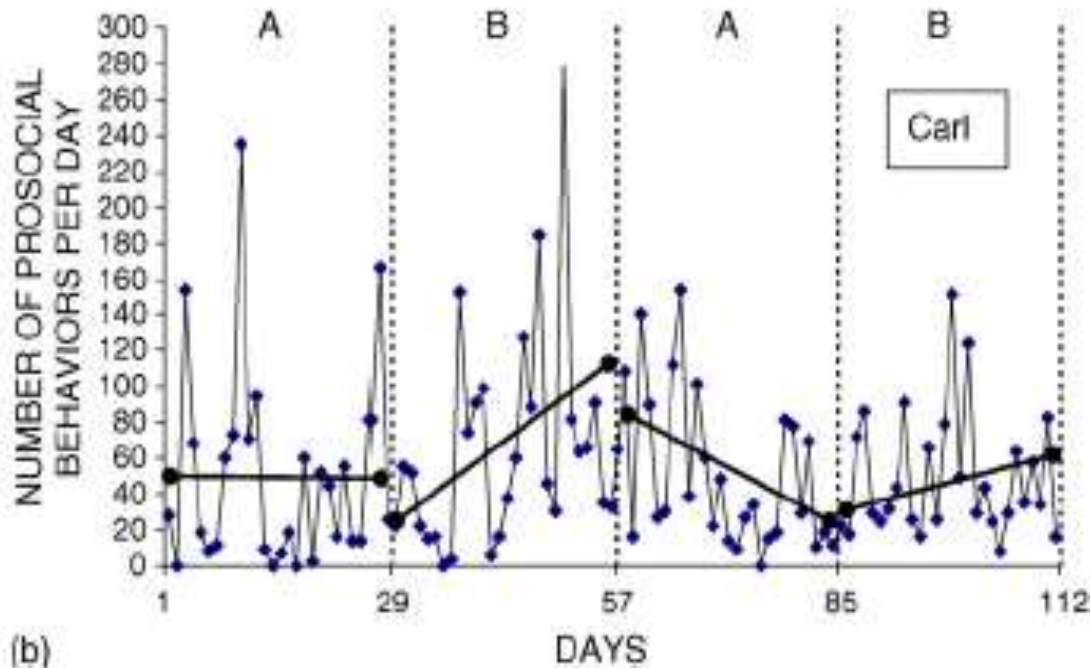
# Abe, Ben, Carl



➔ Abe: no difference in disruptive or prosocial behaviours

➔ Ben: more disruptive and slightly more prosocial behaviours in SR (B) condition

➔ Carl: no impact on either measure



# But...

- Kaplan et al. (2006) examined the effect of SR on task engagement and problem behaviour in 3 adults (ages 31-52) with moderate-profound intellectual disability and autism in a day treatment program
- The “tasks” included playing games, making a snack, and playing catch
- For 2/3 participants, task engagement increased and problem behaviour decreased following SR sessions

# The Punchline for Snoezelen Rooms

- All research to date has been with institutionalized adults, most with profound MR but not autism
- Results have been mixed, for both immediate and long-term effects
- NO research has been conducted on the effectiveness of Snoezelen Rooms with students with autism in school settings (Botts et al., 2008)
- NO research has been conducted on the effectiveness of non-Snoezelen “sensory rooms”



# Auditory Integration Training (AIT)

- Several types: Tomatis, Berard, etc.
- All three require listening to electronically modified music or stories for varying periods of time, to “ameliorate auditory processing defects and improve concentration”





# Auditory Integration Training

- Sinha et al. (2006) reviewed Level 1 (randomized control trials) AIT-ASD studies
- Six studies with a total of 171 participants, ages 3-39
  - AIT was typically delivered in two 30 minute sessions for each of 10 consecutive days
  - Three studies showed **no change in autism symptoms compared to a control group**
  - Three studies showed **improvements in autism symptoms 3 months later, but the reason for this was unclear**

# Conclusions

- “Parents should be informed that the amount of research regarding the effectiveness of sensory integration therapy is limited and inconclusive....Pediatricians should recognize and communicate with families about the limited data on the use of sensory-based therapies for childhood developmental and behavioral problems” (American Academy of Pediatrics Policy Statement, 2012)
- “The great variability that characterizes this literature in terms of populations, interventions, and study quality precludes the formation of any firm conclusions regarding specific approaches. There is an urgent need for well-controlled studies examining the effectiveness of frequently used pediatric occupational therapy interventions with well-defined homogeneous populations on outcomes that target participation in everyday life” (Polatajko & Cantin, 2010, *American JOT*)
- “...it is important that occupational therapy is not viewed synonymously with sensory integration. By continuing to practise and promote interventions that are poorly supported by evidence, we are doing our clients, ourselves and our profession a disservice” (Rodger *et al.*, 2012, *Australian OTJ*)

# Baranek's (2002) Recommendations

- Comprehensive educational programs should consult with professionals who have expertise in sensory-motor interventions (OT, SLP, PT, adaptive physical educators, etc.)
- Educational programs should include physical and sensory environments to accommodate the unique sensory processing differences of children with autism, while at the same time embedding developmentally appropriate sensory-motor activities
  - Some children may require specific task or environmental modifications to address sensory processing or motor difficulties
- When implementing any sensory intervention, one needs to be conservative
  - Implement for a short time (6 to 12 weeks) and collect data to determine if the intervention is leading to a desired outcome