Just right for learning

From the bottom up and the inside out

Slides from Presentations to the staff of Clarke Rd Special School 4/9/12 and 18/9/12

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Autism Central Pty. Ltd.
In partnership with Clarke Rd. School
### Brain development - sensory processing is the foundation

<table>
<thead>
<tr>
<th>Cognitive Function</th>
<th>Daily living skills</th>
<th>Language</th>
<th>Reading writing</th>
<th>Maths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Problem solving</td>
<td>Thinking Reasoning</td>
<td>Decision making</td>
<td>Impulse control</td>
</tr>
<tr>
<td></td>
<td>Emotions</td>
<td>Attachment</td>
<td>Memory</td>
<td>Attention</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Sensory Processing</th>
<th>Visual processing</th>
<th>Eye hand coordination</th>
<th>Posture balance</th>
<th>Motor planning</th>
<th>Body scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature regulation</td>
<td>Hunger thirst</td>
<td>Taste</td>
<td>Reflex Integration</td>
<td>Auditory processing</td>
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<tr>
<td></td>
<td>Touch</td>
<td>Pain</td>
<td>vestibular movement</td>
<td>Body awareness</td>
<td>Vibration</td>
</tr>
</tbody>
</table>

- **Cortex**
  - Limbic system
  - Mid brain
  - Brain stem (& Cerebellum)

- **Higher level function**
- **Emotional regulation / control**
- **movement**
- **safety**

Adapted Autism Central Pty Ltd from Taylor/Trott, 1991
Sighted in *How Does your engine run?* Leader’s guide by M.S. Williams and S. Shellenberger.
SAFETY: Womb space and body space

**Safety**

Predictability: Build up schemas

**Brain stem**

- Touch
- Pain
- Movement
- Body awareness
- Vibration

Near space

**Movement**

Rocking, swing, trampoline

**Mid brain**

- Smell
- Eye hand coordination
- Balance
- Motor planning
- Temperature
- Body scheme
- Hunger
- Thirst
- Visual processing
- Auditory processing
- Taste
Far space

2. Build relationships

- emotions
- attachment
- memory
- attention

Limbic system

Mental space

1. Develop thinking and reasoning skills

- language
- maths
- reading
- writing
- Problem solving
- thinking
- Decision making
- Impulse control

cognitive

cortex
Why focus on Sensory processing?

- A study by Crane, Goddard and Pring in 2009 assessed sensory processing in adults with ASDs using the adult/adolescent sensory profile showed that 94.4% reported extreme levels of sensory processing challenges.

- A study by Tomcheck and Dunn in 2007 of 281 children with ASD between ages 3 and 6 (in comparison with typical kids) using Short sensory profile showed 95% demonstrated sensory processing dysfunction.

- Changes in the DSMV reflect these statistics
Brain and nervous system

- Orients to sensory information
- Tunes in to what is important
- Organizes and processes information
- Makes connection with past experiences
- Stores important information and
- Disregards unimportant information

Understanding and accurate perception of the environment and situation

Appropriate level of arousal, attention, behaviour

Interaction with environment and others

DEVELOPMENT
In each sensory system we can experience meaning and joy or sensitivity and stress.
Neurological shutdown – brain overload

Sensory defensive – fright flight fight

Sensory sensitive
Borderline good stress/ dis-stress

Optimum alertness - Calm yet alert

Low level of alertness

Sensory events throughout the day

Sensory processing and sensory modulation affect levels of alertness and therefore affect learning.
Optimum alertness
Calm and ready to learn
Resilient, able to cope with sensory information and internal state.

# Example of Cameron’s day and changes to arousal levels.

## Shutdown

<table>
<thead>
<tr>
<th>Very High arousal, upset, sensory defensive, Fright/flight/flight</th>
<th>High arousal</th>
<th>Optimum arousal – calm yet alert</th>
<th>Low arousal Vague, sleepy</th>
</tr>
</thead>
</table>

## Events and arousal through day

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Events and arousal through day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before school</td>
<td>Frustrated about losing a Lego piece</td>
</tr>
<tr>
<td>Morning session</td>
<td>Distracted during maths. Needed a run</td>
</tr>
<tr>
<td>Recess</td>
<td>Ran around</td>
</tr>
<tr>
<td>Middle session</td>
<td>Calm and productive</td>
</tr>
<tr>
<td>Lunch</td>
<td>Ran around</td>
</tr>
<tr>
<td>Afternoon session</td>
<td>Started well but became distracted</td>
</tr>
<tr>
<td>After school</td>
<td>Very alert. Repeating questions</td>
</tr>
<tr>
<td>evening</td>
<td>Raced through dinner, finally calmed down.</td>
</tr>
</tbody>
</table>
Neurological shutdown – brain overload

Sensory defensive – fright flight fight

Sensory sensitive
Borderline good stress/ dis-stress

Narrow band of optimum arousal, poor resilience.
Ineffective tools for self regulation

Smells textures confusion
loud sound
stress

Sensory events throughout the day or activity:
Over-responder – sensory defensive

DANGER

Freeze or fornicate
Cells that fire together wire together

Neural network: identity - 15,000 cells firing together

Neural network: anxiety
Too many stress hormones
Learning and neurons

Neural network: identity – 15,000 cells firing together

90 layers = solid learning (tarmac)
With each neural connection a layer of myelin is laid down.

Neurotransmitters:
Seratonin and dopamine
Prepare brain to be more resilient: happy hormones: Serotonin and dopamine

Engage a team of professionals to treat sensory issues, gut problems, intolerances and allergies and provide Tools for communication.

Provide portable strategies and tools for self regulation
Provide sensation that is organising for the brain
Deep pressure and heavy muscle work
Count to 10
Breathe deeply
Social story
Visual Sequence strip
Reward chart
stress

• It is very important that we reduce the amount of stress the person is exposed to.

• Stress has tragic consequences for brain functions – it destroys important pathways of the brain making life a very chaotic and fearful experience.

Learning
Memory
imagination
Emotions and feelings, like wrath, fright, passion, love, hate, joy and sadness, are mammalian inventions, originated in the limbic system. This system is also responsible for some aspects of personal identity and for important functions related to memory.
Attention
Figure out what is going on

Now fold your fingers over your thumb as the cortex is folded over the limbic areas of the brain.

Insight and empathy
Moral judgments
Links to:
Cortex
Limbic system
Brain stem
Signals from social world

Dr. Dan Siegel
Flip your lid:
and head down the low road in interactions with others

Dr. Dan Siegel
Happy hormone no.1 : Serotonin

This would be a picture of red and green blobs if not for the visual information being turned into an electrical impulse and transported to the back of the brain, processed, connected to past experience and interpreted accurately as strawberries.
All of this is influenced by the neurotransmitter serotonin. Without serotonin sensory information cannot be translated into anything meaningful.

Serotonin is also instrumental in the control of:
• Sleep
• Stress and mood
• Learning
• Appetite
• Sensory perception
• Body temperature regulation
• Long muscle contraction

If you are stressed, agitated, anxious, confused... Serotonin levels decrease and brain function is impaired.
Happy hormone no.2 Dopamine

- When dopamine levels are low like in the case of people with Parkinson’s disease it causes uncontrolled movements.
- In neurotypical people – low dopamine can lead us to seek out caffeine, nicotine, stimulants, drugs.
- When dopamine flow is unruly such as for people with ADHD – it results in constant movement.
- For people with Autism, depression, schizophrenia lack of dopamine can lead to sadness, serious issues with motivation, willpower and determination and issues with memory storage and retrieval.

“Life is built around sensations and memories, feelings and facts. If this perfect harmony is disrupted the way it is in autism, life is no longer a smooth line of learning and joy, play and planning, but a series of brutal peaks of sensation which do not make any sense.”
Claudie Pomares Gordon – “Autism is not a life sentence” and Mendability program.
You know, just 30 minutes of exercise a day can reduce depression by 50%.

JUST GIVE ME THE DRUGS!
Happy hormone no.3 Endorphins
Meditation boosts serotonin, endorphins and the neurotransmitter GABA (stabilising mood, anxiety)

Meditation boosts melatonin - hormone needed for restful sleep. Stress lowers melatonin levels.

Meditation decreases levels of stress hormone cortisol.

As scientists are discovering more about the brain we are learning that dysfunctional neurotransmitters (serotonin, endorphins and dopamine) can be included as core issues for inappropriate behaviour. With this in mind it now seems as reasonable to request self control from an obsessive child, or a child engaging in repetitive behaviours, as it is reasonable to tell a flower to change its colour upon request.
“The colour of a flower can be changed by placing a colouring factor at the root of the plant; it will gradually end up changing the most visible part of the flower, its petals. From the root to the petal, the change will happen, but not by summoning the flower to conform to a demand. In the same way, by understanding the roots of the child’s behaviour from a brain perspective’ we can get to higher level functions through developing the foundations of learning and nurturing the growth of brain stem and mid brain functions such as sensory modulation and limbic functions by ensuring that the student understand emotions and is able to store and retrieve memories for learning, socialising and language development.”

Claudie Pomares Gordon –“Autism is not a life sentence” and Mendability program
Happiness heals the brain!!
The nervous system **modulates** sensory inputs throughout the day so that the focus is on important salient information.

- Lights/fan
- Computers
- People talking
- People moving

The typical brain knows that these sounds are different from the pattern of the spoken word “lunch.”

*Concepts from Ellyn Arwood, pictures from Softpics.*
The nervous system **discriminates** sensory inputs throughout the day so that the brain can make sense of what is happening.

- **Lights/fan**
  - what is that light touch tickling my arm?

- **Computers**
  - what is that tapping noise?

- **People talking**
  - what are the people talking about?

- **People moving**
  - they are dancing, is it dangerous, will I fall over?

- **Teacher talking**
  - hmmm, I think I’ll ignore her!!

*Concepts from Ellyn Arwood, pictures from Softpics.*
How does a child learn concepts?

Conceptual understanding:
Child knows that this round object is an orange and not a ball.
Child develops understanding of the possibilities and affordances of an object

By Ellyn Lucas Arwood & Carole Kaulitz.
Conceptual learning

The child does not have a conceptual Image In his head. He simply copies without meaning

- echolalia, copying or imitating does NOT improve language or the meaning of concepts

The child writes down what is on The board but has not been able To match this writing with a conceptual Image in her head.

By Ellyn Lucas Arwood & Carole Kaulitz.
Let’s play T-ball

A student is “teachable” when the mental image and plan in the teacher’s mind matches the image and plan in the student’s mind.
Too much touching
Your voice is right in my ear
Breath down my neck
Your aftershave makes me feel sick

Let’s play T-ball

For many of our students the scenario looks more like this.
It is impossible for the messages to move past the limbic system into the cortex because the sensory experiences are bombarding him and he is going into fright, fight or flight mode.
Common scenarios for students with poor sensory processing, insufficient concept formation and poor motor planning/ideation.

Sid sees all the balls. He can’t separate them visually.

Alex starts to count the balls. As soon as he is Confused he starts to count.

Adam will throw and kick them. He is over stimulated.

Nina will ignore the balls. She is fixated by the Leaves on the tree.
To assist each of these students to participate in the game of t-ball we will need to consider:

- Sensory modulation (reduce distraction and prepare brain for learning for example new skills are taught after the student has participated in an regulating/organising physical activity such as swimming, trampoline, swinging)
- Praxis, motor planning and ideation. (break down the steps and teach each step). Has the student understood the idea, purpose and process of playing T-ball? Can they motor plan the steps of holding the bat, aiming and swinging with force? Adapt equipment (e.g. balloon on string first)
- Episodic memory – cells that fire together wire together – use repetition, video modeling, visual memory book
- Processing time – allow the student to observe first and join in when ready.
- Predictable activities- include visual timetable and an explanation board of the steps involved in t-ball
Temple Grandin’s “hug” machine

Temple Grandin is an adult with autism. In her books, she described her severe anxiety and how her discovery of deep pressure ultimately helped her reduce the anxiety's debilitating effects. During her childhood years, Temple would crave deep pressure and would crawl under sofa cushions or wrap herself in blankets to provide pressure. She said she could not obtain the 'right' amount of pressure from people because they either gave her too much deep pressure or too little. "People would touch me and I would just pull away. You know, the way my nervous system reacts when I panic is just like the nervous system of cattle or a horse when they panic” says Temple.

Temple devised a hug machine during a visit to her aunt's ranch in Colorado, where she noted the way cattle were vaccinated while confined in a squeeze chute, and how some of the cattle immediately calmed down after pressure was administered. Temple reasoned that the deep pressure from the cattle chute led to an overall calming effect and found her own hug machine helped to settle her "over-stimulated nerves."
Wendy lawson has also taught us a great deal about what it is like to be on the autism spectrum. She describes the autistic brain as being monotropic - that is a brain that is highly focused and only able to do one thing at a time. She says: “School was a nightmare! I was so easily caught away with life's interruptions. It might have been a child coughing, a bus passing by on the road outside, a bird singing, or simply my own thinking trying to work out words from a previous conversation. I couldn't organise either myself, or my time. I knew that I didn't 'fit' anywhere. Even when I tried to talk to my peers, somehow my words only compounded the issue. My father once said to me "make friends Wendy". I knew how to make a rice pudding, I even knew how to make my dog sit, but I had no idea how to make friends!
Neuro-typical person:
Polytropism – multiple diffuse interests
Quick and dirty

Wendy Lawson – adult with high functioning autism:
Monotropism – highly focused interests take precedence
Narrow and deep
Autism Is: Wendy Lawson

Autism is: being present in this world,
But not entirely of it.
I am one step removed and curled,
The switch just doesn’t click.
I perform the role of my perception,
And play many parts so well.
But minus files for my redemption,
My part in life I cannot tell.
Life is like a video,
I watch but cannot partake.
My uneven skills are but an echo,
Of the frustrations which I hate!
However, my focused use of time and space,
I would not give away.
I know that I am especially placed,
For some developed career one day!
Take home message: Happiness heals the brain
REFERENCE AND RESOURCE LIST

Answers to questions teachers ask about sensory integration. Jane Koomar, Carol Kranowitz, Stacey Szklut


Sensory Processing in daily life: issues for home and school workshop presented by Winnie Dunn (2002) at Sydney University.


Learning through the senses resource manual. The impact of sensory processing in the classroom. Territory Health Services. Northern Territory Government
Out of Sync Child. Carol Stock Kranowitz
The Out of Sync Child Has Fun. Carol Stock Kranowitz
Sensory Integration and the Child. Jean A Ayers
The Hidden Senses: You’re Balance Sense. Jane Koomar & Barbara Friedman
The Hidden Senses: You’re Muscle Sense. Jane Koomar & Barbara Friedman
Watch Me, I Can Do It. Neralie Cocks
Skipping Not Tripping. Neralie Cocks
Building Bridges through sensory integration. Ellen Yack & Paula Aquilla, & Shirley Sutton
Paediatric Disorders of Regulation in Affect and Behaviour Georgia DeGangi (2000)
• The M.O.R.E model by P. Oetter, E. Richter, S. Frick
• Therapeutic Listening – Listening with the whole body by Sheila Frick course notes.
• The Alert Program – How does your engine run by Mary Sue Williams and Sherry Shellenberger
• Astronaut training – Mary Kawar course notes 2011
• Praxis course notes by Teresa May-Benson (Sensory Tools Symposium- August 2012)
• Anita Bundy and Shelley Lane course notes (Sensory Potential – June 2012)
• NDT, SI and play course notes by Lezlie Adler September 2011.
• Thinking in pictures by Temple Grandin

• Notes and thoughts from article: Trauma and Attachment-informed sensory integration assessment and intervention by Jane Koomar PhD, OTR (2009)

- Wendy Lawson’s website: http://www.mugsy.org
- Temple Grandin’s website: www.templegrandin.com
- Wrong planet – Autism community: www.wrongplanet.net
- Dr. Dan Siegel – www.drdansiegel.com ("flip you lid", "mindsight" and other neurological concepts)
- Engaging Autism (2006); Greenspan, S. and Wieder, S.
- Autism Society of America: www.autism-society.org
- www.sensory-processing-disorder.com

To find these books and for more information, useful resources are: www.sensorytools.com.au www.amazon.com.au www.therapybookshop.com