Tactile Perception in the ASD Population: A psychophysics investigation into tactile thresholds and their related sensory experiences.

- Tactile sensitivity in ASD.
- A comparison of Sensory experiences in ASD and typically developing peers.
- Establishing tactile thresholds.
- A relationship between tactile perception and physical thresholds.

Saffron Morris
Autism is a neurodevelopmental disorder characterised by two core symptoms; social communication/social interaction and **restricted, repetitive patterns of behaviour**.

Recent inclusion of hyper- or hyporeactivity to sensory stimuli and unusual interest in the environment’s sensory features.

(DSM-V: American Psychological Association [APA], 2013)

**Tactile Sensitivities in ASD**

- Tactile abnormalities have a high prevalence in ASD 95% prevalence.
  
  (Tomcheck and Dunn, 2007)

- Avoidance response or Sensory seeking behaviours.

- Discriminates ASD group from both peers with no disability and from other developmental disorders.
Cascio, Lorenzi and Baranek (2013)

**Pleasantness task:**
- Passive touch of an unpleasant, pleasant and social stimuli.
- Three bodily sites - perioral, forearm and thenar.
- Smiley face 5-point Likert scale to rate pleasantness.

**Examiner coding:**
- Coding of immediate responses to stimuli after each trial.
- 0-3 scale of defensiveness coding responses ranging from no negative reaction - severe negative reaction.

**Sensory measure:**
- The Sensory Experiences Questionnaire version 2.1

**Findings:**
1) ASD group had higher defensive reactions than controls.
2) Tactile defensiveness and social impairment were positively correlated when the tactile stimulus was applied to a bodily site associated with social touch.
Blakemore et al. (2006)

Investigated vibrotactile thresholds:

- Method of limits procedure to determine thresholds for 200Hz and 30Hz.
- Tactile perception threshold was lower in the ASD group than controls for 200Hz.
- ASD group were hypersensitive to vibratory stimuli at the higher frequency.

Investigated whether self-produced movement influenced tactile perception:

- 0-10 rating scale of a tickle stimulus with either externally or self-produced movement.
- Ratings for Intense, Painful, Tickly, Irritating and Pleasant.
- More ASD participants rated the stimulus as painful or irritating.
- ASD group had higher ratings than controls for ‘Intense’ when self-produced.
- ASD group had higher ratings for ‘Tickly’ for both externally and self-produced touch.
Objectives:

- Investigate the differences between typically developing adolescents and adolescents with ASD in tactile perception and three tactile discrimination thresholds.

- Investigate the correlation between psychophysics data analysing tactile discrimination thresholds and tactile hypo- hypersensitivity identified by Dunn’s Sensory Profile. 
  (Brown & Dunn, 2002)

Research Questions:

1) Do individuals with ASD differ to typically developing peers in tactile sensory experiences.

2) Does ASD affect tactile discrimination thresholds.

3) Is there a relationship between tactile perception and physical tactile thresholds.
Participants:

<table>
<thead>
<tr>
<th>ASD Group</th>
<th>Typically Developing Control Group</th>
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<tbody>
<tr>
<td>13 adolescents (N=2 female, N=11 male)</td>
<td>13 adolescents (N=4 female, N=9 male)</td>
</tr>
<tr>
<td>Mean age =13.5 years (SD=1.6 years)</td>
<td>Mean age=13.3 years (SD=1.7 years)</td>
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- Participants were matched on chronological age and verbal IQ.

The Autism Diagnostic Observation Schedule (ADOS):

- Diagnoses of an ASD were confirmed using the Autism Diagnostic Observation Schedule. *(Lord, Rutter, Dilavor, & Risi, 1999)*
- Semi-structured assessment of communication, social interaction and imaginative play.
- Allows for an accurate assessment of autism across ages and language skills.
Adolescent/Adult Sensory Profile (AASP):

- Sensory experiences were measured using the AASP.  
  (Brown & Dunn, 2002)

- 20-30 minute assessment of everyday sensory issues suitable for individuals with or without disabilities.

- 60 items measuring:

- The AASP generates sensory profiles about an individual's general response to sensations across four quadrants:
  1) low registration
  2) sensory sensitivity,
  3) sensory seeking and
  4) sensory avoidance.
Light touch threshold

- Semmes-Weinstein monofilament test.
- Measuring diminishing cutaneous perception.
- Testing began with a midrange monofilament (monofilament F).
- Calibre was reduced until stimulation was no longer reliably identified.
- Threshold was taken as the finest monofilament participants could successfully identify the monofilaments presence three times.
Fine and coarse texture discrimination thresholds:

- Participants were either blindfolded (A) or the stimuli was hidden from view inside a box (B).

- Two sets of Tufset gratings (one coarse set and one fine set).

- The sets of gratings ranged in ridge width and height and spatial period of the ridges.

- In each trial participants were required to identify which felt smoother (for the fine gratings set) or which felt rougher (for the coarse gratings set) from a standard grating and a test grating.

- The task consisted of 16 trials - threshold was derived from the average of the last 12 trials.
Tactile Acuity:

- Grating orientation threshold with JVP domes.
- A measure of spatial resolution for 2 point discrimination threshold.
- The JVP domes were placed either vertical or parallel to the axis of the finger.
- Participants were instructed to identify whether the gratings were ‘along’ or ‘across’
- Initial grating of 2mm spatial period.
- The experiment was stopped after the participant incorrectly identified the orientation of the grating 8 times.
Overall on the AASP:
- On over 85% of the measures the ASD group showed more sensory behaviours than the population norms of the sensory profile.
- ASD group had significantly higher scores on eight of the categories.
- There was a significant difference between groups on sensory seeking and sensory avoidance behaviours.

Within the tactile processing category:
ASD group displayed higher scores for both hypertactile and hypotactile perception and touch processing.
Tactile thresholds:

- No significant differences between groups for GOT and texture discrimination.
- Monofilament test suggests that the ASD group were hyposensitive to light touch.
- ASD group had a significantly higher light touch threshold.
- Higher variance for light touch within the ASD group.
A significant correlation was found between the grating orientation threshold and fine texture discrimination threshold in the ASD group ($p=0.002$), but not in the control group ($p=0.30$).

Individuals who exhibited lower GOT also had lower fine texture discrimination.
A correlation was found between hypertactile scores on the AASP and coarse texture discrimination thresholds in the ASD group ($p=.016$), but not for the control group ($p=.397$).

- Higher scores for hypertactile perception decreased coarse texture threshold.
1) **Do individuals with ASD differ to typically developing peers in tactile sensory experiences.**
   - Adolescents with ASD vary from their typically developing peers for sensory experiences.
   - Adolescents with ASD displayed higher levels of atypical sensory behaviours.
   - The Adolescent/Adult Sensory Profile found that the ASD group displayed both hyper-reactivity and hypo-reactivity to tactile experiences.

2) **Does ASD affect tactile discrimination thresholds.**
   - The ASD hyposensitive to light touch.
   - Lower GOT was related to lower fine texture discrimination thresholds in the ASD group.

3) **Is there a relationship between tactile perception and physical tactile thresholds.**
   - Hypertactile scores on the AASP were linked to coarse texture discrimination threshold in the ASD group.
   - As hypertactile levels increased the coarse texture discrimination threshold lowered.
Thank you for Listening.

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