Can you tell it by the prime: Metaphorical priming in high-functioning autism in comparison with matched controls

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Autism spectrum disorder (ASD) - developmental disorder characterized by

- Impaired social interaction and communication
- Stereotyped and repetitive patterns of behaviour
LANGUAGE IN ASD

ASD may significantly affect language and communication, and many individuals with ASD do not develop fluent language due to comorbidity with other impairments, such as Language Impairment (LI).
HIGH FUNCTIONING AUTISM (HFA)

• Structural language skills
• Normal to above average intelligence
• Enhanced abilities/talents in certain areas

+• Pragmatic aspects of language (Landa, 2000, Volden, Coolican, Garon, White and Bryson 2009, Vulchanova et al., 2012; Vulchanova et al., 2015)

-• Weaknesses in figurative language contra clear strengths in areas of grammar (Vulchanova, et al 2012)
Difficulty to understand idiomatic expressions

Chahboun et al. (2016)
The current study

Aim
Responses to metaphorical expressions and whether or not metaphors solicit priming for literal or rather the appropriate figurative interpretation in high-functioning children and adolescents with ASD

Hypotheses
Increased latencies in ASD groups
Decreased priming effect in ASD groups
METAPHORS selected for study
Conventional vs. Novel

Familiarity and frequency
Time

- Prime
  + Fixation point 500ms
  - Latency 400ms
  - Target

Is this a word in Spanish?

- YES
- NO

A Literal semantic relation
- vena malvada (evil vein)
  - sangre (blood)

B Metaphorical semantic relation
- verdad tardía (delayed truth)
  - inútil (useless)
Participants

ASD
Autism Diagnostic Observation Schedule (ADOS)

Matched on:
• Age: 10 – 12 years & 16-22 years
• Gender
• IQ (WISC/WAIS-IV)
• Verbal comprehension (WISC/WAIS-IV)

Predictor variables
• Theory of mind (first & second order)
• Verbal comprehension (WISC/WAIS IV)
• Receptive vocabulary size
• Receptive grammar (CEG-TROG)

<table>
<thead>
<tr>
<th></th>
<th>Young adults</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD</td>
<td>N=20</td>
<td>N=22</td>
</tr>
<tr>
<td>TD</td>
<td>N=18</td>
<td>N=22</td>
</tr>
</tbody>
</table>
RESULTS:

Average response speeds (in response per second) for each age (children/young adults) and group (control/ASD).

![Graph showing mean response speeds for different groups and age categories, with error bars indicating standard error. The graph is labeled with categories: ASD Children, ASD Young Adults, Control Children, Control Young Adults.]
Difference in response speed for trials with a literal relation between prime and target and trials with a metaphorical relation between prime and target for each age (children/young adults) and group (control/ASD). Positive values indicate faster responses on trials with a literal relation between prime and target.
General response speed for each condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean Response Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>conv lit aud</td>
<td>1.20</td>
</tr>
<tr>
<td>conv met aud</td>
<td>1.25</td>
</tr>
<tr>
<td>conv lit text</td>
<td>1.30</td>
</tr>
<tr>
<td>conv met text</td>
<td>1.35</td>
</tr>
<tr>
<td>nov lit aud</td>
<td>1.40</td>
</tr>
<tr>
<td>nov met aud</td>
<td>1.45</td>
</tr>
<tr>
<td>nov lit text</td>
<td>1.50</td>
</tr>
<tr>
<td>nov met text</td>
<td>1.55</td>
</tr>
</tbody>
</table>

Error Bars: +/- 1 SE
Difference in response speed for trials with primes presented as text and trials with primes presented as audio for each Age (children/young adults), Group (control/ASD) and Type of Expression. Positive values indicate faster responses on trials with primes presented as text. Error bars denote one standard error of the mean.
Difficulty to understand metaphors

Chahboun et al. (2016) You can tell it by the prime: A study of metaphorical priming in high-functioning autism in comparison with matched controls. (submitted).
## Correlations with predictors: Overall performance

<table>
<thead>
<tr>
<th>AGE/GROUP</th>
<th>Correlated measures</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD children</td>
<td>Accuracy and verbal comprehension</td>
<td>$r = .474; n=22; p = .026$</td>
</tr>
<tr>
<td>ASD children</td>
<td>Accuracy and receptive grammar</td>
<td>$r = .429; n=22; p &lt; .001$</td>
</tr>
<tr>
<td>ASD young adults</td>
<td>Speed and receptive vocabulary size</td>
<td>$r = .515; n=19; p = .02$</td>
</tr>
</tbody>
</table>
## Correlations with predictors: Visual vs. auditory modality condition

<table>
<thead>
<tr>
<th>AGE/GROUP</th>
<th>Correlated measures</th>
<th>Modality</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD young adults</td>
<td>Receptive vocabulary size and speed</td>
<td>Visual</td>
<td>$r = .514; n=19; p = .024$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Auditory</td>
<td>$r = .472; n=19; p = .041$</td>
</tr>
<tr>
<td>ASD children</td>
<td>Accuracy and verbal comprehension</td>
<td>Auditory</td>
<td>$r = .518; n=22; p = .014$</td>
</tr>
<tr>
<td></td>
<td>Accuracy and receptive grammar</td>
<td>Auditory</td>
<td>$r = .475; n=21; p = .029$</td>
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</tbody>
</table>
### Correlations with predictors: Metaphorical vs. Literal prime condition

<table>
<thead>
<tr>
<th>AGE/GROUP</th>
<th>Correlated measures</th>
<th>Prime condition</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD children</td>
<td>Accuracy and verbal comprehension</td>
<td>Literal</td>
<td>$r=.437; n=22; p=.042$</td>
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<tr>
<td>ASD young adults</td>
<td>Speed and receptive vocabulary size</td>
<td>Metaphorical</td>
<td>$r=.550; n=19; p=.015$</td>
</tr>
<tr>
<td>ASD children</td>
<td>Accuracy and verbal comprehension</td>
<td>Metaphorical</td>
<td>$r=.426; n=22; p=.048$</td>
</tr>
</tbody>
</table>
Linear regression model for ASD children's accuracy and verbal comprehension scores.
Linear regression model for ASD young adults' speed and receptive vocabulary size.
Discussion

• Main effect of group – ASD participants are significantly slower
• Main effect of age – younger participants are slower (language processing still developing)
• Different developmental trajectory for ASD – a delay (ASD young adults similar to control children)
• Development also in ASD
• Conventional metaphors are the most challenging category
• Novel metaphors are easier
✓ Role of transparency
✓ Most likely invoke «literal»/compositional interpretation
Control group only

• Effect of modality
✓ Novel metaphors faster in auditory modality
✓ Conventional metaphors faster in visual modality
• No language measure predicts performance in controls
✓ More developed language competence?
✓ Strategies in task do not rely on the competencies tested?
ASD

• ASD young adults – systematic relationship b/n performance speed and receptive vocabulary (in both modalities)

• ASD children – verbal comprehension and accuracy (overall model and in auditory modality)
Acknowledgments

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