# Beyond Theory of Mind:
# Exploring Pragmatic Language in Autism Spectrum Disorders

Greta Mazzaggio                     *Universidad de Valladolid, March 8, 2024*

# Main Topics

- Autism Spectrum Disorders: a focused overview

- Experiment 1: Pronouns production

- Experiment 2: Scalar and Ad-hoc implicatures comprehension

- Experiment 3: Verbal irony comprehension

- Conclusions

# Autism Spectrum Disorders: a focused overview
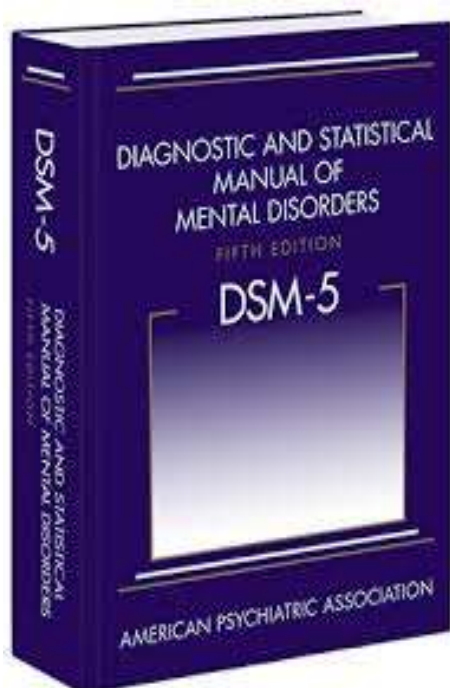
# Linguistic skills in ASD

- The last three decades have witnessed a **significant increase in our understanding of autism**, encompassing various aspects from behavioral to neurocognitive to biological. Scientific interest in language in autism has also followed this positive trend.

- As more and more evidence becomes available from experimental and clinical studies, autism research also becomes increasingly important for more **<u>foundational debates about the nature of linguistic competence</u>**.
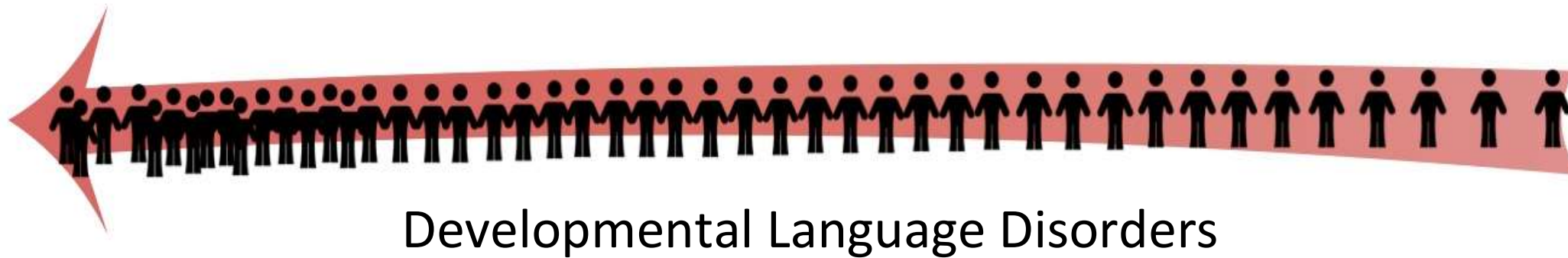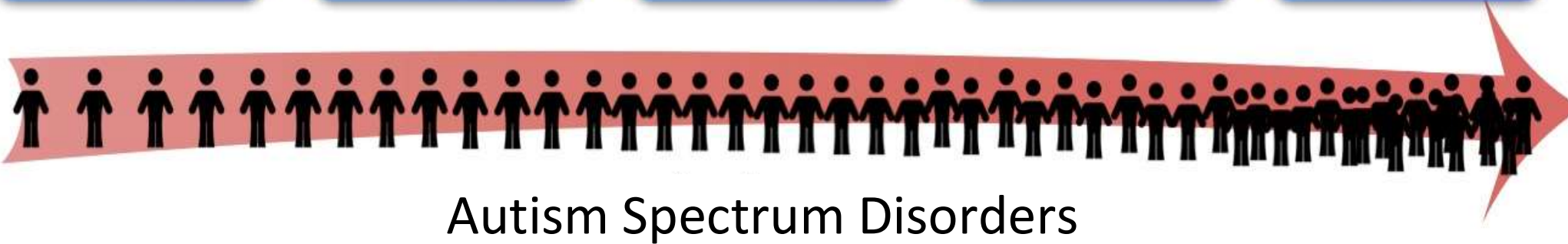
[Kissine, 2021]

# Linguistic skills in ASD

- In the **DSM-5** (APA 2013) and **ICD-11** (WHO2022), **language deficits are no longer diagnostic criteria**.

- On one side, in clinical settings, the language skills of autistic children are often not fully assessed and – even when they are – subtle distinctions between different linguistic abilities are often overlooked.

[Kjelgaard & Tager-Flusberg, 2001; Panzeri et al., 2022; Schaeffer et al., 2023]

# Linguistic skills in ASD

- On the other side, in many countries, the primary reason parents seek formal evaluation and diagnosis is **delayed communication** or **poor linguistic abilities** compared to peers of the same age. This suggests that a significant portion of autistic children face challenges with language.

- Research show **diverse language profiles in ASD**, with some children having intact language skills while others display impairments similar to **Developmental Language Disorder** (DLD).

[Kozlowski et al., 2011; Schaeffer et al., 2023]

# Linguistic skills in ASD



Phonetics & phonolgy | Morphology | Syntax | Semantics | Pragmatics

Autism Spectrum Disorders

Developmental Language Disorders

[Kissine, 2017]

# Communication in ASD

- This problems in handling **nonliteral language** have been spelled out as a core feature of autism since the very beginning

→ Kanner (1944) mentioned that autistic individuals tend to display excessive "literalness"

→ Asperger (1944/1991) suggested that they usually lack the understanding of jokes.

# In sum

Despite the phenotypical variability in the <u>severity</u> and <u>heterogeneity</u> of linguistic and intelligence profiles of abilities          [Silleresi et al., 2020; WHO, 2018]
→ **Pragmatics** is acknowledged as the most consistently and universally impaired linguistic domain in autism

[a.o.,Baron-Cohen, 1988; Dewey & Everard, 1974; Tager-Flusberg et al., 2005]

→even in those individuals who score in the normal range on tests of IQ and display structural language skills in the norm.

# Pragmatics

| LINGUISTIC FUNCTIONS | NON-LINGUISTIC FUNCTIONS |
|---|---|
| Register's choice | Eye-contact |
| Turns negotiation | Body language |
| Referential expressions' choice (eg. a VS the) | Face expressions |

# Pragmatics and the role of the other



LISTENER

Social background

knowledge

Interests

Motivations
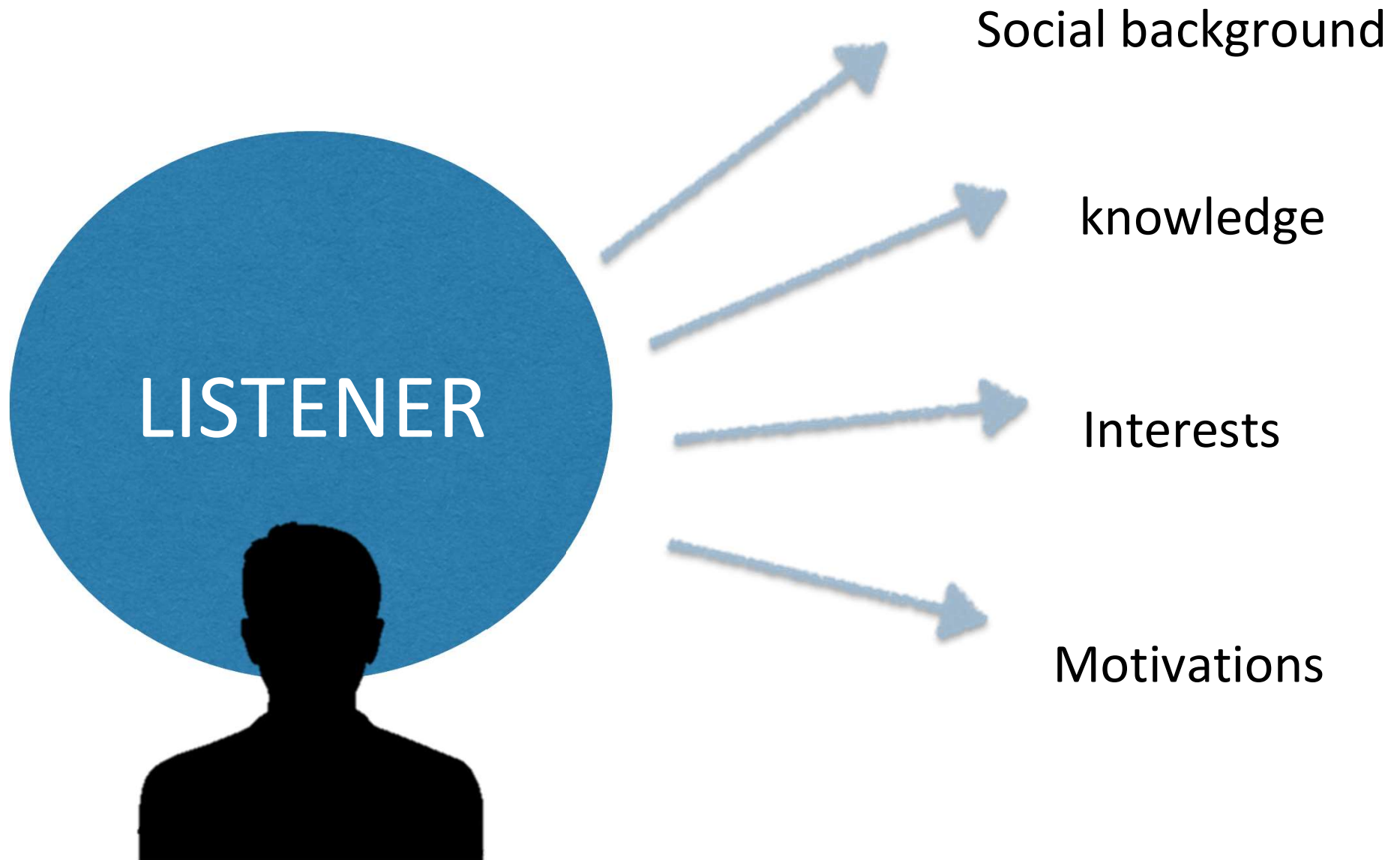
# Pragmatic Impairments

- Inappropriate topic change (Chin & Bernard-Optiz, 2000)
- Difficulties in adapting the register (Frith, 1989)

- Difficulties with non-literal language (Happé, 1995): jokes (Baron-Cohen, 1997; Reddy et al., 2002), irony (Happé, 1993), metaphors, indirect speech act (e.g. Paul & Cohen 1987; MacKay & Shaw 2005), implicatures (e.g., Mazzaggio et al. 2021)

- Difficulties with deixis (eg. pronouns: Cheng, 2012; Mazzaggio & Shield 2020)


→ Is there a common reason?

→ Linguistic and pragmatic assessment in ASD may be complex due to **interactions with other cognitive areas** like Theory of Mind, executive functions, working memory, and non-verbal reasoning.

# PERSONAL PRONOUNS

# Is it easy to learn a pronoun?

**Person & gender** - are you talking about:

yourself → [1st Person]: I/me/my/mine

someone else → [2nd Person]: you/your/yours

[3rd Person]: **he/him/his/**
**she/her/hers/**
**it/its**

# Is it easy to learn a pronoun?

**Case to use** - what function does the pronoun have in the sentence?:

Nominative, Subjective → I/you/he/she/it

Objective → me/you/her/him/it

Adjectival Genitive or Nominal Genitive →
my/your/his/her/its or mine/your/his/hers/its

Reflexive → myself/yourself/himself/herself/itself

# Is it easy to learn a pronoun?

Pronouns designate speech roles → The individuals they identify shift according to who is speaking
[Chiat,1986]

- Speaker (1° person pronominal form)
- Addressee (2° person pronominal form)
- Non-participant (3° person pronominal form)

# Wechsler: "De se" Theory

- "first- and second-person indexical pronouns indicate *reference de se* (also called *self-ascription*)"

- Self-ascription in Wechsler is the ascription via a "self-notion" and we can express it throughout the **"self-notion axiom":**

$$\forall x \, [\text{ContentOf} \, (^x n_{self}) = x]$$

- In other words, for any agent x, the self-notion of x gives back x; the first-person pronoun is grammatically specified in order for a speaker to refer to herself via her self-notion, while the second-person pronoun is grammatically specified in order for an addressee to refer to herself via her self-notion.
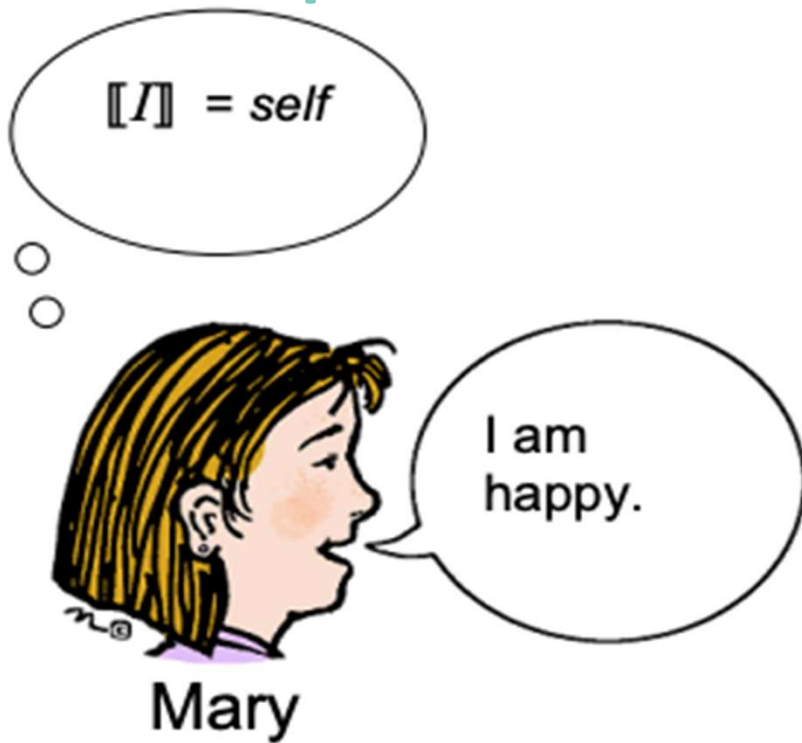
[Wechsler, S., 2010]

# Wechsler (2010): "De se" Theory

Rule relevant to 1st person pronouns:

- **Speaker rule for 1st pers**.: Speakers should self-identify as the referent of any 1st person pronoun that they utter.

- **Addressee** rule: none (see Grice's cooperative principle)
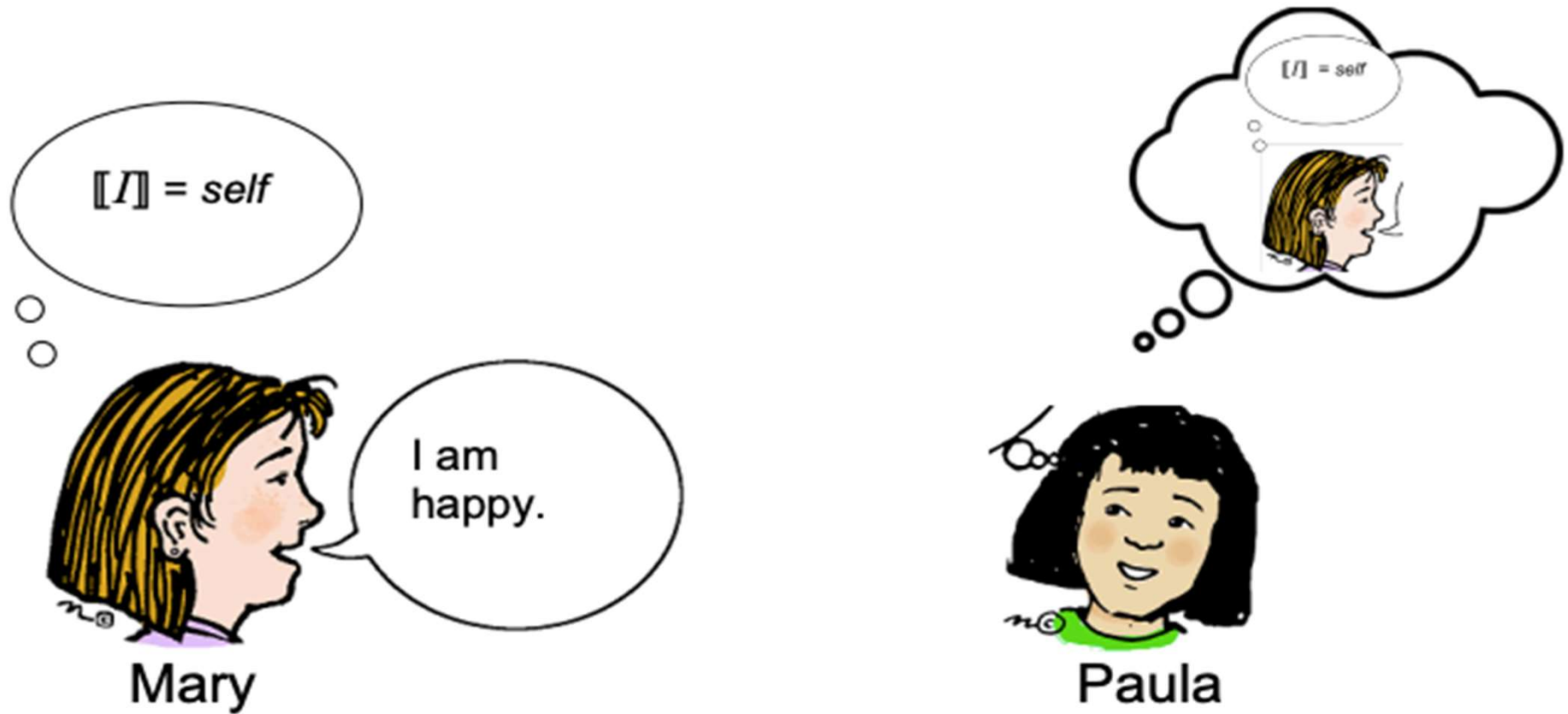
Consequence: An addressee hearing a 1st person pronoun assumes the speaker has applied the Speaker Rule for 1st perss.

# Speaker rule for 1st person



Speaker Rule for 1st pers.: Self-identify as the referent of any 1st person pronoun that you utter.

[Slides from Wechsler, S.]
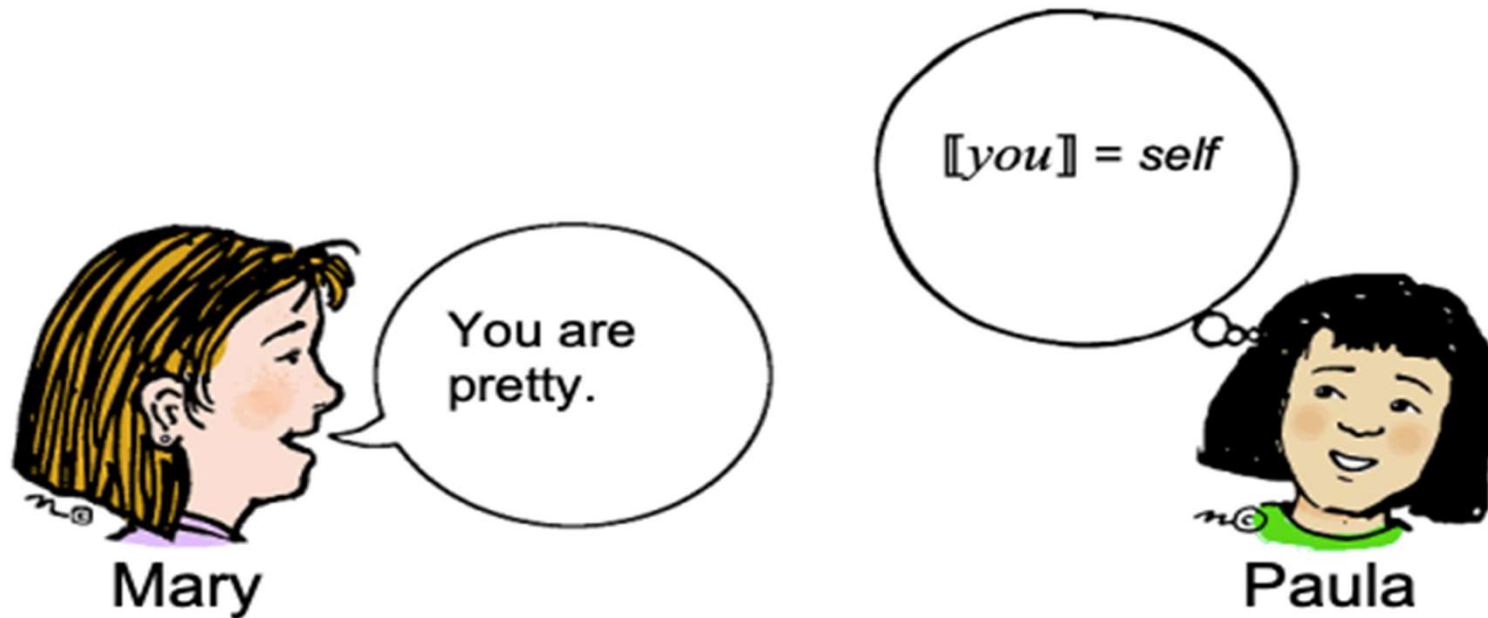
# Addressee role for 1st person

# Wechsler (2010): "De se" Theory

Rule for 2nd person pronouns:

- **Addressee** Rule for 2nd pers.: Addressees should self-identify as the referent of any 2nd person pronoun that they hear.

- **Speaker** rule: none (see Grice's cooperative principle)

Consequence: A speaker says *you* when he wants the addressee to apply the Addressee Rule for 2nd pers.
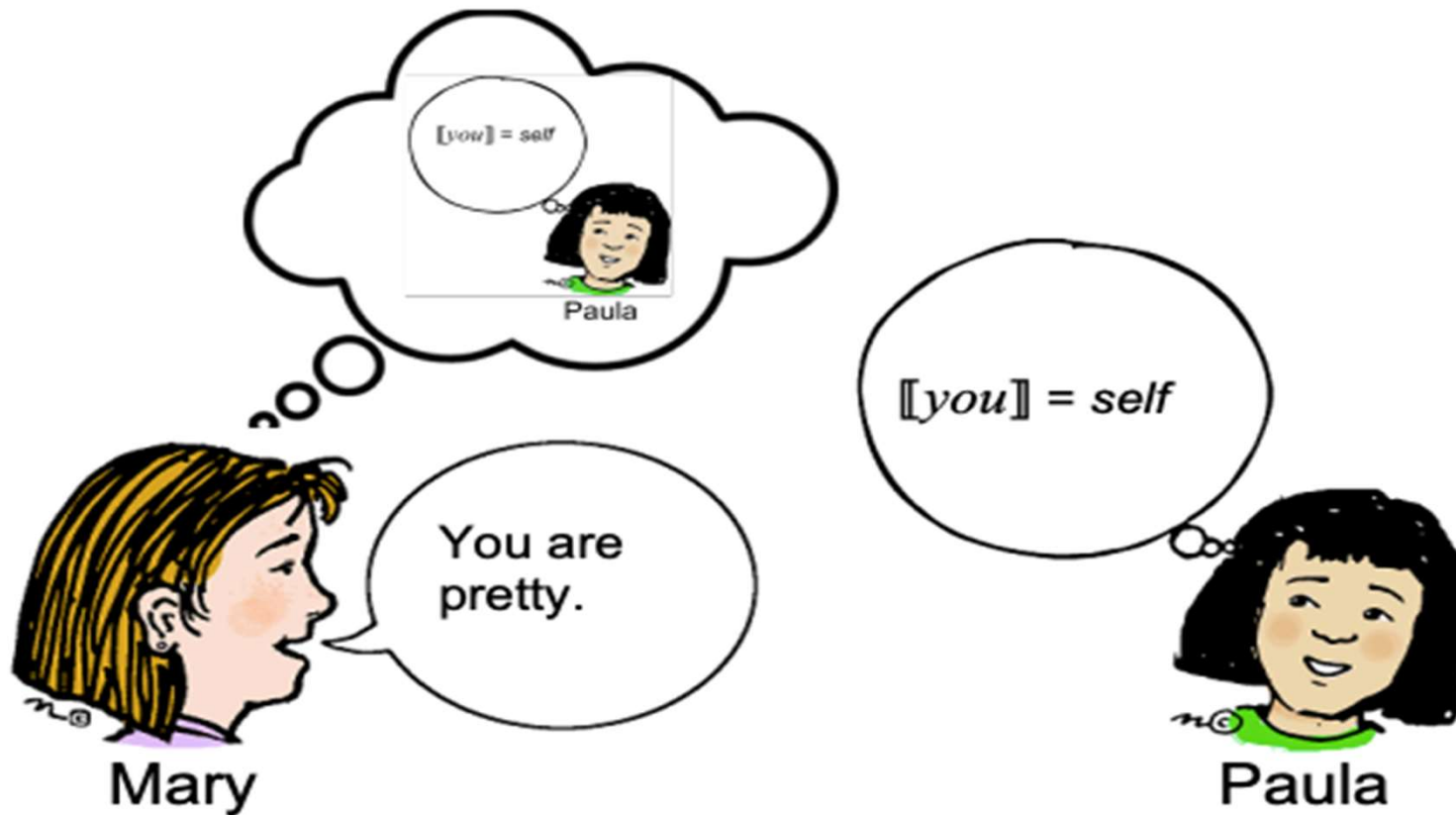
# Addressee rule for 2nd person



Addressee Rule for 2nd pers.: self-identify as the referent of any 2nd person pronoun that you hear

⇒ Paula self-ascribes prettiness.

# Speaker role for 2nd person



A speaker says *you* when she wants the addressee to apply the Addressee Rule for 2nd pers.

[Slides from Wechsler, S.]

# "De se" Theory and ToM

| | Production | Comprehension |
|---|---|---|
| 1st person singular pronoun *I* | Self-ascription = Acquired earlier | **ToM** = Acquired later |
| 2nd person singular pronoun *You* | **ToM** = Acquired later | Self-ascription = Acquired earlier |

# Pronoun acquisition in typically developing children

→ Wechsler's theory: Proved with Italian TD children                    [Mazzaggio,  2016]

- Before children use pronouns at the same level as adults, two kind of errors have been observed in literature:
  - pronoun avoidance
  - pronoun reversal

# Pronoun acquisition in ASD

"Personal pronouns are repeated just as heard, with no change to suit the altered situation. The child, once told by his mother, "Now I will give you your milk," expresses the desire for milk in exactly the same words. Consequently, he comes to speak of himself always as "you," and of the person addressed as "I." Not only the words, but even the intonation is retained. (Kanner 1943)

**BRIEF REPORT**

# The Production of Pronouns and Verb Inflections by Italian Children with ASD: A New Dataset in a Null Subject Language

Greta Mazzaggio[1] · Aaron Shield[2]

## Abstract

The language of children with autism spectrum disorder (ASD) is often characterized by difficulties with pronouns. The underlying reasons for such difficulties are still unclear. This study is the first to test the abilities of children with ASD who speak Italian, a language in which overt subject pronouns are optional but verbs obligatorily feature person-referencing morphology. We found that Italian children with ASD were less accurate than typically-developing (TD) Italian children in the production of first-, second-, and third-person singular pronouns, avoiding pronouns in favor of nouns or names more often than controls. Moreover, children with ASD produced more overt pronouns than null pronouns in marked contexts, compared to TD children. These phenomena can be accounted for by difficulties with pragmatics.

**Keywords** Autism spectrum disorder · Pronoun production · Pronoun avoidance · Language development
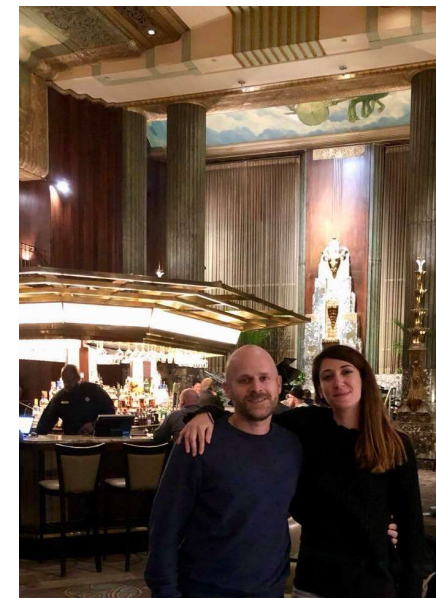
# Participants

| | TD children N=35 | | Children with ASD N=26 | | Mann–Whitney U |
|---|---|---|---|---|---|
| | Mean (SD) | Range | Mean (SD) | Range | |
| Age | 5.45 (.45) | 4.75–6.38 | 7.26 (2.03) | 3.73–10.29 | $U=250.5; p=.003$ |
| Raven's raw score | 20.86 (4.64) | 12–30 | 24.50 (6.56) | 11–36 | $U=304.5; p=.03$ |
| Syntax | 28.11 (6.23) | 13–39 | 28.81 (5.96) | 19–39 | $U=455.0; p=1.0$ |
| ToM | 4.29 (1.54) | 1–7 | 2.00 (1.33) | 0–7 | $U=694.0; p<.001$ |

## Match for linguistic skills.

# Task: Lee et al. (1994) and Shield et al. (2015)

- "Who is this person?"
- "What's happening in this picture?"

# Results
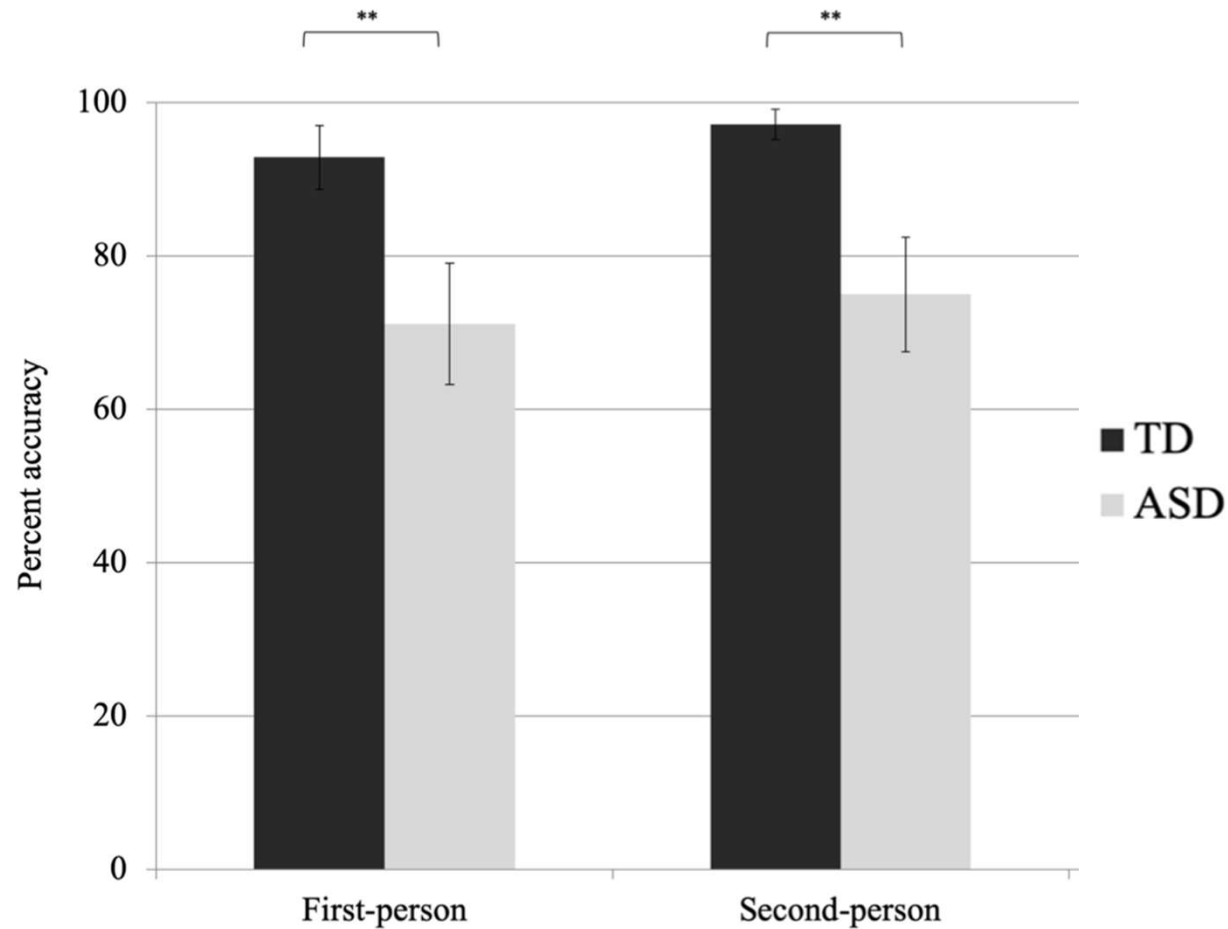


The groups differed in their overall production of first- and second-person pronouns and verbs in response to both questions, with TD children producing the correct pronominal and verb forms significantly more often than ASD children (first-person: $p$ = .006; second-person: $p$ = .003).

Number and percentages of correct and incorrect uses of the **first-person pronoun** in response to the first ("who is this person?") and second questions ("what's happening in this picture?") for the two groups

| | TD children Number of occurrences (%) | Children with ASD Number of occurrences (%) |
|---|---|---|
| Question 1 | | |
| First-person overt correct pronoun (*io*) | 33 (94.3) | 19 (73.1) |
| First-person error: proper name | 2 (5.7) | 6 (23.1) |
| First-person error: tonic form (*me*) | 0 (0) | 1 (3.8) |
| Question 2 | | |
| First-person correct, unmarked use (*null pronoun + first-person inflected verb*) | 31 (88.5) | 13 (50) |
| First-person correct but marked use (*overt pronoun + first-person inflected verb*) | 1 (2.9) | 5 (19.2) |
| First-person error (*null pronoun + verb infinitive*) | 1 (2.9) | 2 (7.7) |
| First-person error (*null pronoun + third-person inflected verb*) | 2 (5.7) | 4 (15.4) |
| First-person error (*proper name + 3rd-person inflected verb*) | 0 (0) | 2 (7.7) |

Number and percentages of correct and incorrect uses of the **second-person** pronoun in response to the first ("who is this person?") and second questions ("what's happening in this picture?") for the two groups

| | TD children Number of occurrences (%) | Children with ASD Number of occurrences (%) |
|---|---|---|
| Question 1 | | |
| Second-person overt correct pronoun (*tu*) | 33 (94.3) | 22 (84.6) |
| Second-person error: experimenter's proper name | 2 (5.7) | 0 (0) |
| Second-person error: other third-person reference | 0 (0) | 4 (15.4) |
| Question 2 | | |
| Second-person correct, unmarked use (*null pronoun + second-person inflected verb*) | 34 (97.1) | 13 (50) |
| Second-person correct but marked use (*overt pronoun + second-person inflected verb*) | 1 (2.9) | 4 (15.4) |
| Second-person error (*null pronoun + 3rd person inflected verb*) | 0 (0) | 3 (11.6) |
| Second-person error (*DP + 3rd person inflected verb*) | 0 (0) | 4 (15.4) |
| Second-person error (proper name without a verb) | 0 (0) | 1 (3.8) |
| Second-person error (mentioning object in the picture, no pronoun, no verb) | 0 (0) | 1 (3.8) |

# Discussion

- The data suggests that Italian ASD children can generally acquire and use pronouns, at least at the age we observed (remember, they were older), but struggle to understand **when and where to use them conventionally**, indicating pragmatic difficulties.

- The observed patterns (not omitting pronouns and producing nouns instead of pronouns) represent cases where more information than necessary is provided, and as such, these uses constitute **violations of a pragmatic rule of conversation**: not providing more informative contributions than necessary (Grice 1975).

# CONVERSATIONAL IMPLICATURES
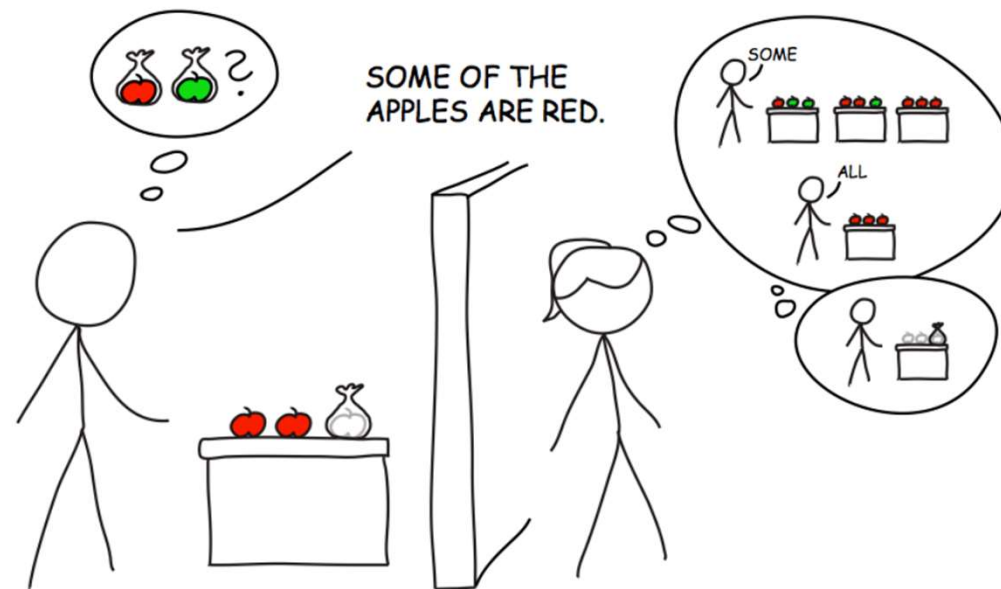
# Implicatures

Implicatures are pragmatic inferences that emerge when a speaker utters a statement that is less informative than another alternative that could have been uttered instead.

# Scalar implicatures

**Scalar** implicatures are computed thanks to specific **lexical items** that are part of a scale in which they are ordered with respect to their informativeness.

Whenever we use a word that expresses a degree you automatically implicate the negation of all degrees above the chosen one.

<some, all>
<or, and>
<sometimes, always>

…

# Scalar implicatures



**1**   **2**

Sp:   *On my cake, some of the candles are lit.*

This sentence is logically compatible with both cakes.

But since there is an alternative, more informative, statement that the speaker could have used to describe cake 1:

[ALT]  *On my cake, all of the candles are lit.*

The hearer is entitled to derive the *implicature* that the stronger statement does not hold:

*On my cake, some but not all of the candles are lit.*

# Scalar implicatures



1

2

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*On my cake, some but not all of the candles are lit.*

# Ad hoc implicatures

- Ad hoc implicatures emerge when the context, or a particular world knowledge, renders one alternative more informative than another one.

- Ad hoc implicatures are triggered by the same mechanisms (comparing alternative statements with respect to their informativeness), but the alternatives are not lexically retrieved: they emerge from the context of utterance.

# Ad hoc implicatures

*Sp: My friend wears glasses.*

This sentence is logically compatible with both guys.

But since there is an alternative, more informative, statement that the speaker could have used to describe guy 1:

[ALT]   *My friend wears glasses and a hat.*

The hearer is entitled to derive the *implicature* that the stronger statement does not hold:

*My friend wears glasses but not a hat.*

# Ad hoc implicatures

*Sp: My friend wears glasses.*



**1**    **2**

This sentence is logically compatible with both guys.

But since there is an alternative, more informative, statement that the speaker could have used to describe guy 1:

[ALT]   *My friend wears glasses and a hat.*

The hearer is entitled to derive the *implicature* that the stronger statement does not hold:

*My friend wears glasses but not a hat.*

# Acquisition of implicatures in TD children

- TD children up to 5 years of age tend to accept underinformative sentences.
- In general, ad hoc implicatures seem to be accessed earlier than scalar implicatures

[Stiller, Goodman & Frank, 2015; Foppolo et al., 2021]

- A role of Theory of Mind have been evidenced for scalar implicatures.

[Foppolo et al., 2021]

# Scalar Implicatures in ASD: No pragmatic deficits

- **Pijnacker et al., 2009; Chevallier at al., 2010**
  tested Sis in adolescents and adults with ASD
  ➔ overall, similar rate of SI computation in ASD and TD
  ➔ **Correlation with VIQ** in ASD (HFA)

  - **Yi Su, Lin-Yan Su, 2015**
    Tested Sis in 4–15-year-old HFA Mandarin-speaking children.

    ➔ younger ASD participants didn't answer similarly to their TD peers in in the some-condition. Older ASD participants did.

NO TOM

# Scalar Implicatures in ASD: No pragmatic deficits

- Schaeken, Van Haeren and Bambini (2018)
  - Pastor-Cerezuela et al. (2018)

→ ASD children have difficulties with implicatures, but those are **evened out** when using a **binary task.**
= it is important the task selection when assessing pragmatic abilities, especially with impaired population

- Hochstein, Bale & Barner, 2017

→ ASD participants can compute SIs but **without considering interlocutors' epistemic states**
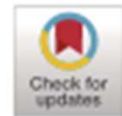
# Ad-hoc and scalar implicatures in children with autism spectrum disorder

Greta Mazzaggio [a,1,2,*], Francesca Foppolo [b,1], Remo Job [a], Luca Surian [a]

[a] Department of Psychology and Cognitive Science, University of Trento, Corso Bettini no. 31, 38068 Rovereto, TN, Italy
[b] Department of Psychology, University of Milan-Bicocca, Piazza dell'Ateneo Nuovo n.1, 20126 Milano, Italy

# Study. Aims

- To test younger ASD children with SI

- Moreover, since an effect of language abilities has been found for SI computation, we want to test ASD children with **ad-hoc implicatures** (not lexically based).

# Study. Design

**Participants**

26 TD children ($M\_age$ = 84.88)

26 ASD (HF) children ($M\_age$ = 87.08)

Matched for age.

**SI Picture Selection Task**

1 warm up

2 sentences with ALL (control)

4 sentences to test for SIs (test)

1 control (no quantifier)

**Ad hoc Picture Selection Task**

1 warm up

4 sentences to test for AIs (test)

1 control (no scale)
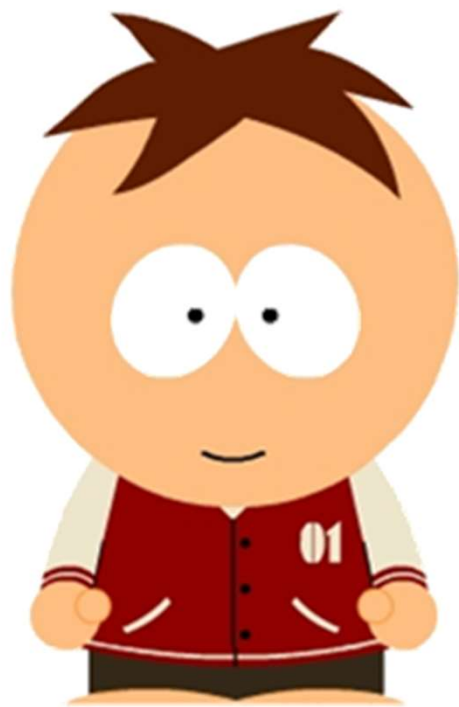
Scalar Implicatures: Picture Selection Task

On my couch some of the pillows are striped

TARGET

COMPETITOR (underinf.)

Ad hoc Implicatures: Picture Selection Task
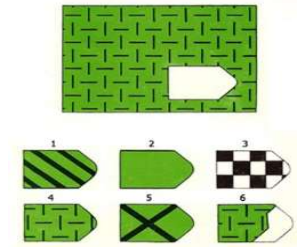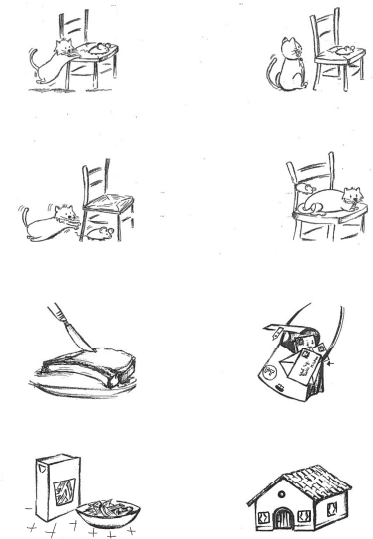
➤ *Mental Age*:
Raven's Progressive Matrice

➤ *Verbal Age:*
Batteria per la Valutazione del Linguaggio 4_12
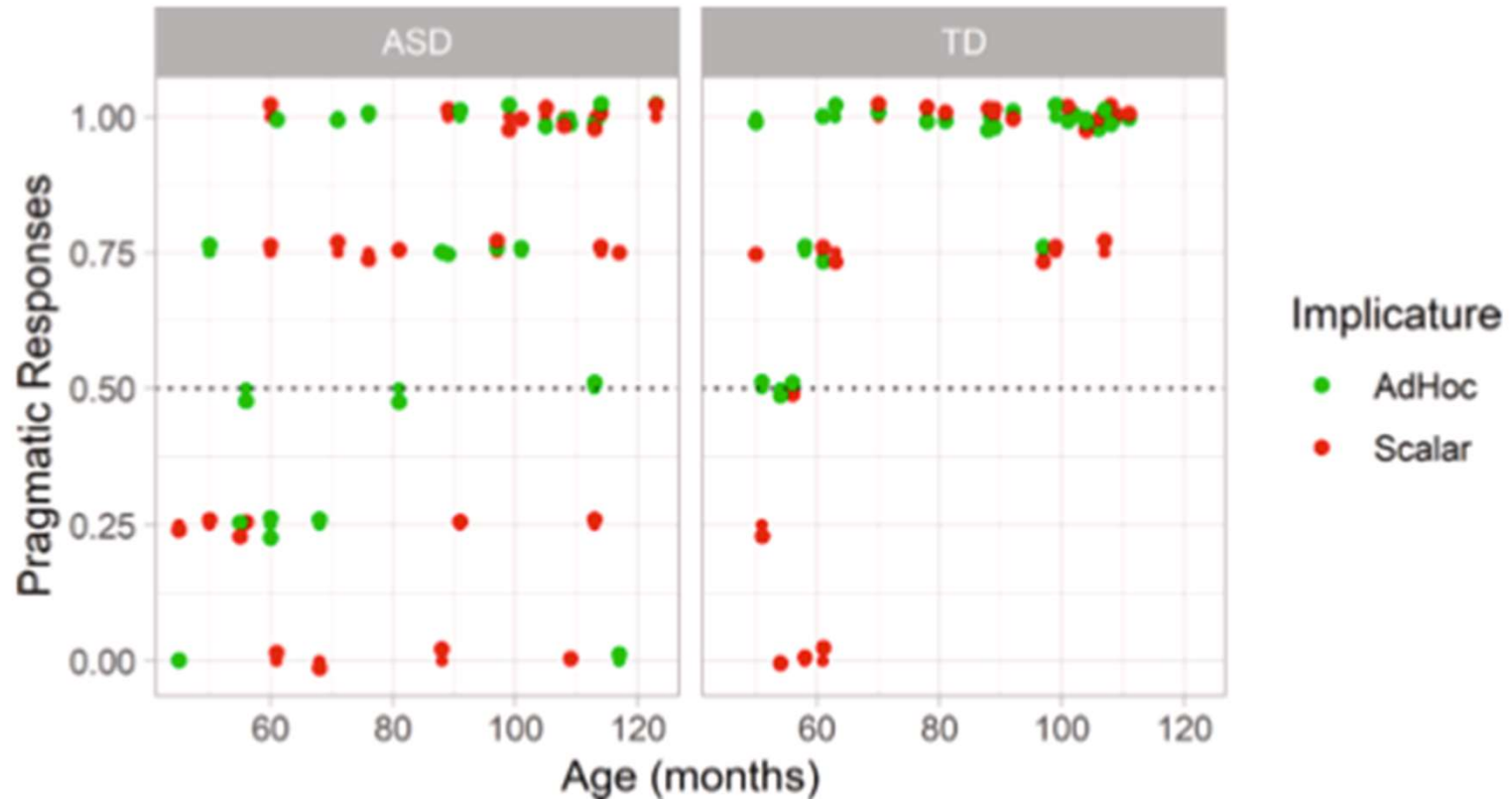(BVL, Marini 2015): Syntax & Lexicon

➤ *Up to 1$^{st}$ order ToM* (Wellman & Liu 2004)*:*
Diverse Desires
Diverse Beliefs
Knowledge Access

➤ *1$^{st}$ order ToM* (Perner et al. 1987)
Unexpected content task.
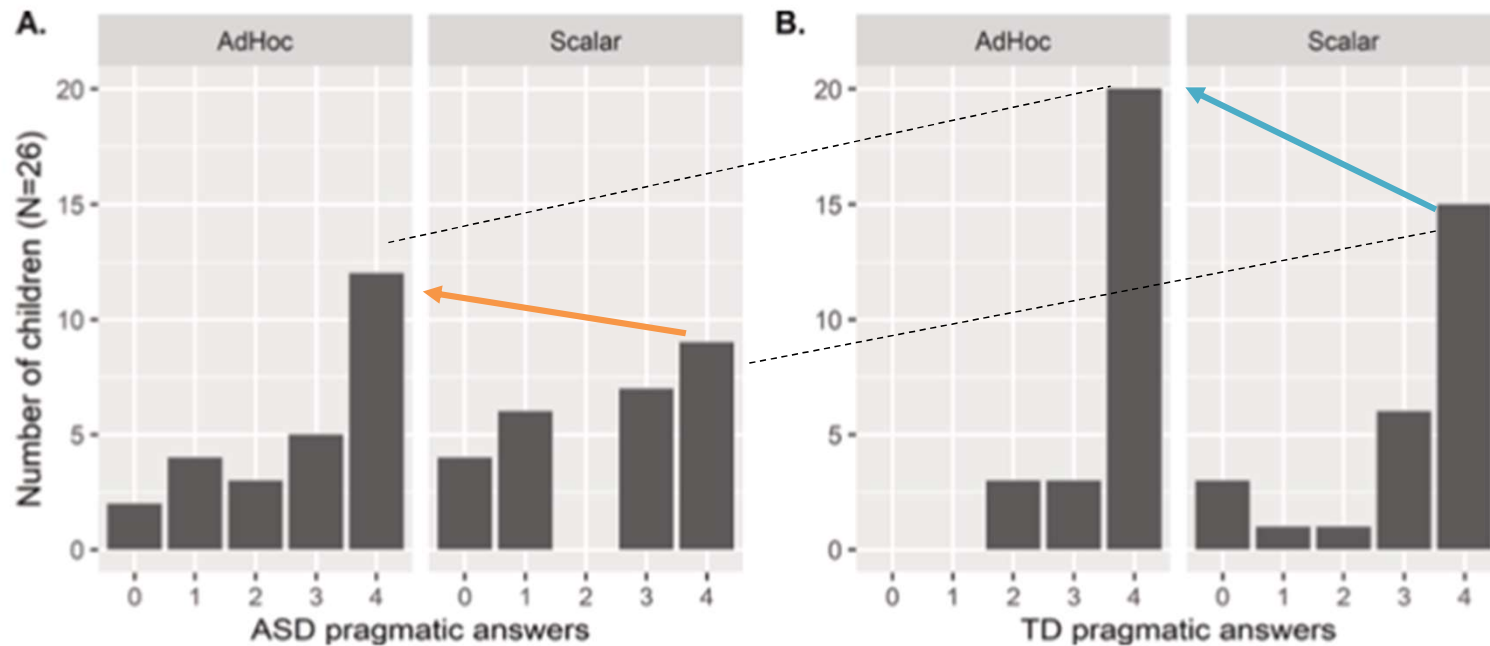
Study. Mental and Verbal Age

# Results



The average accuracy of children's responses on control items was very high: 95% in the ASD group and 98% in the TD group.

The success of children in hitting the targets was lower in both groups, especially in the ASD group (65%) compared to the 85% in the TD group.
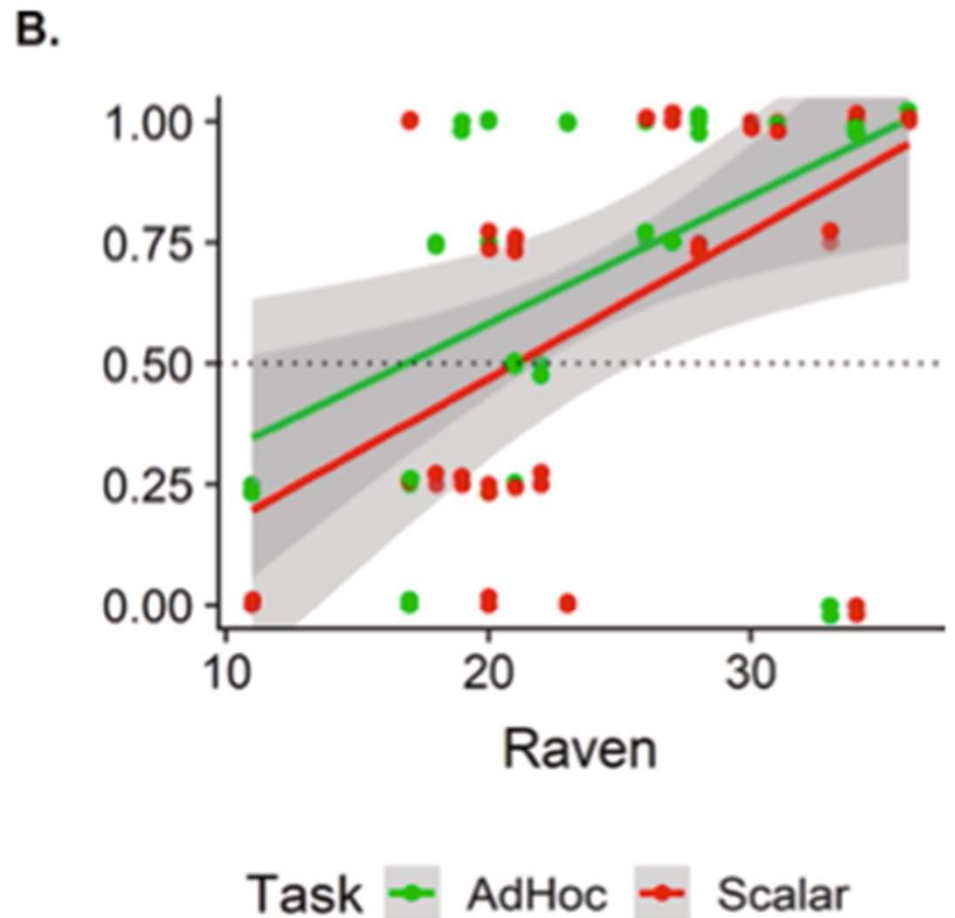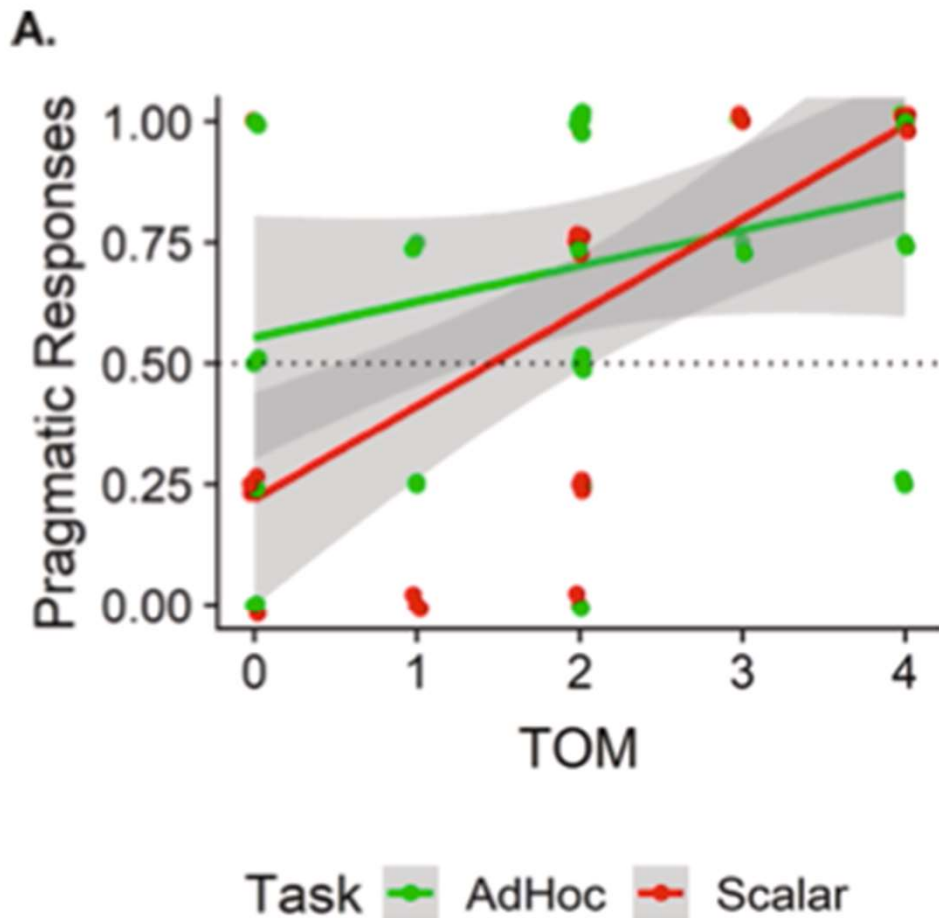
# Results



TD: The accuracy in ad hoc items is higher than in scalar ones (91% vs 78%).

ASD: The accuracy in ad hoc implicatures does not differ from that in scalar ones (70% and 61%).

Autistic children achieved significantly worse results compared to TD children both in ad hoc implicatures and scalar ones, but not in control items.

Autistic children with a higher IQ computed more implicatures, regardless of type.

Theory of Mind (ToM) appears to play a role only for scalar implicatures.

# General Discussion

1. ASD kids have more difficulties than their TD peers in deriving pragmatic inferences

## BUT

➔ they do not have problems with the task (controls are at ceiling)
➔ more than half of the kids (~65%) give  pragmatic responses
➔ this difficulty seems to be related to problems in other cognitive domains (Raven and ToM)

# General Discussion

2. ASD kids show a different developmental pattern compared to TDs:

➔ they have difficulties with both ad hoc and scalar implicatures

➔ in some cases, difficulties are persistent even after age 6

## HOWEVER

these difficulties might be overcome later in life, and/or reduced by compensatory strategies and mechanisms

# IRONY

CAMBRIDGE
UNIVERSITY PRESS

ORIGINAL ARTICLE

# The atypical pattern of irony comprehension in autistic children

Francesca Panzeri[1],* iD, Greta Mazzaggio[2,3], Beatrice Giustolisi[1], Silvia Silleresi[1] and Luca Surian[2]

[1]Department of Psychology, University of Milan - Bicocca, Piazza dell'Ateneo Nuovo 1, 20126 Milano, Italy, [2]Department of Psychology and Cognitive Science, University of Trento, Corso Bettini 31, 38068 Rovereto, TN, Italy and [3]Center for Cognitive Science of Language, School of Humanities, University of Nova Gorica, Vipavska 13, SI-5000 Nova Gorica, Slovenia
*Corresponding author. Email: francesca.panzeri@unimib.it

(1) What an ugly house!

Literal criticism

(2) What a beautiful house!

Ironic criticism

(3) What a beautiful house!

Literal compliment

(4) What an ugly house!

Ironic compliment

Irony often consists in stating the contrary of what is meant.

Irony comprehension is a complex task, that requires the recognition of:

**(i)** **Speaker meaning**: understanding that what the speaker meant to communicate diverges from what she literally said;

**(ii)** **Speaker attitude**: understanding that a "literal compliment" is used to *criticize*, and a "literal criticism" is used to *congratulate*.

➢ Typically developing (TD) children start comprehending irony around the age of 6.

➢ Ironic criticisms (the most common form of irony) are understood more easily than ironic compliments, at least when they don't echo a preceding statement.

[Hancock et al. 2000; Harris & Pexman 2003; Nakassis & Snedeker 2002]

➢ The detection of speaker meaning (i.e., the fact that the speaker wants to communicate the opposite meaning of what is said) is achieved earlier and better than the recognition of speaker attitude (i.e., the fact that the speaker is being *mean/nice* and *serious/joking* in uttering the statement).

[Ackerman 1983; Dews & Winner 1997]

Acquisition of Irony

What does it take for a child to fully understand irony?

Some scholars claimed that 2nd order **Theory of Mind** (ToM) abilities are required to distinguish lies from jokes.

[Winner & Leekam 1991; Happé 1993; Sullivan et al. 1995; Winner et al. 1998]

But **Linguistic abilities** are tightly linked to ToM competence

[Happé 1995; Astington & Jenkins 1999; Milligan et al., 2007]

And **conversational experience or contextual factors** (e.g., the presence of echo) might account for the lag between Ironic Criticisms and Ironic Compliments

[Hancock et al. 2000; Harris & Pexman 2003; Mazzaggio et al., 2024]

Predictors for Irony Comprehension

- **Aim**:
  identify the **factors** that better predict irony comprehension.

- **Participants**
  - Typically Developing Children

  - Autistic Children (ASD)

Is irony comprehension in autistic children related to their linguistic skills, ToM abilities or other factors?

Participants:

26 autistic children →(24 M; Mean Age: 7y;2m; Age range: 45-123 m)

52 typically developing (TD) children

→ half matched for chronological age (CA)

→ half matched for linguistic age (LA)

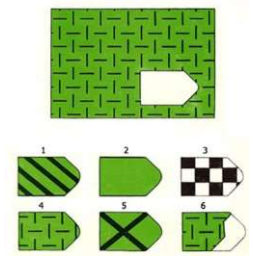| Group | Age | Raven | BVL |
|---|---|---|---|
| ASD | 87 (24) | 24 (7) | 29 (6) |
| CA | 87 (24) | 25 (6) | 33 (7) |
| LA | 73 (20) | 23 (5) | 29 (6) |

The study: Participants

*Mental Age*:
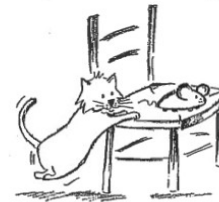Raven Coloured Progressive Matrices
Maximum score: 36

*Linguistic Age:*
Grammatical Comprehension Task
(BVL, Marini 2015)
investigating morphosyntactic
abilities (agreement,
active/passive/reflexive/negative
sentences, clitics, relative clauses).
Maximum score: 40

Materials: Mental and Linguistic Age

➢ *Up to 1st order ToM* (Wellman & Liu 2004)*:*
   Diverse Desires
   Diverse Beliefs
   Knowledge Access

➢ *1st order ToM* (Perner et al. 1987)
   Unexpected content task.

➢ *2nd order ToM* (Sullivan et al. 1994, Hutchins & Prelock 2014):
   Q1: 2nd order ignorance
   Q2: 2nd order false belief
   Q3: 2nd order false belief justification

Maximum score: 7

Materials: Theory of Mind

10 short stories, with two characters, ending with a remark, ironic (6), or literal (4), meant to criticize (5) or to congratulate (5):
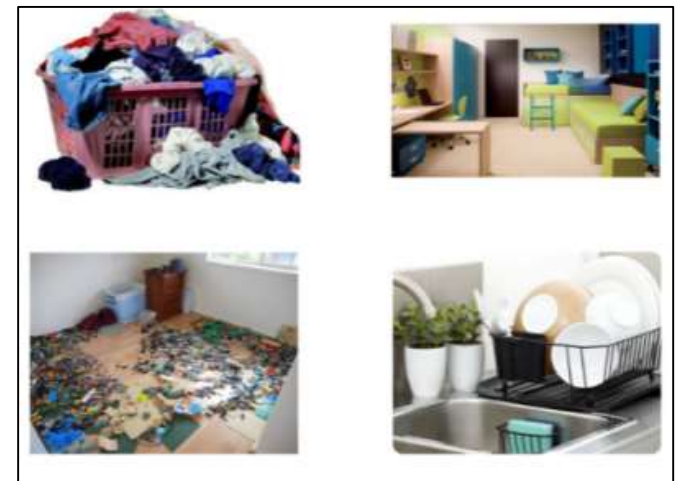
| | IRONIC | LITERAL |
|---|---|---|
| CRITICISM | 3 | 2 |
| COMPLIMENT | 3 | 2 |

3 questions:
Q1: Speaker meaning
Q2: Context (control)
Q3: Speaker attitude



Audio recorded stories, ppt presentation

Materials: Irony comprehension task

Tommy is spending the afternoon playing at Paul's home. Tommy asks Paul to pick up the Legos to build a big spaceship. Initially, Paul does not want to play with Legos because he is worried that after playing his room would be a mess. Tommy promises that he will help Paul to tidy up the room. But when it is time for Tommy to go home, he leaves without helping Paul. The room remains a mess. So Paul tells Tommy

**Thanks for your help in tidying up!**

**Q1** (Speaker meaning): Did Paolo mean that: Tommy helped him or Tommy did not help him

**Q2** (Context) How was Paul's room when Tommy left?

**Q3** (Speaker attitude) When Paul thanked Tommy for his help in tidying up, Paul wanted to compliment or criticize Tommy?
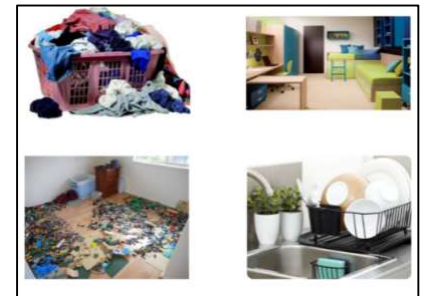


Irony comprehension task

# Results: Irony comprehension task

Accuracy on ironic stories was significantly lower in the ASD group than in the two TD groups, whereas the difference in accuracy in literal stories was not significant.
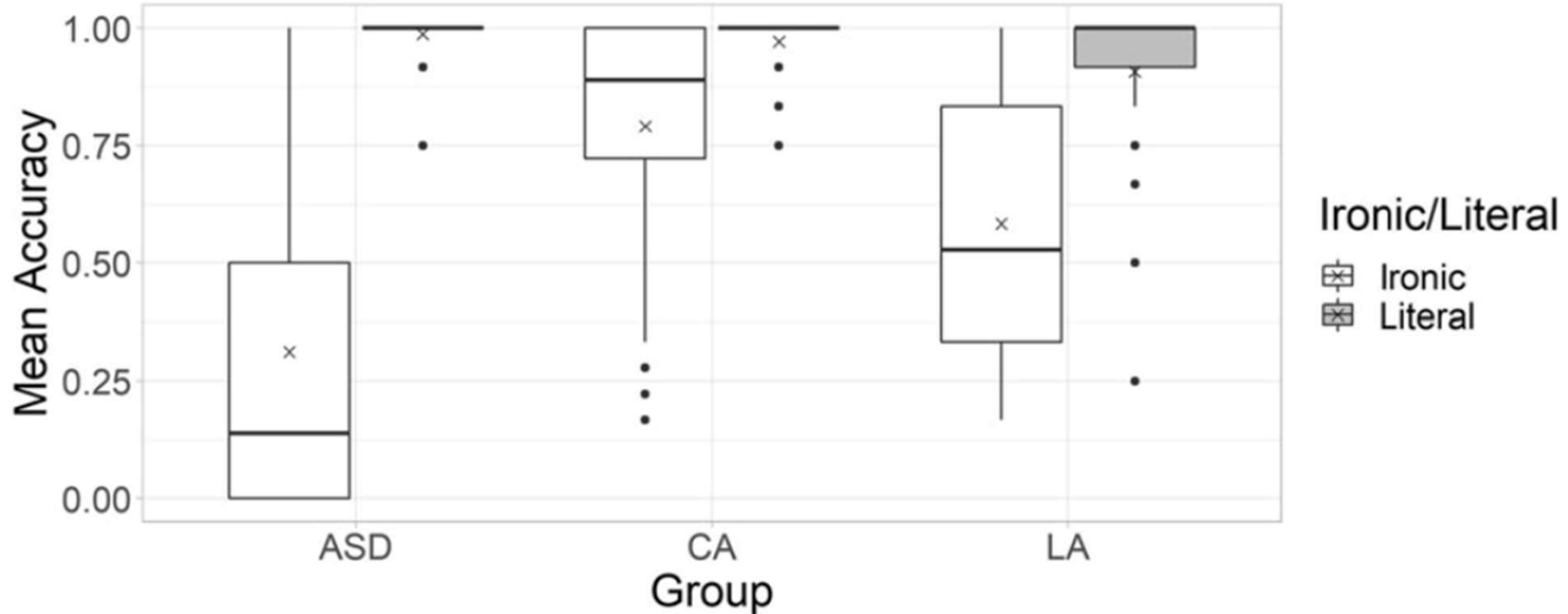


**Figure 1.** Boxplots representing the distribution of participants mean accuracy (y-axis) in the three groups (x-axis) in ironic (white) and literal (gray) stories. The "X" symbols represent mean values.

Focussing on ironic stories only, splitting ironic criticisms from ironic compliments, we get that across groups, accuracy was higher in criticisms than in compliments. No significant difference was found between the meaning and attitude questions.
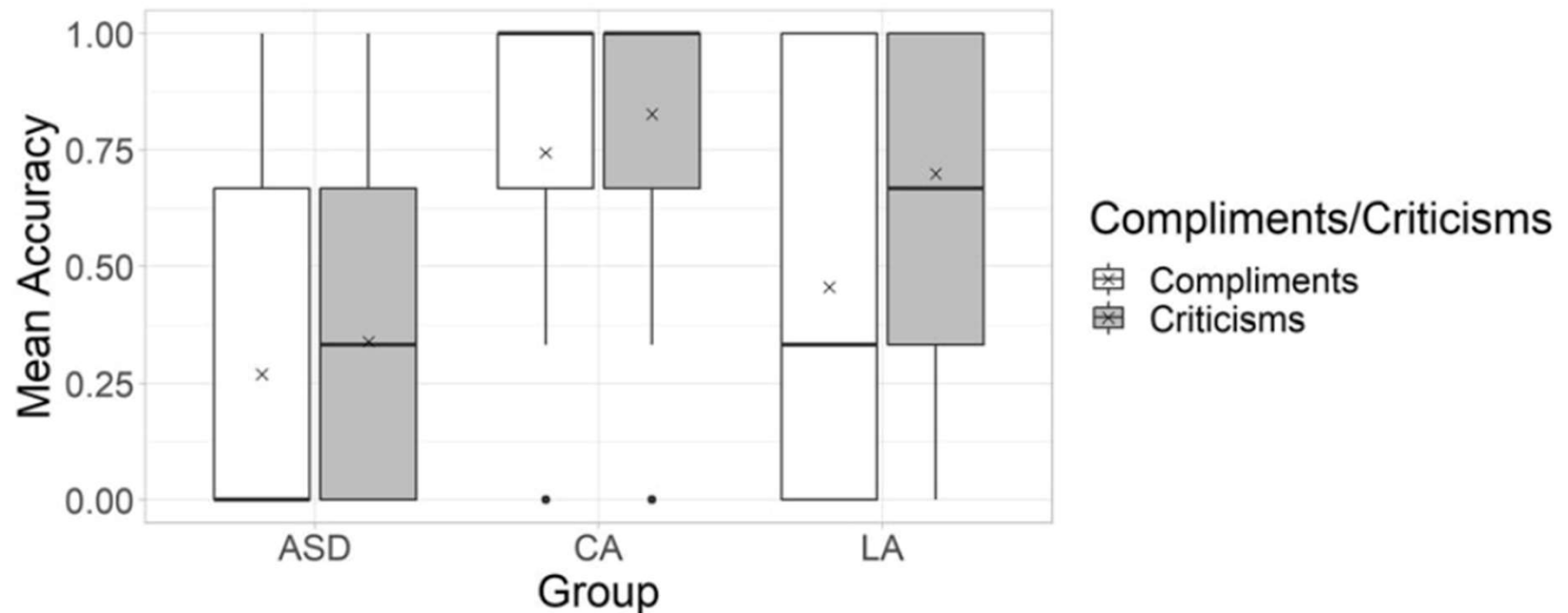


**Figure 2.** Boxplots representing the distribution of participants mean accuracy (y-axis) in the three groups (x-axis) in ironic compliments (white) and ironic criticisms (gray). The "X" symbols represent mean values.

Results: Irony comprehension task

# ASD Individual performances

- We calculated an ironic criticism and an ironic compliment score → one point for each correct answer to the two irony-related questions (detection of speaker's meaning and of speaker's attitude)

- the score distribution was not homogeneous: 12/26 participants (46%) scored 0/6 both in ironic compliments and criticisms, and 6/26 participants (23%) scored 6/6. Of the remaining eight participants, the vast majority had a score of 0 in compliments and a very low score (1 or 2) in criticisms.
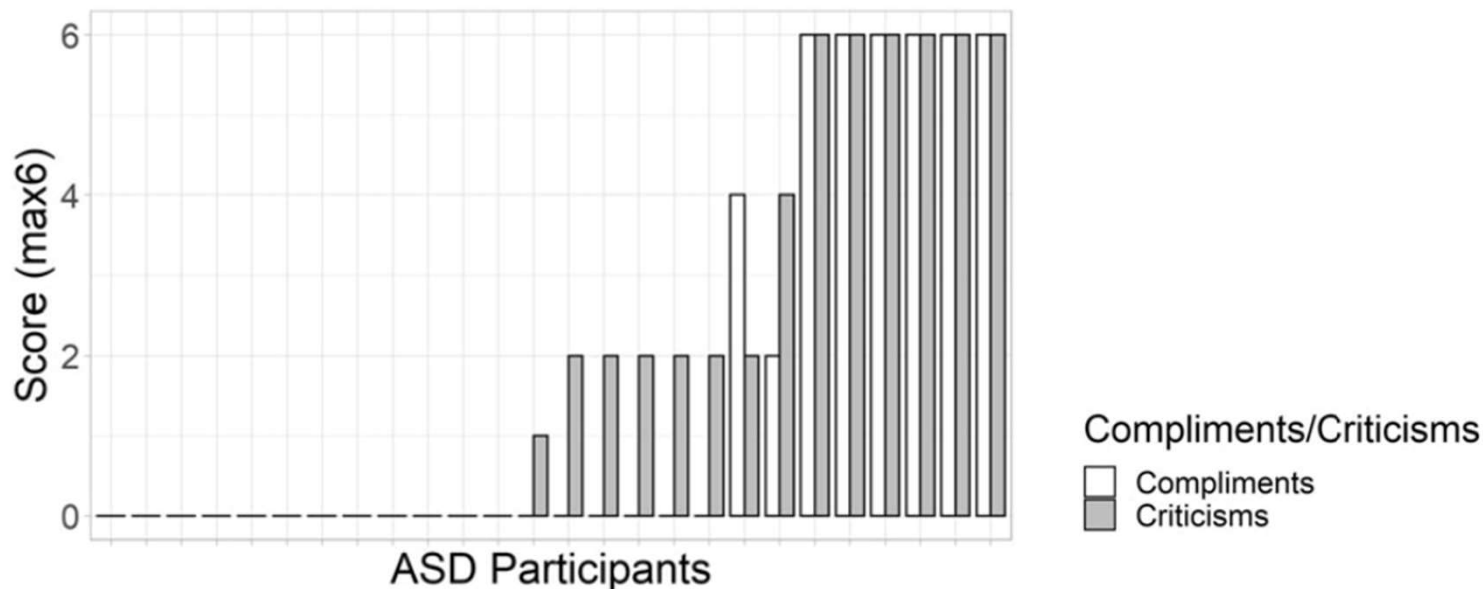
# TD Individual performances



The situation is quite different:
- no TD child had a score of 0 both in compliments and in criticisms,
- the distribution from low to high scores looks smoother than for ASD children
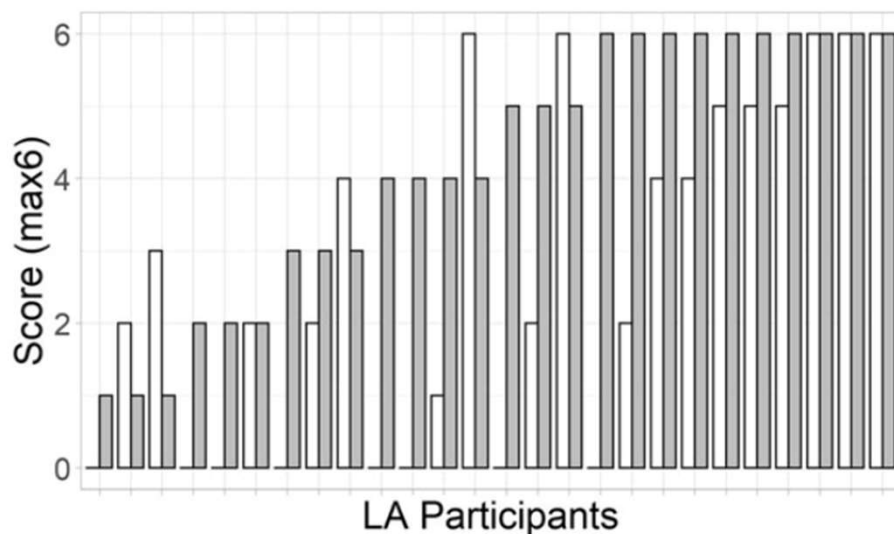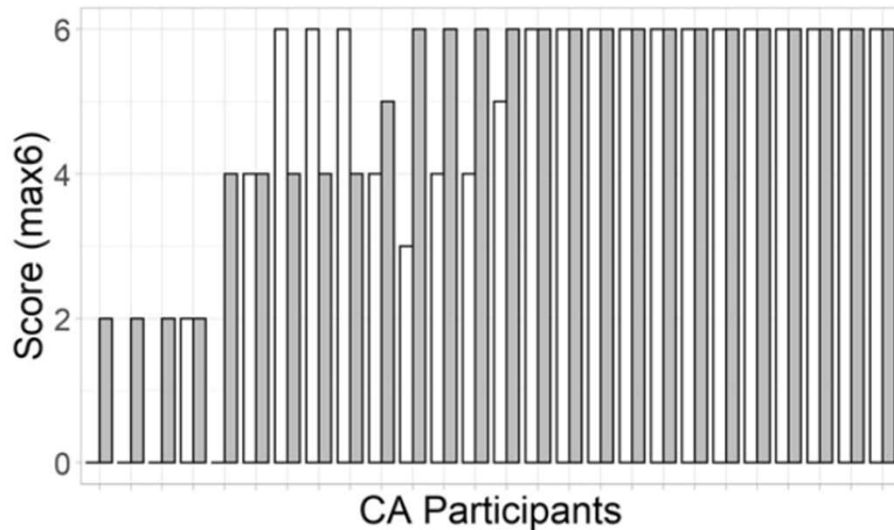
# Predictors

## TD

| | Age | BVL | ToM 1 | ToM 2 | Raven | IrCompl | IrCrit |
|---|---|---|---|---|---|---|---|
| Age | 1.00 | | | | | | |
| BVL | .86*** | 1.00 | | | | | |
| ToM 1 | .25 | .39* | 1.00 | | | | |
| ToM 2 | .49** | .59*** | .31* | 1.00 | | | |
| Raven | .76*** | .72*** | .11 | .48** | 1.00 | | |
| IrCompl | .48** | .45** | .00 | .37* | .36* | 1.00 | |
| IrCrit | .49** | .43* | .08 | .26 | .37* | .63*** | 1.00 |

| | Age | BVL | ToM 1 | ToM 2 | Raven | ADOS | IrCompl | IrCrit |
|---|---|---|---|---|---|---|---|---|
| Age | 1.00 | | | | | | | |
| BVL | .64** | 1.00 | | | | | | |
| ToM 1 | .16 | .27 | 1.00 | | | | | |
| ToM 2 | .27 | .39* | .92*** | 1.00 | | | | |
| Raven | .75*** | .63** | .24 | .36 | 1.00 | | | |
| ADOS | −.35 | −.25 | −.09 | −.14 | −.45* | 1.00 | | |
| IrCompl | .04 | .21 | .48* | .41* | .13 | .12 | 1.00 | |
| IrCrit | .23 | .43* | .47* | .39 | .31 | .01 | .84*** | 1.00 |

## ASD

The overall picture is different.
- TD: improvement in all areas was linked to age (except for first-order ToM because of an at-ceiling effect).
- ASD: Age did not have any impact on irony comprehension; grammatical skills were related to ironic criticisms only, and ToM positively correlated with accuracy in both types of irony.

We hypothesize that:

➢ The Low Performance autistic children correspond to the typical profile of ASD, with impairments in social communication (irony and ToM).

➢ The High Performance autistic children could be using **compensatory** strategies to respond correctly to ToM and irony tasks

Discussion

Analogously, it has been noticed that some autistic individuals respond correctly to irony detection task, nevertheless implicit measures (magnetic resonance and eye-tracking) reveal that **autistic children employ a strategy of resolution of the task that is different from their TD peers, and is more "intellectual based"** (Wang, Lee, Sigman & Dapretto, 2006; Pexman, Rostad, McMorris, Climie, Stowkowy & Glenwright, 2011)

→ Less appreciation of the social function of irony
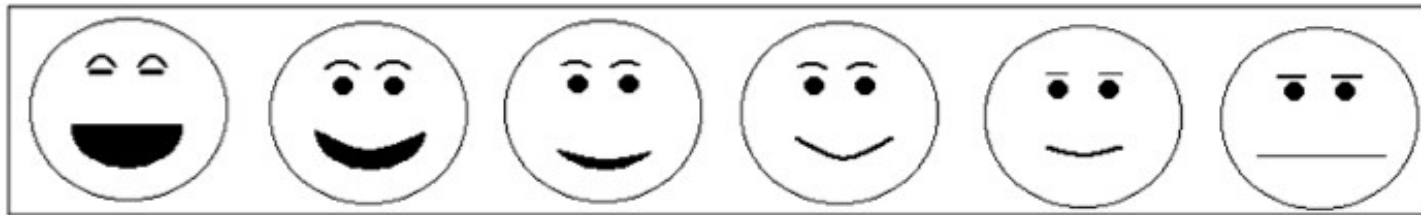


[Pexman et al., 2011]

HFA and irony

# More effort…

- A functional MRI study showed that autistic children showed significantly greater activity than TD children in the right inferior frontal gyrus as well as in bilateral temporal regions

→ This reflects **more effortful processing** needed to interpret the intended meaning of an utterance.
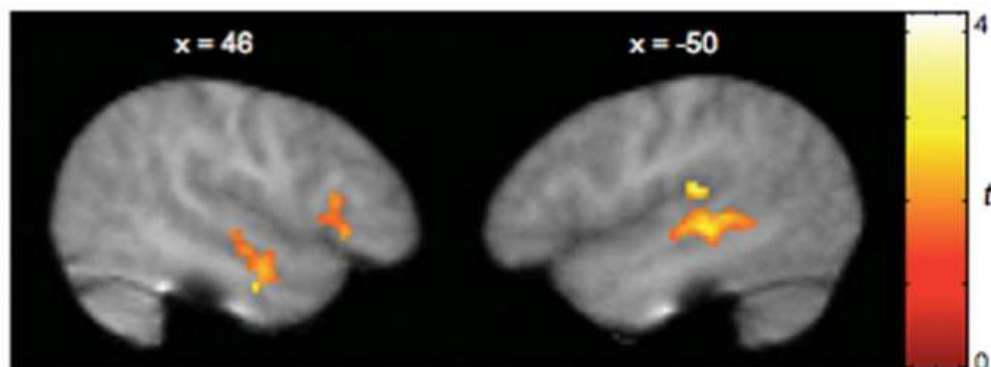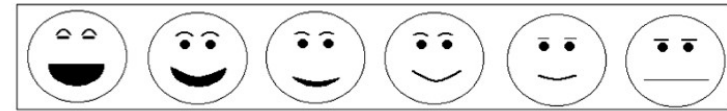


Wang, A. T., Lee, S. S., Sigman, M., & Dapretto, M. (2006). Neural basis of irony comprehension in children with autism: the role of prosody and context. Brain, 129(4), 932-943.

In this study, HP autistic children performed very well on both irony and ToM.

Specific training in irony (Persicke, Tarbox, Ranick & Clair, 2013; Bosco, Longobardi & Gabbatore, 2018) and/or ToM (Howlin, Baron-Cohen & Hadwin, 1999) might have taught HP autistic children to respond correctly. →
e.g. detection of the incongruency

→ But what about the (mocking) attitude?
→ Can specific training help in detecting the attitude?

Future research should verify whether
a) a specific training in ToM enhances also irony comprehension, or viceversa
b) If an attitude detection training is useful.

To Conclude

# Conclusion

- Even if in our study autistic children lagged behind their TD peers in tasks assessing irony
→**some autistic children had TD children performance.**

-  These results and those of previous studies suggest that **difficulties might slowly decrease with age**
→ due to the acquisition of more advanced linguistic and cognitive skills or to compensatory learning?

- Future longitudinal studies might shed light on factors affecting this developmental path and would be crucial in testing causal hypotheses.

# General Conclusions and Reflections
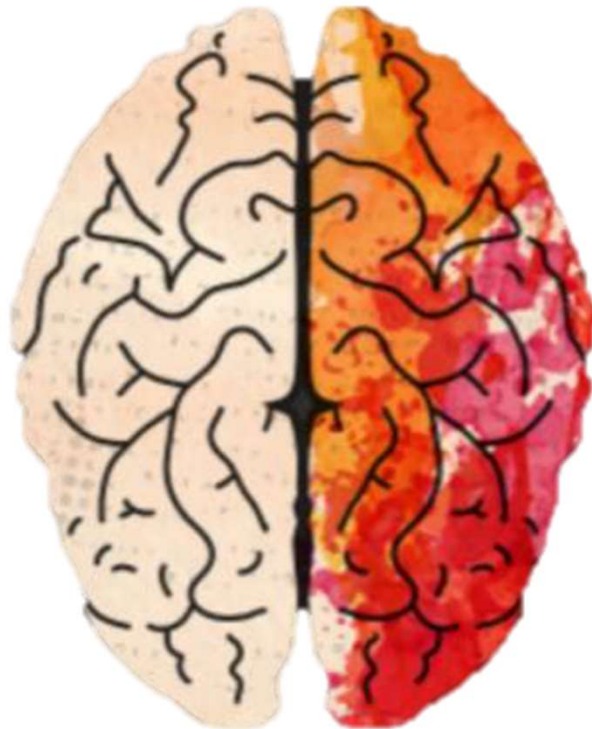
# Language Profiles in ASD

- Three main language profiles have been identified:
  - **ASD-LN** ("normal language"): Demonstrates intact structural language skills comparable to neurotypical language.
  - **ASD-LI** ("language impairment"): Shows deficits in structural language skills, including phonology and/or morphosyntax.
  - **MV** ("minimal verbal"): Exhibits minimal verbal abilities, with expression limited to a restricted set of words or short phrases, or absence of spoken language.

- Regardless of the above tripartite distinction, it's widely agreed in the field that all autistic individuals experience **challenges with pragmatics**. However, selective impairments within pragmatics can also occur.

[Schaeffer et al., 2023]

# ASD, Pragmatics and Theory of Mind

- According to some authors (e.g., Kissine, 2021), these data on language in autism poses an important challenge for lines of thought that have significant influence in contemporary linguistics, particularly **the notion that intersubjective socio-communicative skills are inseparable from mind-reading abilities.**

*"Language in autism invites a critical examination of linguistic theories that put mind reading at the core of language use"* (Kissine, 2021: e150).

- Recent studies suggest that the autistic condition permits to solve the more **"linguistic pragmatic" tasks**, such as interpreting indirect speech acts (Marocchini et al., 2021), whereas **"social pragmatic" tasks** such as those that require inferring speakers' communicative intentions (e.g., irony) remain difficult to solve.

- Age plays a role (see for implicatures, Mazzaggio et al., 2021)→ more consideration of diverse age groups that might develop diverse solving strategies → adolescents? Older adults?

# ASD, Pragmatics and Theory of Mind

Future studies should better consider:

- the specific pragmatic topic under investigation (linguistic pragmatic vs. social pragmatic)

→ some pragmatic tasks require the attribution of specific beliefs and intentions to the speaker (1st order vs. 2nd order)

→ others might be solved via the enrichment of what has been literally said, but **without using mentalistic skills**.

- the INDIVIDUAL differences and language domains without considering the overall group performance.

*The study of the way autistic individuals acquire and use language should not be confined to some periphery of 'serious' linguistics. [...] Careful investigation of linguistic profiles in autism is crucial for better mapping the heterogeneity of the autism spectrum or for predicting individual developmental trajectories and outcomes. But taking language in autism seriously may also bring linguistic theory a step closer to answering foundational questions about the nature of linguistic competence.*

*Kissine, 2021*

# Thank you so much for your attention.

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