Communicative impairment in adolescents with Autism Spectrum Disorder (ASD): A comprehensive pragmatic assessment

(Article begins on next page)

09 May 2024

Communicative impairment in adolescents with Autism Spectrum Disorder (ASD): A comprehensive pragmatic assessment

Ilaria Traetta [a], Francesca M. Bosco [a], Alessandra Aimar [b], Giovanni Chiavazza [b] & Ilaria Gabbatore [a]

[a] *Department of Psychology, University of Turin, Turin, Italy*
[b] *Centro Riabilitazione Ferrero, Alba, Italy*

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social communication, repetitive behaviors and restrictive interests[1]. Within social communication, pragmatics - the ability to use appropriately language and other expressive means in a given context[2-3] - may be particularly impaired[4].

Given the variability within the ASD spectrum, communicative difficulties in individuals with ASD fluctuate from stronger difficulties in specific aspects of language processes (lexical and syntactic) to deficit in pragmatic ability[5]. In this case, they do not necessarily show linguistic impairments, but may have difficulty with more sophisticated aspects, such as communicative-pragmatic ability[6].

Difficulties in communicative-pragmatic ability have been shown for both verbal and nonverbal communicative acts[7]. As for non verbal modality, the difficulties concern with facial expressions, gestures and eye contact[8]. Verbal communication deficits include turn taking management[9], topic maintenance and the ability to provide adequate and informative quantity of information[10].

The majority of studies investigated the development of pragmatic communication and assessed performance in pre-school or school age[11-12] while very few studies addressed the development of such ability in later stages e.g.,[7].

Pragmatics is related to other cognitive skills, such as Executive Functions (EF) and Theory of Mind (ToM), even if the nature of such relationship is not totally clear (see e.g.,[13-14]). EF refers to a set of cognitive processes such as planning, shifting and working memory that allow goal-directed behaviors[15]; ToM is the ability to comprehend own and others' mental states[16].

Individuals with ASD have difficulties in understanding the speaker's intention when it does not correspond to the literal meaning, and therefore they have difficulties in dealing with pragmatic phenomena such as indirect speech acts, humor and sarcasm[17]. Moreover, individuals with ASD often have problems in the behavioral regulation of executive processes such as planning, shifting, initiation and self-monitoring[18-19].

As pragmatic difficulties may have an impact on ASD adolescents' social life[20] carefully assessing these aspects is crucial. Nevertheless, only a few clinical assessment tools with adequate psychometric properties are available[21-22] and most of them are specific for school-aged children, e.g., Test of Pragmatic Language[23] or Pragmatic Rating Scale[24].

In light of this gap, the present research aims at providing a comprehensive communicative-pragmatic assessment inASD using the Assessment Battery for Communication (ABaCo[25-26]), a validated clinical tool that allows to investigate several facets of pragmatic ability, both in comprehension andproduction. Furthermore, we expect differences both for the cognitive and ToM tasks performances between ASD and control group.

Moreover, the study aims to explore the relationship among pragmatics and other cognitive functions such as ToM and EFs, and to assess the role these latter have on the pragmatic performance in ASD. Specifically, we expect adolescents with ASD to exhibit pragmatic difficulties in all the aspects investigated by ABaCo scales, in line with previous data on younger children[7]. Furthermore, we expect to find performance differences between ASD and control group in both cognitive and ToM skills. In particular, we expect adolescents with ASD to perform worse on all tasks examined.

Methods

Partecipants

A group (N=25) of adolescents with ASD will be enrolled based on the following inclusion criteria: (1) diagnosis of verbally fluent ASD, previously assigned by qualified clinicians using DSM-5 criteria; (2) adequate cognitive functioning: IQ $\geq$ 80, as assessed by Raven's Standard Progressive Matrices Italian version[27]; (3) adequate linguistic skills evaluated with the subtask for linguistic comprehension of the BVN12– 18[28].

A control group (N = 25) of adolescents with typical development (TD) will be matched to the clinical group for age and gender. All participants will have to meet the following criteria: (4) native-Italian speakers; (5) age range 12-18 years; (6) none of them will have any previous history of brain damage or neurological disorders. Both participants and caregivers will provide informed written consent.

Material

Pragmatic assessment

- ABaCo[25-26], it is composed of 172 items divided in 5 scales. See the Table 1 for more details.

Cognitive assessment

A selection of items from the Neuropsychological Evaluation Battery, standardized in Italian for pre-adolescents and adolescents BVN 12–18[28]:

- Token test[29]

- Expressive vocabulary task[30]

- Digit Span[31]

- Corsi block-tapping test[31]

- Immediate and Deferred Recall test for long-term verbal memory task[32-33]

- Selective attention[31]

- Tower of London[34]

- Modified card sorting test[35]

ToM assessment

- Sally and Ann task[36]

- Strange Stories task[37]

- Reading the Mind in the Eyes task[38]

Procedures

Each participant will be tested in a quiet room, in two sessions of 1 h each. Recruitment will be held in collaboration with the Centro Riabilitazione Ferrero (Alba, Italy). Administration and coding procedures will be organized so that each ABaCo protocol will be coded by a different person than the one who administered it, in order to reduce any possible bias in the attribution of scores. Sessions will be video recorded to allow offline coding by blind raters. Administration and scoringprocedures will be carried out according to the instructions provided in the standardized manual foreach task.

Ability assessed	Tools	Description
Communicative-pragmatic assessment	*ABaCo* (Angeleri et al., 2012; 2015)	It assesses various aspects of the *pragmatic ability*, both in *comprehension* and *production*. It is composed of 172 items divided in 5 scales: linguistic, non-verbal/extralinguistic, paralinguistic, contextual, conversational. For each task can be assigned a score of 0 (incorrect answer) or 1 (correct answer).
Cognitive assessment	*Token test* (De Renzi & Faglioni, 1978)	It assesses *receptive language comprehension*. The score ranges from 0 to 36.
	Expressive vocabulary task (Brizzolara et al., 1994)	It assesses the *ability to name* items. The score ranges from 0 to 88.
	Digit Span (Bisiacchi et al., 2005)*	It assesses *short-term verbal memory*. The score ranges from 0 to 9.
	Corsi block-tapping test (Bisiacchi et al., 2005)	It assesses *spatial working memory*. The score rangesfrom 0 to 7.

	Immediate and Deferred Recall test for long-term verbal memory task (Rapaport et al., 1968; Spinnler & Tognoni, 1987)	It assesses *the ability to extract and memorize information* and *recall* it, immediately after its presentation and after a short time has elapsed. The total score is separate for immediate and deferred taskand ranges from 0 to 8.
	Selective attention (Bisiacchi et al., 2005)	It assesses the *ability to focus on a single or a few items* in a given perceptual field, for a certain amount of time. The score ranges from 0 to 21.
	Tower of London (Shallice, 1982)	It assesses *planning ability*. The score ranges from 0 to12.
	Modified card sorting test (Nelson, 1976)	It assesses *shifting and inhibitory control*. The score ranges from 0 to 8.
Theory of Mind tasks	*Sally and Ann task* (Wimmer & Perner, 1983)	It assesses the *first-order ToM*. A score of 1 is given for correct interpretation, a score of 0 otherwise.
	Strange Stories task (Happé, 1994)	It assesses *advanced ToM*. A set of mentalistic stories constitutes the task. The six stories selected regard double bluff, mistakes, white lies, pretense, misunderstanding. The score ranges from 0 to 6.
	Reading the Mind in the Eyes task (Baron-Cohen et al., 2001)	It assesses *the ability to recognize complex mental states* as expressed by human eyes. The task assesses is composed by 28 pictures where only the eye region of the face is available. The total score ranges from 0 to 28.

Table 1. Assessment measures for the pragmatic, cognitive and ToM abilities with description

Approach for statistical analysis

The communicative-pragmatic performance of the two groups (ASD and controls), will be compared submitting their ABaCo scores to a 2×5 repeated measures analysis of variance (ANOVA), with *Group* (ASD vs. control) as between-subjects factor and *Scale* (five levels: Linguistic, Extralinguistic, Paralinguistic, Context, Conversational) as within-subjects factor. Pairwise comparisons with Bonferroni correction will be used to examine the differences in scores on the ABaCo scales.

To analyze differences in cognitive and ToM performance between participants with ASD and TD adolescents, we will perform a series of independent- samples T-tests for each cognitive task examined (i.e. memory, selective attention, working memory and cognitive flexibility). Then, we will apply Bonferroni correction for multiple comparisons.

To examine the relationship among pragmatic ability, ToM and EF, we will perform a correlation analysis (Pearson's R) among the scores on the ABaCo (global scores and different scales) and ToM and cognitive task scores.

To further examine the role of relevant predictors, i.e. cognitive skills, EFs and ToM, on pragmatic performance, we will use Multilevel Regression models with global ABaCo score. Before conducting the regression analyzes, we will check for collinearity between the predictors. We will then start by fitting a null model (intercept only), and then add each predictor (i.e. cognitive, EFs and ToM scores) using a stepwise forward procedure (model fit and model comparison is measured using the Akaike Information Criterion, AIC).

References

1. American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders, 21(21), 591-643. https://doi.org/10.1176/appi.books.9780890425596.744053

2. Bara, B. G. (2010). Cognitive pragmatics: The mental processes of communication. MIT press.

3. Levinson, S. C. (1983). Pragmatics. Cambridge university press.

4. Baird, G., & Norbury, C. F. (2016). Social (pragmatic) communication disorders and autism spectrum disorder. Archives of Disease in Childhood, 101(8), 745- 751. http://dx.doi.org/10.1136/archdischild-2014-306944

5. Volden, J., & Phillips, L. (2010). Measuring pragmatic language in speakers with autism spectrum disorders: Comparing the Children's Communication Checklist—2 and the Test of Pragmatic Language. https://doi.org/10.1044/1058-0360 (2010/09-0011)

6. Loukusa, S., & Moilanen, I. (2009). Pragmatic inference abilities in individuals with Asperger syndrome or high-functioning autism. A review. Research in Autism Spectrum Disorders, 3(4), 890-904. https://doi.org/10.1016/j.rasd.2009.05.002

7. Angeleri, R., Gabbatore, I., Bosco, F. M., Sacco, K., & Colle, L. (2016). Pragmatic abilities in children and adolescents with autism spectrum disorder: a study with the ABaCo battery.https://www.minervamedica.it/en/journals/minervapsychiatry/article.php?cod=R17Y2016 N03A0093

8. Vitásková, K., & Říhová, A. (2013). Analysis of impaired nonverbal communication in people with Autism Spectrum Disorders. Social Welfare: Interdisciplinary Approach, 3(2), 87-97.

9. Bauminger-Zviely, N., Karin, E., Kimhi, Y., & Agam-Ben-Artzi, G. (2014). Spontaneous peer conversation in preschoolers with high-functioning autism spectrum disorder versus typical development. Journal of Child Psychology and Psychiatry, 55(4), 363-373. https://doi.org/10.1111/jcpp.12158

10. Paul, R., Orlovski, S. M., Marcinko, H. C., & Volkmar, F. (2009). Conversational behaviors in youth with high-functioning ASD and Asperger syndrome. Journal of autism and developmental disorders, 39(1), 115-125. doi: 10.1007/s10803- 008-0607-1

11. Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2006). Assessing prosodic and pragmatic ability in children with high-functioning autism. Journal of Pragmatics,38(10), 1776-1791. https://doi.org/10.1016/j.pragma.2005.07.004

12. Murdock, L. C., Cost, H. C., & Tieso, C. (2007). Measurement of social communication skillsof children with autism spectrum disorders during interactions with typical peers. Focus on Autism and Other Developmental Disabilities, 22(3), 160-172. https://doi.org/10.1177/10883576070220030301

13. Bosco, F. M., & Gabbatore, I. (2017). Sincere, deceitful, and ironic communicative acts and the role of the theory of mind in childhood. Frontiers in psychology, 8, 21. https://doi.org/10.3389/fpsyg.2017.00021

14. Parola, A., Salvini, R., Gabbatore, I., Colle, L., Berardinelli, L., & Bosco, F. M. (2020). Pragmatics, theory of mind and executive functions in schizophrenia: disentangling the puzzleusing machine learning. PLoS One, 15(3), e0229603. https://doi.org/10.1371/journal.pone.0229603

15. Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. Cognitive psychology, 41(1), 49-100. https://doi.org/10.1006/cogp 1999.0734PMID:10945922

16. Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind?. Behavioraland brain sciences, 1(4), 515-526. https://doi.org/10.1017/S0140525X00076512

17. Baron-Cohen, S. (2000). Theory of mind and autism: A review. International review of researchin mental retardation, 23, 169-184. https://doi.org/10.1016/S0074-7750(00)80010-5

18. Robinson, S., Goddard, L., Dritschel, B., Wisley, M., & Howlin, P. (2009). Executive functions in children with autism spectrum disorders. Brain and cognition, 71(3), 362-368. https://doi.org/10.1016/j.bandc.2009.06.007

19. Leung, R. C., Vogan, V. M., Powell, T. L., Anagnostou, E., & Taylor, M. J. (2016). The role of executive functions in social impairment in Autism Spectrum Disorder. Child Neuropsychology, 22(3), 336-344. https://doi.org/10.1080/09297049.2015.1005066

20. Whitehouse, A. J., Watt, H. J., Line, E. A., & Bishop, D. V. (2009). Adult psychosocial outcomes of children with specific language impairment, pragmatic language impairment and autism. International Journal of Language & Communication Disorders, 44(4), 511-528. https://doi.org/10.1080/13682820802708098

21. Hyter, Y. D. (2017). Pragmatic assessment and intervention in children. Research in clinical pragmatics, 493-526. DOI: 10.1007/978-3-319- 47489-2_19

22. Bishop, D. V. (1998). Development of the Children's Communication Checklist (CCC): A method for assessing qualitative aspects of communicative impairment in children. The Journal of Child Psychology and Psychiatry and Allied Disciplines, 39(6), 879-891.

23. Phelps-Terasaki, D., & Phelps-Gunn, T. (2007). TOPL-2: Test of pragmatic language. Austin, TX: Pro-Ed.

24. Dillon, E., Holingue, C., Herman, D., & Landa, R. J. (2021). Psychometrics of the Pragmatic Rating Scale for School-Age Children With a Range of Linguistic and Social Communication Skills. Journal of Speech, Language, and Hearing Research, 64(9), 3477-3488. https://doi.org/10.1044/2021_JSLHR-20-00753

25. Angeleri, R., Bosco, F. M., Gabbatore, I., Bara, B. G., & Sacco, K. (2012). Assessment battery for communication (ABaCo): normative data. Behavior research methods, 44(3), 845-861. https://doi.org/10.3758/s13428-011-0174-9

26. Angeleri, R., Bara, B. G., Bosco, F. M., Colle, L., & Sacco, K. (2015). ABaCo- Assessment Battery for Communication. Giunti Psychometrics OS Firenze.

27. Picone, L., Orsini, A., & Pezzuti, L. (2017). Raven's Standard Progressiv e Matrices: Contribution to Italian standardization for subjects between ages 6 and 18. BPA-Applied Psychology Bulletin (Bollettino di Psicologia Applicata), 65(280).

28. Gugliotta, M. (2009). BVN 12-18: Batteria di Valutazione Neuropsicologia per l'adolescenza. Edizioni Erickson.

29. De Renzi, E., & Faglioni, P. (1978). Normative data and screening power of a shortened versionof the Token Test. Cortex, 14(1), 41-49. https://doi.org/10.1016/S0010-9452(78)80006-9

30. Brizzolara, D., Cipriani, P., Chilosi, A. M., & De Pasquale, L. (1994). L'apprendimento del linguaggio scritto nei bambini con difficoltà di acquisizione del linguaggio orale: Continuità o discontinuità. Apprendimento e Patologia Neuropsichica nei primi anni di scuola. Modelli interpretativi della clinica, 124-35.

31. Bisiacchi, P. S., Cendron, M., Gugliotta, M., Tressoldi, P. E., & Vio, C. (2005). BVN 5-11— Batteria di Valutazione Neuropsicologica per l'età Evolutive. Erickson: Trento, Italy.

32. Rapaport, D., Schafer, R., & Gill, M. M. (1968). Diagnostic psychological testing (No. 3-4). International Universities Press.

33. Spinnler, H. (1987). Standardizzazione e taratura italiana di test neuropsicologici. Ital J NeurolSci, 6, 21-120.

34. Shallice, T. (1982). Specific impairments of planning. Philosophical Transactions of the Royal Society of London. Biological Sciences, 298(1089), 199-209. https://doi.org/10.1098/rstb.1982.0082

35. Nelson, H. E. (1976). A modified card sorting test sensitive to frontal lobe defects. Cortex,12(4), 313-324. https://doi.org/10.1016/S0010-9452(76)800 35- 4

36. Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. Cognition, 13(1), 103–128. https://doi.org/https://doi.org/10.10 16/ 0010-0277(83)90004-5

37. Happé, F. G. (1994). An advanced test of theory of mind: Understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. Journal of autism and Developmental disorders, 24(2), 129-154. https://doi.org/10.1007/BF02172093

38. Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading theMind in the Eyes" Test revised version: a study with normal adults, and adults with Aspergersyndrome or high-functioning autism. The Journal of Child Psychology and Psychiatry and Allied Disciplines, 42(2), 241-251. https://doi.org/10.1111/1469-7610.00715