

The pattern of pragmatic decay in healthy aging: a focus on deceit and irony

Hilviu, D.^{a*}, Gabbatore, I.^{a,b}, Parola A^a., Bosco F.M.^{a,c}

^a Department of Psychology, University of Turin, Turin, Italy

^b Child Language Research Center, University of Oulu, Oulu, Finland

^c Neuroscience Institute of Turin (NIT), University of Turin, Turin, Italy

*presenter

Correspondence: dize.hilviu@unito.it

Keywords: Deceit, Irony, Healthy Aging

Introduction

The ability to communicate in different contexts, i.e., pragmatics^{1,2}, may decay in healthy aging^{3,4}. Such decline may affect the ability to use both linguistic and extralinguistic (i.e., gestures) modalities⁵. This decay could be related to a general cognitive decay⁶, that primarily involves high order cognitive abilities such as Executive Functions⁷ (EFs) as well as Theory of Mind (ToM), i.e. the ability to ascribe to one self and others thoughts, mental states and beliefs⁸. Some data in literature indicate that old adults have difficulties in dealing with deceptions⁹, jokes, humor and irony^{10,11}. According to the Pragmatic theory¹, different kind of pragmatic phenomena, i.e. sincere, deceitful and ironic communicative speech acts, require to be understood and comprehended an increasing inferential ability – the cognitive ability necessary to fill the gap between the literal and the speaker's meaning. It is thus possible that different pragmatic phenomena, involving an increasing inferential ability, undergo to different degree of decay in aging (from the simplest to the most difficult: sincere, deceitful and ironic communicative speech acts). However, an accurate assessment of the ability to deal with different pragmatic phenomena, EF and ToM in aging is lacking. Our study aims at evaluating the ability of elderly people to deal with sincere, deceitful and ironic, communicative acts and exploring whether and to what extent EFs and the ToM play a role in the pragmatic performance observed.

Methods

Participants: Fifty-four Italian subjects took part to the study:

- 18 Young Adults (YA); 9 F; Age range = 20-40 (25.22±2.65); Edu = 14.28±2.67;
- 18 Old Adults (OA); 9 F; Age range = 65-75 (70.50±2.94); Edu = 10.50±4.55;
- 18 Senior Old Adults (SOA); 10 F; Age range = 76-86 (80±2.57); Edu = 11.78 ±5.08.

Groups were comparable in terms of education ($F = 2.72$; $p = .075$). Subjects' selection was based on several exclusion criteria (cognitive or linguistic deficits, current or past neurological disorder, substance or alcohol abuse disorder, sensory deficits, head injury and

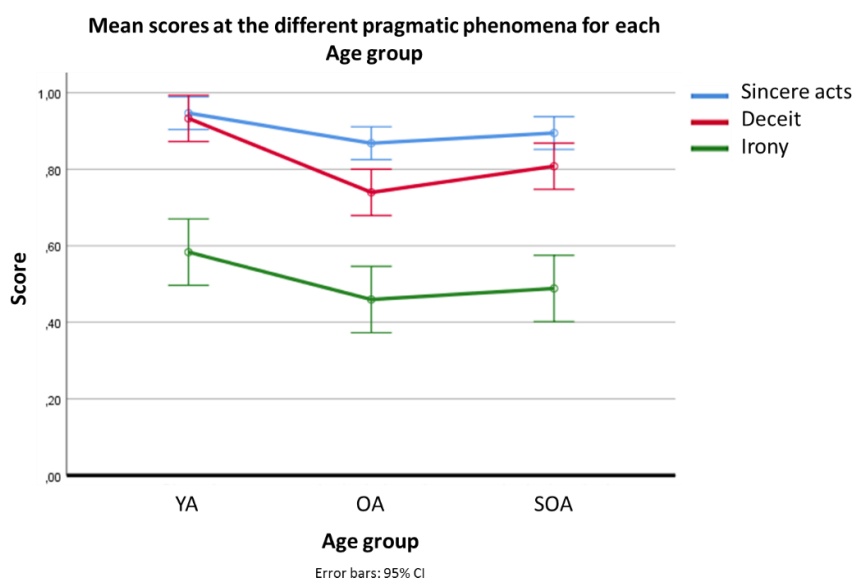
mood stabilizers consumption) and on the achievement of a cut-off score in the Montreal Cognitive Assessment¹², Token Test¹³ and the naming task of the Aachener Aphasia Test¹⁴.

Material: We administered 48 items assessing sincere deceitful and ironic communicative acts that were taken from the Assessment Battery for Communication (ABaCo)¹⁵. We also assessed the following cognitive variables: attention (Trail Making Test, Subtest A)¹⁶ and working memory (Digit and Listening Span tests)^{17,18}; EFs: Prose memory test²¹, inhibition (Stroop test)¹⁹, cognitive flexibility (Nelson's test Trail Making Test, Subtest B-A)^{20,16}; ToM: emotion and mental state recognition (Reading the Mind in the Eyes test; RME)²¹, first-order ToM mentalistic and physical (Strange stories tasks)²² and second order ToM tasks²³.

Data analysis: We performed a 3x3 repeated measures ANOVA, with the Age group (YA, OA, SOA) as between-subjects factor and the Type of task (sincere, deceitful and ironic) as the within-subjects factor. We ran a correlation analysis (Pearson's r) between the global pragmatic performance at ABaCo (sincere, deceit, and irony) and demographic and cognitive features, EFs and ToM; we then applied a hierarchical regression analysis to examine the role of such components on the observed performance at the pragmatic phenomena. We entered relevant predictors in the model in 3 consecutive stages: (1) cognitive and demographic background factors; (2) EFs; (3) ToM.

Results

The ANOVA revealed a main effect of Age group ($F = 7.704$; $p = .001$; $\eta^2p = .232$) (YA, OA and SOA) on pragmatic performance evaluated using the ABaCo and a main effect of the Type of task ($F = 275.61$; $p = .000$; $\eta^2p = .844$) (sincere, deceitful and ironic). The interaction effect was non-significant, Age Group x Type of task ($F = .385$; $p = .683$; $\eta^2p = .015$). A significant linear contrast ($F = 275.61$; $p = .000$), indicates a linear decrease in performance from sincere to ironic communicative acts. Bonferroni-corrected paired contrast revealed that OA ($p = .001$) and SOA ($p = .033$) performed worse than YA, whereas we did not detect any difference between the two groups of elderly subjects ($p = .707$) (Graph 1). The pattern is confirmed also when considering linguistic ($F = 17.43$; $p = .000$) and extralinguistic ($F = 127.01$; $p = .000$) acts separately. The ANOVAs revealed a main effect of Group ($6.29 < F < 26.74$; $.000 < p < .004$) on performance in all cognitive, EFs and ToM tests, with the only exceptions being the Trail Making Test A and B-A, Prose memory test, Stroop test and ToM Strange Stories. The global pragmatic performance (i.e., sincere, deceit, irony) correlated with age, education, Forward and Listening span, Nelson's test, second order ToM task and RME ($-.406 < r < .515$; $.000 < p < .045$).



Graph 1. Participants' mean scores on the different pragmatic phenomena investigated by ABaCo.

The hierarchical regression analysis revealed cognitive (working memory) and demographic factors (age and education) to be significant predictors of participants' performance at all the three pragmatic phenomena investigated, while no significant increase in the explained variance was detected with the insertion of the models including EFs and ToM (Table 1).

Table 1. Hierarchical regression analysis for variables predicting participant's performance on sincere communicative acts, deceit and irony.

Dependent Variable	Predictors	R ² _{Adj}	R ² _{Change}	F _{Change}	Sig. F _{Change}
Sincere	Model 1	.102	.153	3.006	.039
	Model 2	.106	.021	1.234	.272
	Model 3	.132	.057	1.726	.189
Deceit	Model 1	.264	.305	7.321	.000
	Model 2	.249	.001	.038	.847
	Model 3	.235	.016	.551	.580
Irony	Model 1	.155	.203	4.237	.010
	Model 2	.184	.043	2.777	.102
	Model 3	.151	.002	.059	.942

Discussion

Results suggest the presence of a decline in all pragmatic phenomena investigated in both elderly age groups (OA and SOA), compared to the control group (YA). These findings confirm the few results existing in literature⁹⁻¹¹. Moreover, a significant contrast confirmed a linear trend of decrease in performance from the sincere (the easiest) to the ironic (the most difficult) communicative act, in line with the Cognitive Pragmatic theory¹. Pragmatic performance showed a significant correlation with a number of cognitive abilities, but the hierarchical regression analyses showed that only age, education⁴ and working memory were significant predictors. These preliminary findings confirm a decline of pragmatic ability

associated with aging process and confirm the existence of a trend of difficulty in pragmatic phenomena characterized by different degree of inferential complexity. Finally, the study provides highlights regarding the relation with cognitive functions, that deserves further and more detailed investigation.

References

1. Bara, B.G. (2010). *Cognitive pragmatics*. Cambridge: MIT Press.
2. Levinson, F.C. (1983). *Pragmatics*. Cambridge, UK: Cambridge University Press.
3. Zanini, S., Bryan, K., De Luca, G., Bava, A. (2005). The effects of age and education on pragmatic features of verbal communication. *Aphasiology*, 19(12), 1107-1133.
4. Champagne-Lavau, M., Monetta, L., Moreau, N. (2012). Impact of educational level on metaphor processing in older adults. *Revue française de linguistique appliquée*, 17(2), 89-100.
5. Bosco, F.M., Hilviu, D., Gabbatore, I., Parola, A. (2019). Pragmatic assessment in healthy aging. in Tonini, E., Bischetti, L., Ervas, F., Domaneschi, F., & Bambini, V., *Book of Abstracts - XPRAG.it2019*.
6. Glisky, E.L. (2007). Changes in cognitive function in human aging. In D.R. Ed. Riddle DR, e 3-202. *Brain Aging: Models, Methods, and Mechanisms*. CRC Press/Taylor & Francis.
7. 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. *Cognitive psychol*, 41(1), 49-100.
8. Premack, D., Woodruff, G. (1978). Does the chimpanzee have a theory of mind?. *Behav brain sci*, 1(4), 515-526.
9. Ruffman, T., Murray, J., Halberstadt, J., Vater, T. (2012). Age-related differences in deception. *Psychol Aging*, 27(3), 543-549.
10. Greengross, G. (2013). Humor and aging-a mini-review. *Gerontol*, 59(5), 448-453.
11. Bischetti, L., Ceccato, I., Lecce, S., Cavallini, E., Bambini, V. (2019). Pragmatics and theory of mind in older adults' humor comprehension. *Curr Psyc*, 1-17.
12. Nasreddine, Z.S., Phillips, N.A., Bedirian, V., Charbonneau, S., Withhead, V., Collin, I., Cummings, J.L., Chertkow, H. (2005). The Montreal Cognitive Assessment (MoCA). *J Am Geriatr Soc*, 53, 695-699
13. De Renzi, A., Vignolo, L.A. (1962). Token test. *Brain J Neurol*. 85, 665-678
14. Luzzatti, C., Willems, K., DeBleser, R. (1991). *Aachener Aphasie test* (Versione Italiana). Firenze: Organizzazioni Speciali.
15. Angeleri, R., Bosco, F.M., Gabbatore, I., Bara, B.G., Sacco, K. (2012). Assessment battery for communication (ABaCo): normative data. *Behav res methods*, 44(3), 845-861.
16. Reitan, R.M. (1958). Validity of the Trail Making Test as an Indicator of Organic Brain Damage. *Percept Motor Skill*, 8(3), 271-276.
17. Wechsler, D. (1987). *Wechsler memory scale revised*. The Psychological Corporation.
18. Daneman, M., Carpenter, P.A. (1980). Individual Differences in Working Memory and Reading. *J Verb Learn Verb Be*, 19, 450-466.

19. Spinnler, H., Tognoni, G., Gruppo italiano per lo studio neuropsicologico dell'invecchiamento. (1987). *Standardizzazione e taratura italiana di test neuropsicologici*. Milano: Masson Italia Periodici.
20. Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *J Exp Psychol*, 18(6), 643-662
21. Nelson, H.E. (1976). A modified card sorting test sensitive to frontal lobe defects. *Cortex*, 12(4), 313-24.
22. Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., Plumb, I. (2001). The "Reading the Mind in the Eyes" Test revised version. *J Child Psychol Psyc*, 42(2), 241-51.
23. Happé, F.G. (1994). An advanced test of theory of mind. *J autism Dev disord*, 24(2), 129-154.
24. Perner, J., Wimmer, H. (1985). John thinks that Mary thinks that . . .'. *J Exp Child Psychol*, 39, 437-471.