



Irony, deception and theory of mind in people with intellectual disabilities and dual diagnoses

Ironija, prevara i teorija uma kod osoba sa intelektualnom ometenošću i dualnim dijagnozama

Mirjana Djordjević, Nenad Glumbić, Branislav Brojčin

University of Belgrade, Faculty of Special Education and Rehabilitation,
Belgrade, Serbia

Abstract

Background/Aim. The ability to comprehend and produce irony and deception is rarely explored in people with intellectual disability (ID) or dual diagnoses (DD). The ability to understand irony and deception appears to be related to many cognitive skills, but some authors point out that the theory of mind is one of the most important factors for this ability. This research was conducted to determine the linguistic aspects of production and comprehension of irony and deception in adults with ID and DD, as well as the relationship of these abilities with theory of mind. **Methods.** The sample consisted of 120 people with ID aged between 20 and 56. Half of the sample comprised people with DD. Four subscales from the Assessment Battery for Communication were used to assess the participants' abilities to produce and comprehend irony and deception. False-belief tasks from "appearance-reality" category were used in theory of mind assessment. The level of intellectual functioning was measured by the Raven's progressive matrices, while the Peabody Picture Vocabulary Test was used to assess speech comprehension ability. **Results.** The results show that participants with DD and ID comprehend and produce false statements better than ironic ones. Participants with

ID were more successful in production than in comprehension tasks of both false and ironic statements, while the same was true for participants with DD only for ironic statements. Participants with ID were significantly more successful than participants with DD in irony comprehension tasks. In participants with ID, first-order theory of mind significantly correlated only with the ability to produce irony, and second-order theory of mind significantly correlated with producing irony and deception. There were no significant correlations between theory of mind and producing and comprehending irony and deception in participants with DD. **Conclusion.** Although differences in some aspects of assessed abilities were found between the two groups of participants, the similarities in the profile of these abilities were dominant. Results of variability can be explained by differences in speech comprehension ability more than by differences in nonverbal intellectual functioning or theory of mind acquisition. Future studies should assess the influence of other cognitive factors.

Key words:

intellectual disability; diagnosis, dual (psychiatry); mental processes; deception; theory of mind; comorbidity.

Apstrakt

Uvod/Cilj. Sposobnost razumevanja i produkcije ironije i prevare je retko izučavana u populaciji osoba sa intelektualnom ometenošću (IO) ili dualnim dijagnozama (DD). Sposobnost razumevanja ironije i prevare se dovodi u vezu sa mnogim kognitivnim veštinama, ali neki autori ističu da je upravo teorija uma jedan od najznačajnijih faktora za ovu sposobnost. Ovo istraživanje je sprovedeno radi utvrđivanja lingvističke sposobnosti razumevanja i produkcije ironije i prevare odraslih osoba sa IO i DD, kao i utvrđivanja odnosa između ovih sposobnosti i teorije uma. **Metode.** Uzorak je činilo 120 osoba sa IO starosne dobi između 20 i 56 go-

dina. Polovinu uzorka činile su osobe sa DD. Za procenu ispitanikovih sposobnosti produkcije i razumevanja ironije i prevare korišćene su četiri supskale iz Baterije za procenu komunikacije. Za procenu teorije uma korišćeni su zadaci lažnog verovanja iz kategorije „izgled-realnost“. Nivo intelektualnog funkcionisanja proveravan je Ravenovim progresivnim matricama, dok je sposobnost razumevanja govora procenjena Peabody Picture Vocabulary testom. **Rezultati.** Rezultati pokazuju da ispitanici sa IO i DD bolje razumeju i produkuju lažne nego ironične iskaze. Ispitanici sa IO su uspešnji u zadacima produkovanja, nego u zadacima razumevanja, kako lažnih, tako i ironičnih iskaza, dok za ispitanike sa DD ovo važi samo za ironične tvrdnje. U zadacima

razumevanja ironije, ispitanici sa IO su bili značajno uspešniji od ispitanika sa DD. Kod ispitanika sa IO teorija uma prvog reda ostvarila je značajne korelacije samo sa sposobnošću produkcije ironije, a teorija uma drugog reda sa produkcijom ironije i produkcijom prevare. U grupi ispitanika sa DD nisu ustanovljene značajne korelacije između teorije uma i produkcije i razumevanja ironije i prevare. **Zaključak.** Između dve grupe ispitanika pronađene su razlike u nekim aspektima ispitivanih sposobnosti, ali ipak dominiraju sličnosti u profilu ovih sposobnosti. Varijabilnost rezultata više

objašnjava razlike u sposobnosti razumevanja govora, nego razlike u neverbalnom intelektualnom funkcionisanju ili usvojenosti teorije uma. Narednim istraživanjima trebalo bi proveriti uticaj drugih kognitivnih faktora.

Ključne reči:
intelektualna ometenost; dijagnoze, dualne (psihijatrija); mentalni procesi; prevara; teorija uma; komorbiditet.

Introduction

The ability to comprehend irony should be considered in terms of the knowledge and context shared by two interlocutors (i.e., one interlocutor understands that the meaning of the other interlocutor's spoken message is in contrast to the background and context of the message)¹. By uttering ironic contents, the speaker produces a message that is not true and is contrary to the truth, but has no desire to deceive or trick the interlocutor².

When the speaker intends to influence the interlocutor's mental state, i.e., to manipulate his/her mental state, we refer to deception. In situations involving deception, the speaker knows that what he/she is saying is a lie but tries to convince the interlocutor that it is true. By uttering a lie, the speaker conveys a message he/she knows is a lie³⁻⁴.

Detecting the literal meaning of a statement represents only the first step in discovering and comprehending the interlocutor's communicative intentions. Bara⁵ points out the importance of understanding the interlocutor's mental states in realizing and comprehending a communication act. For communication to be successful, the interlocutor should reconstruct the speaker's mental state, search for the speaker's communicative intention, attribute certain mental states to the speaker with the possibility to change them, form his own communicative intentions and reply to the speaker⁵⁻⁶.

That is the reason the theory of mind (TOM) ability is singled out as significant cognitive factor for this ability⁴. However, the exact role of the theory of mind in pragmatic aspects of communication has not yet been fully explored, both in typical participants⁷, and those with psychiatric disorders⁸⁻⁹. Theory of mind (mentalization) represents the ability to understand and attribute different mental states to oneself and others, and as such is associated with communication in which the interlocutors convey messages with an intention, with the possibility to persuade the interlocutor, or deliberately deceive him/her, by sharing mutual attention, mutual plans, and goals of behaviour¹⁰.

According to some authors, first-order theory of mind (the ability to understand personal mental states) correlates with the comprehension of metaphor¹¹, and second-order theory of mind (a phenomenon that a person has a belief about the belief of another person) correlates with the comprehension of irony¹¹⁻¹³. On the other hand, some authors have not found significant correlation between theory of mind and irony comprehension¹⁴.

In previous years, the ability to comprehend and produce irony and deception has been studied in children and adults with average intellectual abilities^{4, 15-22}, but also in persons with traumatic brain injuries²³, autism²⁴, schizophrenia¹⁴, Parkinson's disease¹³, cerebral palsy²⁵, attention deficit hyperactivity disorder (ADHD)²⁶.

By analysing the literature, we determined that the abilities to comprehend and produce irony and deception have almost never been studied in people with intellectual disability (ID) or those with dual diagnoses (DD) i.e., people who have ID and a comorbid psychiatric disorder). ID represents a condition which occurs before the age of 18, and which is characterized by significant limitations in intellectual and adaptive functioning. Limitations in adaptive functioning include the deficits in conceptual, social, and practical skills²⁷. Insufficiently mastered conceptual and social skills in persons with ID hinder, among other things, the identification and comprehension of relevant social signals, their integration and processing, and thus planning and realization of behaviour in accordance with the existing situation²⁸. With regard to that, persons with ID can, to a greater or lesser extent, express difficulties in different aspects of functional communication and pragmatic abilities²⁹.

ID is often accompanied by comorbid psychiatric disorders³⁰⁻³². The prevalence of these disorders ranges from 14% to 70%³³⁻³⁶, and such a wide range of the obtained results is attributed to methodological characteristics of different studies³⁷⁻³⁸. It is believed that the presence of psychiatric symptoms has a negative effect on everyday functioning of persons with ID more than that is the case in persons with average intellectual abilities³¹.

Studies that aimed to assess general linguistic aspects of production and comprehension in participants with DD indicate that these people express disorganized linguistic production, which is characterized by unclear and poor speech expression, confusion, discomfort and frustration caused by the interlocutor's poor comprehension, and noticeably reduced or absent initiative in conversation³⁹⁻⁴¹. The conversation of persons with DD can be described as aimless, disorganized, incoherent, and poor⁴²⁻⁴³.

In addition, previous studies have shown theory of mind to be substantially delayed in people with ID. Several authors indicate that people with ID do not exhibit a theory of mind deficit relative to typically developing people of the same mental age⁴⁴⁻⁴⁵, while the others reveal significant impairments, especially in people with specific aetiologies⁴⁶⁻⁴⁷.

There are also many studies examining alterations of theory of mind in patients with schizophrenia and average intellectual abilities⁴⁸⁻⁵¹, but no one investigated the ability of theory of mind in people with DD.

The aim of this research is to investigate the linguistic abilities to produce and comprehend irony and deception in adults with ID with regard to the level of ID and the presence or absence of DD. Additionally, the relationship between theory of mind ability and the ability to produce and comprehend irony and deception was tested.

Methods

Participants

The sample consisted of 120 participants of both genders. The complete sample was divided into ID and DD subsamples, with 60 participants in each subsample. The exclusion criteria for both groups were severe visual and hearing impairment, bilingualism, autism spectrum disorder and brain injury.

The groups did not differ significantly in terms of age ($t[118] = 1.42, p = 0.158$).

Data on gender, age, speech comprehension ability, and intellectual functioning are presented in Table 1.

The participants with ID were those with below average intellectual and adaptive functioning of unknown aetiology. No comorbid psychiatric disorders were detected in their clinical presentations, and thus these participants did not use medications.

In participants with DD, comorbid psychiatric disorders were diagnosed along with below average intellectual and adaptive functioning, and they were all classified as schizophrenia spectrum disorders according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) classification⁵². Because of the existing psychiatric disorder, the participants with DD used antipsychotics, and their medical charts included information on occasional hospitalization in psychiatric institutions, while their below average intellectual functioning had no known cause.

All of the participants were diagnosed in childhood, and repeated diagnosis and obligatory psychiatric assessments were conducted upon the participants' admission to a social care institution. Data on the dual diagnoses were taken from the participants' personal records. Raven's progressive matrices were used to determine the level of intellectual functioning. Independent samples *t*-test was used to compare scores on Raven's progressive matrices in participants with ID

and DD, and the obtained results indicated that there were no statistically significant differences ($t[118] = 1.20, p = 0.232$).

Speech comprehension ability was assessed using the Peabody Picture Vocabulary Test. Both groups of participants were compared using independent samples *t*-tests, and the results showed that speech comprehension ability was more developed in the participants with ID than in the participants with DD ($t[118] = 2.13, p = 0.035$).

Bearing in mind the importance of language abilities for understanding irony⁵³ and deception⁵⁴, as well as for theory of mind⁵⁵, speech comprehension ability was used as the covariate in this research. Apart from speech comprehension ability, the score on Raven's progressive matrices was also used as the covariate.

Measures

The abilities to comprehend and produce irony and deception were assessed using four subscales from The Assessment Battery for Communication (ABaCo)⁶, a clinical instrument for evaluating pragmatic abilities. The ABaCo was translated in full from Italian into Serbian using the "double-blind translation" method. The video tasks were synchronized by male and female synchronizers. The instrument has five scales: Linguistic scale (e.g. the examiner asks the subject "Tell me that you are cold"), Extralinguistic scale (e.g. the examiner asks the subject "Order me to be quiet", the subject has to produce gestural acts), Paralinguistic scale (e.g., saying "I like it very much" while one's voice and attitude reveal that one doesn't like it at all), Context scale (the actor asks "Where are you going precisely?" and the partner replies "I'm going out"; the subject has to detect and explain the adequacy/inadequacy of the partner's reply), and Conversational scale (which assesses participants' ability to get involved in conversation, answer questions, respect the given topic, introduce new topics and speak when it is their turn). Within each scale, except the Conversational scale, the tasks were grouped into two subcategories – for the assessment of comprehension abilities and for the assessment of production abilities. There were 172 items in total, where 100 items were presented as video clips and 72 items were direct items in which the examiner asked questions and the participant was his interlocutor. In video tasks, the examiner showed a video clip and then asked questions related to communicative interaction presented in it. Video clips were 20 to 25 seconds long, and the number of words uttered in them ranged between five and nine. Each correct answer was marked with 1, and incorrect with 0. Maximum number of points in one task differed with regard to the scale it belonged to and the type of the task itself.

Table 1

The participants' characteristics

Subsamples	n	Gender		Age (years)				Peabody Picture Vocabulary Test				Raven's progressive matrices			
		F	M	min	max	mean	SD	min	max	mean	SD	min	max	mean	SD
ID	60	30	30	20	55	32.95	8.333	10	176	95.22	44.394	6	35	13.73	4.974
DD	60	30	30	20	56	30.70	8.494	9	159	78.12	43.379	4	24	12.73	4.104

ID – intellectual disability; DD – dual diagnoses; n – number of participants; F – female; M – male; SD – standard deviation.

According to the authors⁶ of the scale, the whole battery has high internal consistency which ranges from $\alpha = 0.63$ to $\alpha = 0.91$; the authors⁶ of the scale also point out that the agreement among the evaluators was high and that it ranged from 0.76 to 0.96.

Only the following subscales from the entire ABaCo battery were used for the purpose of this research: The Subscale of Linguistic Comprehension of Irony (hereinafter Comprehension of Irony), The Subscale of Linguistic Comprehension of Deception (hereinafter Comprehension of Deception), The Subscale of Linguistic Production of Irony (hereinafter Production of Irony), The Subscale of Linguistic Production of Deception (hereinafter Production of Deception). Although irony and deception have both linguistic and non-linguistic aspects, the given subscales assessed only linguistic aspects.

Each of the four subscales consists of four video tasks, all of which are graded on three levels. A participant can obtain a maximum of 12 points for each subscale. The mentioned levels within the production tasks include the following: 1. whether the participant expressed (formulated) a message, 2. whether the message was clear, understandable and acceptable, and 3. whether the message was sent with a specific purpose. On the other hand, the following items are evaluated in tasks which assess comprehension: 1) whether the participant understood what the actor in the video said, 2) whether the participant understood the truthfulness of that statement (is it a lie or the truth), and 3) whether the participant understood the purpose of that message (what was the person's intention when he said that).

For the tasks from Comprehension of Irony, after watching a video depicting a two-way communication interaction in which one actor utters an ironic statement (e.g. A girl in the shop tries on a dress that is obviously too tight. She asks her boyfriend whether a dress fits and he replies "It's a bit wide"), the participants are directed to answer the following questions: "What did the actor want to say? Did he really say that? Why did he answer in that way?"

Tasks from Comprehension of Deception include video scenes in which one actor gives a false reply to deceive the interlocutor (e.g. A boy and a girl sit at a table in a reading room. The girl gets up and leaves the room. He accidentally pours coffee over her notes. The girl comes back and asks: "Who has spilled coffee on my notes?" and the boy answers: "I really do not have a clue"). On the basis of what they see and hear, the participants are directed to answer the following questions: "What did the actor want to say? Did he tell the truth? Why did he say that?"

Tasks from Production of Irony include a video that presents a communicative interaction in which one actor says something, and the participants are expected to formulate an ironic answer for the second actor that completes the conversation (e.g. A girl is studying a radio that is on the table. A young man enters the room, leans on the table and observes an unplugged cable. The girl says desperately: "I don't know why the radio does not work"). The following aspects are assessed in this task: whether the participant formulated the message, whether the message is clear and understandable,

and whether the participant said it to make a joke, amuse somebody, or achieve the effect of irony.

In Production of Deception, the participants are expected to complete a chain of communication by formulating and producing an answer to deceive the interlocutor on the basis of the video presented (e.g. A young man enters a room, spots a bottle of juice, drinks it and throws the empty bottle in the bin. Straight after a girl enters the room and asks: "What has happened with my juice?"). The participant's answers to these tasks are graded on three levels: whether the participant formulated the message, whether the message is clear and understandable, and whether the participant lied to deceive somebody, i.e., so that the participant was not revealed.

False-belief tasks, the ones from the category of "appearance-reality" or "deceiving object" tasks, were used to assess the theory of mind ability^{56, 57}. The original task assesses the participants' ability to understand that objects can resemble each other and that appearances can vary from reality. Prior to setting the task, the examiner asks each participant about the names of their two best friends. Real friends' names are used in asking questions. A participant is presented with an object that he/she is asked to identify immediately; then, upon manipulating the object, it becomes clear that it is something else that only resembles the initially identified item. The participants are required to answer the following questions: a) "What does this object look like?", b) "What is the object?", c) "What do you expect your friend [the name of the participant's first friend] would think if he saw this object?"⁵⁷. A successful answer to all three questions in three attempts indicates that the participant has adopted first-order theory of mind. For the purpose of this research, the applied tasks were modified and supplemented with questions which enable the assessment of second-order theory of mind ability. The examiner put additional question in order to assess "beliefs about beliefs": d) "What do you expect your friend [the name of the participant's first friend] to think about what someone else [the name of the participant's second friend] thinks this object represents?". For the purpose of this research, the participants were presented with three objects: a candle that looks like an apple, a box that looks like a book, and a bank that looks like a ladybird. Each correct answer was awarded one point, and incorrect zero. A successful answer to the fourth question in all three attempts indicates that second-order theory of mind has been adopted.

The Peabody Picture Vocabulary Test⁵⁸ was used to assess the ability to comprehend speech, as a control variable. The items were grouped in 19 categories each consisting of 12 words. The total number of words was 228. The original version of the instrument was translated into Serbian, and then the Serbian version was translated back into English. After minor changes made by comparing two versions of the test (the original and the translation), a final version was created. The participants were expected to show one out of four given pictures, which corresponded to the uttered word. The Peabody Picture Vocabulary Test has a high internal consistency ranging from 0.89 to 0.97⁵⁸. Electronic version of this test was used for the purpose of this research. The partici-

pants were presented with pictures on a computer screen. The testing was stopped once a participant gave eight incorrect answers in one set. In accordance with the recommendations of the test authors and scoring instructions, raw score was obtained by subtracting the total number of incorrect answers from the total number of given items.

Raven's progressive matrices⁵⁹ were used to determine the level of intellectual functioning. This instrument consists of non-verbal tasks designed to measure general intelligence factor. The tasks within this test are organized as patterns but always with one segment missing. Participants are expected to recognize the pattern rule and accordingly choose the missing one from several offered. The applied version of the matrices consisted of 60 tasks organized in five series. The tasks were arranged according to difficulty, and the series were organized according to topics: completing patterns, determining analogies between pairs of figures, progressive changing of patterns, permuting figures and breaking the figures into parts. Reliability coefficient determined by even-odd method was high and was 0.96, while test-retest reliability was somewhat lower (0.88)⁵⁹. The test was assigned individually for the purpose of this research. It was shown and explained to the participant that there was one segment missing from the top of the page in each task, and that possible answers were given at the bottom of the page. It was also explained to the participant that each of the given answers was in a shape which could fit in the place of the missing segment, but that there was only one correct answer. Before starting the assessment, it was explained to the participant that he/she was expected to point to the answer he/she believed was the correct missing segment. After the introductory explanation of the task and a trial item, the examiner started the assessment starting from the first set and the first task. The examiner wrote down the answers which the participant pointed. All participants solved this test in less than 30 minutes. Raw score was calculated by adding up all the correct answers.

Ethical notes

All of the participants voluntarily participated in the research. The informed consent to participate in the research was obtained for each of the participants or by their parents or guardians. The participants were informed about the nature and content of the applied instruments and about the possibility of withdrawing from the procedure at any time. Additionally, the participants and their guardians were aware that the obtained results would be used solely for scientific

purposes and that the confidentiality of any information obtained would be respected. The research was approved by the Ethics Committee of the Faculty of Special Education and Rehabilitation, University of Belgrade, Serbia.

Procedure

The assessment was conducted after the sample was formed and written consent was obtained from the participants and their guardians. The participants with ID and DD were interviewed in their social care institutions. After providing introductory explanations and familiarizing the participants with the nature of tasks, the examiner assessed the participants individually in a space without any distractions. Video tasks from the applied scales were presented on a laptop, after which each participant was asked questions about the contents of the video. The video clips were 20 to 25 seconds long.

Data analyses

Descriptive data analysis included calculating the mean value, standard deviation (SD), and standard error of measurement (SE). Two separate mixed three-factor analysis of covariance (ANCOVAs) were used to examine the differences between groups with regard to different factors. The Spearman's correlation was used to assess the relationship between the abilities to comprehend and produce irony and deception, intellectual functioning and theory of mind. The Pearson's correlation was used to determine the relation between the subscales for assessing the abilities to comprehend and produce irony and deception.

Results

Table 2 shows the participants' scores on subscales that assess comprehension and production of irony and deception with regard to the presence of DD.

For the purpose of examining the differences in achievements on comprehending and producing irony and deception tasks, two separate three-factor ANCOVAs were performed, with diagnosis (ID, DD) as between subject factor and irony/deception and comprehension/production as repeated factors (within subject). Speech comprehension ability presented as the Peabody test score was used as the covariate in the first analysis, while intelligence presented through score on Raven's progressive matrices was the covariate in the second analysis.

Table 2

Participants' scores on scales assessing the comprehension and production of irony and deception with regard to the presence of dual diagnoses (DD)

Parameters	Mean		SD		SE	
	ID	DD	ID	DD	ID	DD
Comprehension of irony	5.37	4.20	1.93	2.08	0.25	0.27
Comprehension of deception	6.97	7.65	4.06	3.55	0.52	0.46
Production of irony	6.50	5.58	2.59	2.95	0.33	0.38
Production of deception	8.82	7.30	3.43	3.84	0.44	0.49

ID – intellectual disability; SD – standard deviation; SE – standard error of measurement.

Table 3**Three-factor ANCOVA with Peabody test score as the covariate**

Parameters	F	<i>p</i>	Partial η^2
Comprehension/production	0.177	0.674	0.002
Comprehension/production * Peabody test score	5.076	0.026	0.042
Comprehension/production * ID/DD	1.578	0.212	0.013
Irony/deception	16.981	0.000	0.127
Irony/deception * Peabody test score	0.041	0.840	0.000
Irony/deception * ID/DD	1.778	0.185	0.015
Comprehension/production * irony/deception	0.475	0.492	0.004
Comprehension/production * irony/deception * Peabody test score	0.043	0.836	0.000
Comprehension/production * irony/deception * ID/DD	6.856	0.010	0.055
Peabody test score	58.959	0.000	0.335
ID/DD	0.722	0.397	0.006

η^2 – eta squared; ANCOVA – intellectual disability; DD – dual diagnoses.

Table 4**Three-factor analysis of covariance (ANCOVA) with score on Raven's progressive matrices as the covariate**

Parameters	F	<i>p</i>	Partial η^2
Comprehension/production	0.417	0.520	0.004
Comprehension/production * score on Raven's progressive matrices	3.562	0.062	0.030
Comprehension/production * ID/DD	2.232	0.138	0.019
Irony/deception	12.181	0.001	0.094
Irony/deception * score on Raven's progressive matrices	0.169	0.682	0.001
Irony/deception * ID/DD	1.604	0.208	0.014
Comprehension/production * irony/deception	0.795	0.374	0.007
Comprehension/production * irony/deception * score on Raven's progressive matrices	0.311	0.578	0.003
Comprehension/production * irony/deception * ID/DD	6.940	0.010	0.056
Score on Raven's progressive matrices	10.657	0.001	0.083
ID/DD	2.728	0.101	0.023

η^2 – eta squared; ID – intellectual disability; DD – dual diagnoses.

In the analysis in which speech comprehension ability was used as the covariate, only main effects of the covariate (speech comprehension) and irony/deception factor appeared as significant (Table 3). Apart from that, the analysis revealed significant interactions of speech comprehension ability with comprehension/production, as well as the interaction of all three factors, comprehension/production, irony/deception and ID/DD. The interaction showed that effects of all three factors depended on each other; for instance, effects of irony/deception differed in comprehension and production, and also in ID and DD participants.

In the analysis in which intellectual functioning was used as the covariate, only main effects of the covariate (intellectual functioning) and irony/deception factor appeared as significant (Table 4). Apart from that, the analysis revealed significant interactions of all three factors, comprehension/production, irony/deception and ID/DD. The interaction showed that effects of all three factors depended on each other; for instance, effects of comprehension/production were different for irony and deception, and also in ID and DD participants.

Participants with ID were better in producing irony than in comprehending it in both analyses (comprehending speech covariate $p = 0.003$; intellectual functioning covariate $p = 0.002$), as well as in producing deception than in comprehending it (comprehending speech covariate $p = 0.010$; intel-

lectual functioning covariate $p = 0.007$). DD group was better in producing irony than in comprehending it ($p = 0.000$ in both analyses), while there were no statistical differences in deception tasks; ID group had higher scores compared to DD group for comprehension of irony (comprehending speech covariate $p = 0.016$; intellectual functioning covariate $p = 0.004$) and for production of deception only in the second analysis in which the covariate was intellectual functioning ($p = 0.044$).

With regard to achievements in first-order theory of mind assessment tasks, we could conclude on the basis of mean values that participants with ID ($M = 0.31$, $SD = 0.469$) had somewhat higher achievements than participants with DD ($M = 0.26$, $SD = 0.445$), but not statistically significant ($t[118] = 0.598$, $p = 0.234$). A similar relation was present in second-order theory of mind tasks in participants with ID ($M = 0.15$, $SD = 0.360$) and DD ($M = 0.13$, $SD = 0.345$) ($t[117] = 0.223$, $p = 0.657$). Nonparametric techniques of the Spearman's rank correlation were used to assess the relations between first- and second-order theory of mind. Statistically significant correlations were obtained both in persons with ID ($r = 0.617$, $p = 0.000$) and in persons with DD ($r = 0.649$, $p = 0.000$).

The Pearson's correlation was used to determine the relation between individual subscales for assessing the abilities to comprehend and produce irony and deception.

Table 5

Correlations between comprehension and production of irony and deception^a

Parameters		Comprehension of irony	Comprehension of deception	Production of irony	Production of deception
Comprehension of irony	r	$\alpha = 0.672$	0.120	0.359**	0.302*
Comprehension of deception	r	0.163	$\alpha = 0.891$	-0.021	0.130
Production of irony	r	0.507**	0.125	$\alpha = 0.800$	0.576**
Production of deception	r	0.406**	0.059	0.598**	$\alpha = 0.885$

^a Above diagonal – correlations for intellectual disability; below diagonal – correlations for dual diagnoses; on diagonal – Cronbach's alpha reliability coefficients for linguistic production and comprehending irony and deception subscales; * $p < 0.05$; ** $p < 0.01$.

Table 6

Correlations among comprehension and production of irony and deception, theory of mind intellectual functioning, and speech comprehension

Parameters		Raven's score		TOM I		TOM II		Speech comprehension	
		ID	DD	ID	DD	ID	DD	ID	DD
Comprehension of irony	r_s	0.137	0.306*	0.223	0.097	0.146	-0.022	0.433**	0.459**
Comprehension of deception	r_s	-0.006	0.069	-0.052	0.127	0.145	0.040	0.203	0.235
Production of irony	r_s	0.208	0.426**	0.341**	0.114	0.263**	0.055	0.521**	0.532**
Production of deception	r_s	0.163	0.319*	0.222	0.079	0.312*	0.051	0.527**	0.305*

** $p < 0.01$; * $p < 0.05$; ID – intellectual disability; DD – dual diagnoses; TOM I – first-order theory of mind; TOM II – second-order theory of mind.

The obtained results showed irony comprehension correlated positively with irony production and deception production, in both groups (ID and DD), but in DD the correlations were a bit higher. Also, irony production correlated positively with deception production in both groups quite similarly. Cronbach's alpha coefficients showed satisfactory reliability for almost all scales except for irony comprehension which was a bit lower (Table 5).

The relationship between first- and second-order theory of mind ability and the production and comprehension of irony and deception was assessed using nonparametric techniques of the Spearman's rank correlation, since preliminary analyses determined that there was no normal distribution in theory of mind results. By means of the same technique, we tested the relations among speech comprehension ability, success in comprehending and producing irony and deception, and the level of intellectual functioning presented as the score on Raven's progressive matrices (Table 6).

There were no significant correlations between intellectual functioning and comprehension and production of irony and deception in the group of participants with ID, while in the group with DD significant correlations were determined between intellectual functioning and comprehending irony, producing irony and producing deception. In participants with ID, first-order theory of mind had significant correlations only with producing irony, while second-order theory of mind had significant correlations with producing irony and producing deception. In participants with DD, there were no significant correlations between theory of mind and producing and comprehending irony and deception. With regard to speech comprehension ability, statistically significant correlations were determined in both groups of participants (ID and DD) with all subscales except with comprehending deception subscale.

Discussion

The obtained results showed that participants with ID were significantly more successful in comprehending irony tasks compared to participants with DD. Apart from comprehending irony, participants with ID were also more successful in producing deception. All participants were more successful in deception tasks compared to irony tasks. Production was easier for all participants, except for participants with DD in deception tasks.

Regarding differences between the participants with DD and the participants with ID, after using speech comprehension and intelligence as covariates, the ability to comprehend irony was singled out in both analyses indicating the existence of significant differences at an advantage of persons with ID. Colle et al.⁶⁰ note that participants with psychotic disorders and average intellectual abilities show more prominent difficulties with solving irony tasks. Gavilán and García-Albea⁶¹ also indicate that in participants with symptoms of schizophrenia, the ability to comprehend figurative aspects of language (e.g. metaphor, irony, proverbs) is more strongly influenced by theory of mind ability than by intelligence. Although according to these authors, theory of mind deficit has a negative influence on semantic-pragmatic processing and on comprehending figurative meaning, bearing in mind the absence of statistically significant correlations (which will be interpreted with caution due to reduced variability of the variables which were correlated) between theory of mind and irony obtained in this research, we are closer to the opinion of the authors who argue that the theory of mind could not be considered a crucial factor in irony comprehension^{4,62}.

The following notions also indicate that the relation between theory of mind and comprehending irony in persons

with mental disorders depends on several different factors. In line with the above mentioned, some studies have found that, in persons with schizophrenia who do not have acute symptoms, comprehension of irony is not significantly related to the theory of mind^{14, 63}, which is in accordance with the results of this research. Some authors believe that the absence of relation between the theory of mind and comprehension of irony can be explained by the fact that persons with schizophrenia may have deficits in implementation and execution, i.e. that they understand mental states of others, but they fail to apply this knowledge due to limitations related to processing (e.g. general cognitive deficit)¹⁴.

Some authors believe that cognitive flexibility, the integration of different contextual elements, and the ability to reject literal interpretations and make connections between a statement and a totally opposite meaning are necessary to comprehend irony⁶⁴. All of the mentioned factors (theory of mind and other cognitive factors) are in accordance with the ideas stated in the Theory of Cognitive Pragmatics, which indicate that irony is a non-standard form of communication in which it is not enough for the listener to follow the usual chain of communication; instead, he or she must flexibly observe both contextual segments and the speaker's mental state. In this regard, the participants with DD in our research had somewhat more noticeable difficulties detecting discrepancies in meaning and/or uttered messages whose meanings were in opposition to the contextual background and the speaker's intention, which may point to the fact that the characteristics attributed to these participants – such as cognitive disorientation, poor analytic abilities, and insufficient motivation, can contribute to such results. This assumption is in accordance with the results of the research conducted by Colle et al.⁶⁰ which indicate that severity of schizophrenic symptoms have a negative correlation with overall pragmatic abilities of persons with schizophrenia.

Apart from differences in the ability to comprehend irony, the results of the mixed three-factor ANCOVA analysis, in which the covariate was intellectual functioning, indicate another difference between participants with ID and DD in producing deception tasks, again at an advantage of persons with ID.

On the other hand, the results show that all participants were more successful in deception tasks compared to irony tasks regardless of the presence of ID and DD. The fact that all participants were more successful in deception tasks is not surprising, and is supported by the literature which states that tasks containing irony are more demanding and more complex than tasks containing deception, both for participants with ID⁶⁵, and for typically developing individuals⁴. Also, the results of this research indicate that all participants with ID were more successful in production tasks than in comprehending ironic and false statements. Persons with DD had higher scores in producing irony than in comprehending it. Bearing in mind that the obtained results indicate that speech comprehension ability had significant interactions with the comprehension/production factor ($p = 0.026$, Partial $\eta^2 = 0.042$), the obtained differences between comprehending and producing irony and deception can also be observed in the context of the relation between this variable and receptive speech. We can conclude that better under-

standing of speech leads to more pronounced differences between comprehension and production.

The results of our research indicate that TOM did not correlate with comprehending and producing irony and deception in participants with DD at all, while in participants with ID, first-order TOM correlated with producing irony, and second-order TOM correlated with producing irony and producing deception. It is possible that the absence of correlations was caused by the limited variability (range restriction) in both TOM and comprehending/producing irony/deception (although the restriction appears to be larger for TOM). This finding which points to the relation between TOM and production is not uncommon in studies on other clinical populations, and thus Bosco et al.⁶⁶ indicate that in participants with traumatic brain injury TOM can account for the production of irony and deception to some extent, but not their comprehension. Executive functions were singled out as significant for speech comprehension, but not for production ability.

Achievements of participants with ID and DD in irony and deception tasks with regard to their comprehension and production can be explained by speech comprehension ability (Partial $\eta^2 = 0.335$) to a greater extent than by intellectual functioning (Partial $\eta^2 = 0.083$). Supporters of linguistic theories of non-literal comprehension development also point out the significant influence of general linguistic comprehension and scope of vocabulary for comprehending non-literal language in persons with language difficulties^{67,68}. Language skills have also proved to be crucial in comprehending ironic statements in studies on typically developing children⁶⁹. Norbury⁶⁸ emphasizes that it cannot be argued that TOM fails to play any role in persons with language difficulties in comprehending non-literal language, not because of the theory of mind itself, but because of its close relation to language skills which are considered dominant in non-literal language.

The ability of producing and comprehending both irony and deception in persons with ID cannot solely be explained by the presence of mental disorders, since it appeared as significant only in interaction with other factors. Presence of mental disorders showed significant effect only on irony comprehension and deception production, which were higher in the group without mental disorders. Furthermore, the results of our research also point to the complexity of this relation, indicating that skills of producing and comprehending irony are significantly positively correlated with each other, and correlations were also determined with producing deception. Only comprehending deception did not correlate with other skills in any group. Partial absence of correlations between comprehending deception and irony can also be observed as a part of differences between these skills and their partially different neurological basis. For example, in a neuroimaging study, Bosco et al.⁷⁰ found that the left middle temporal gyrus activated in comprehending ironic statements, while it did not activate in comprehending lies.

Limitations

One of the limitations of this research is the use of only one instrument to assess the production and comprehension

of irony and deception, which did not allow a comparison of the results among instruments measuring the same group of abilities. A second limitation could be the sample structure of this research. Thus, future studies should extend the scope and structure of the assessed groups with regard to age and different intellectual disabilities aetiologies. Also, one of the limitations of this study may be the absence of assessment of certain aspects of executive functions (e.g. planning skills, reasoning skills, cognitive flexibility, etc.), which can potentially be related to non-standard linguistic abilities. Additionally, further studies should include the assessment of other cognitive and adaptive factors that influence the differences in non-standard achievements between participants with intellectual disabilities and those with dual diagnoses.

Conclusion

Although differences were found in some aspects of assessed abilities between the two groups (participants

with intellectual disability were better than participants with dual diagnoses in comprehension of irony and production of deception), similarities in the profile of these abilities were dominant in all participants (both groups were better in comprehending and producing deception than irony). Examining the relations indicated that results variability can be explained by differences in speech comprehension ability more than by differences in non-verbal intellectual functioning or differences in theory of mind acquisition.

Acknowledgement

This paper is a result of the project "Social Participation of People with Intellectual Disability", which was financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia (No. 179017).

R E F E R E N C E S

1. *Airenti G, Bara BG, Colombetti M.* Conversation and behavior games in the pragmatics of dialogue. *Cog Sci* 1993; 17(2): 197–256.
2. *Bosco FM, Angeleri R, Sacco K, Bara BG.* Explaining pragmatic performance in traumatic brain injury: a process perspective on communicative errors. *Int J Lang Commun Disord* 2015; 50(1): 63–83.
3. *Bara B, Bosco F, Bucciarelli M.* Developmental pragmatics in normal and abnormal children. *Brain Lang* 1999; 68(3): 507–28.
4. *Bosco F, Bucciarelli M.* Simple and complex deceptions and ironies. *J Pragmat* 2008; 40(4): 583–607.
5. *Bara B.* Cognitive pragmatics: The mental processes of communication. *Intercult Pragmat* 2011; 8(3): 443–85.
6. *Sacco K, Angeleri R, Bosco FM, Colle L, Mate D, Bara BG.* Assessment Battery for Communication – ABaCo: A new instrument for the evaluation of pragmatic abilities. *J Cogn Sci* 2008; 9(2): 111–57.
7. *Sperber D, Wilson D.* Pragmatics, modularity and mind-reading. *Mind Lang* 2002; 17: 3–23.
8. *Bell EM, Langdon R, Siegert RJ, Ellis PE.* Schizophrenia and social functioning: The role of impaired metacognition. In: *Dimaggio G, Lysaker P*, editors. *Metacognition and severe adult mental disorders: From research to treatment.* London, UK: Routledge; 2010. p. 121–45.
9. *Bosco FM, Bono A, Bara BG.* Recognition and repair of communicative failures: The interaction between theory of mind and cognitive complexity in schizophrenic patients. *J Commun Disord* 2012; 45(3): 181–97.
10. *Baron-Cohen S.* Theory of mind and autism: a fifteen year review. In: *Baron-Cohen S, Tager-Flusberg H, Cohen DJ*, editors. *Understanding Other Minds – perspectives from developmental cognitive neuroscience.* Oxford: Oxford University Press; 2000. p. 3–20.
11. *Happé FG.* Communicative competence and theory of mind in autism: A test of relevance theory. *Cognition* 1993; 48(2): 101–19.
12. *Massaro D, Valle A, Marchetti A.* Irony and second-order false belief in children: What changes when mothers rather than siblings speak? *Eur J Dev Psychol* 2013; 10(3): 301–17.
13. *Monetta L, Grindrod CM, Pell MD.* Irony comprehension and theory of mind deficits in patients with Parkinson's disease. *Cortex* 2009; 45(8): 972–81.
14. *Mo S, Su Y, Chan RC, Liu J.* Comprehension of metaphor and irony in schizophrenia during remission: The role of theory of mind and IQ. *Psychiatry Res* 2008; 157(1–3): 21–9.
15. *Angeleri R, Airenti G.* The development of joke and irony understanding: A study with 3-to 6-year-old children. *Can J Exp Psychol* 2014; 68(2): 133–46.
16. *Bosco FM, Angeleri R, Colle L, Sacco K, Bara BG.* Communicative abilities in children: An assessment through different phenomena and expressive means. *J Child Lang* 2013; 40(4): 741–78.
17. *Bosco FM, Vallana M, Bucciarelli M.* Comprehension of communicative intentions: the case of figurative language. *J Cogn Sci* 2009; 10(2): 245–77.
18. *Hancock JT.* Verbal irony use in face-to-face and computer-mediated conversations. *J Lang Soc Psychol* 2004; 23(4): 447–63.
19. *Hancock JT, Dunham PJ, Purdy K.* Children's comprehension of critical and complimentary forms of verbal irony. *J Cogn Dev* 2000; 1(2): 227–48.
20. *Kreuz RJ.* The production and processing of verbal irony. *Metaphor Symb* 2000; 15(1–2): 99–107.
21. *Milosky LM, Ford JA.* The role of prosody in children's inferences of ironic intent. *Discourse Process* 1997; 23(1): 47–61.
22. *Recchia HE, Howe N, Ross HS, Alexander S.* Children's understanding and production of verbal irony in family conversations. *Br J Dev Psychol* 2010; 28(Pt 2): 255–74.
23. *Dennis M, Purvis K, Barnes MA, Wilkinson M, Winner E.* Understanding of literal truth, ironic criticism, and deceptive praise following childhood head injury. *Brain Lang* 2001; 78(1): 1–16.
24. *Wang AT, Lee SS, Sigman M, Dapretto M.* Neural basis of irony comprehension in children with autism: the role of prosody and context. *Brain* 2006; 129(Pt 4): 932–43.
25. *Caillies S, Hody A, Calmus A.* Theory of mind and irony comprehension in children with cerebral palsy. *Res Dev Disabil* 2012; 33(5): 1380–8.
26. *Caillies S, Bertot V, Motte J, Raynaud C, Abely M.* Social cognition in ADHD: irony understanding and recursive theory of mind. *Res Dev Disabil* 2014; 35(11): 3191–8.
27. American Association on Intellectual and Developmental Disabilities (AAIDD). *Intellectual Disability: Definition, Classification, and Systems of Supports.* 11th ed. Washington, DC: AAIDD; 2010.

28. *Glumbić N.* Quality of social participation of children with moderate mental retardation. *Socijalna misao* 2005; 12(2–3): 143–54. (Serbian)
29. *Angell ME, Bailey RL, Larson L.* Systematic instruction for social-pragmatic language skills in lunchroom settings. *Educ Train Dev Disabil* 2008; 43(3): 342–59.
30. *Cooper SA, Smiley E, Morrison J, Williamson A, Allan L.* Mental ill-health in adults with intellectual disabilities: prevalence and associated factors. *Br J Psychiatry* 2007; 190: 27–35.
31. *Dekker MC, Koot HM.* DSM-IV disorders in children with borderline to moderate intellectual disability. I: Prevalence and impact. *J Am Acad Child Adolesc Psychiatry* 2003; 42(8): 915–22.
32. *Emerson E.* Prevalence of psychiatric disorders in children and adolescents with and without intellectual disability. *J Intellect Disabil Res* 2003; 47(Pt 1): 51–8.
33. *Cormack KF, Brown AC, Hastings RP.* Behavioural and emotional difficulties in students attending schools for children and adolescents with severe intellectual disability. *J Intellect Disabil Res* 2000; 44(Pt 2): 124–9.
34. *Einfeld S, Tonge BJ.* Population prevalence of psychopathology in children and adolescents with intellectual disability. I. Rationale and methods. *J Intellect Disabil Res* 1996; 40(Pt 2): 91–8.
35. *Einfeld SL, Ellis LA, Emerson E.* Comorbidity of intellectual disability and mental disorder in children and adolescents: A systematic review. *J Intellect Dev Disabil* 2011; 36(2): 137–43.
36. *Molteno G, Molteno CD, Finchilescu G, Daves AR.* Behavioural and emotional problems in children with intellectual disability attending special schools in Cape Town, South Africa. *J Intellect Disabil Res* 2001; 45(Pt 6): 515–20.
37. *Horowitz M, Matson JL, Sipes M, Shoemaker M, Belva B, Bamburg JW.* Incidence and trends in psychopathology symptoms over time in adults with severe to profound intellectual disability. *Res Dev Disabil* 2011; 32(2): 685–92.
38. *LoVullo SV, Matson JL.* Comorbid psychopathology in adults with autism spectrum disorders and intellectual disabilities. *Res Dev Disabil* 2009; 30(6): 1288–96.
39. *Bakken TL, Eilertsen DE, Smeby NA, Martinsen H.* Effective communication related to psychotic disorganised behaviour in adults with intellectual disability and autism. *Nord J Nurs Res Clin Stud* 2008; 28(2): 9–13.
40. *Matson JL, Anderson SJ, Bamburg JW.* The relationship of social skills to psychopathology for individuals with mild and moderate mental retardation. *Br J Dev Disabil* 2000; 46(90): 15–22.
41. *Matson JL, Terlonge C, González ML, Rivet T.* An evaluation of social and adaptive skills in adults with bipolar disorder and severe/profound intellectual disability. *Res Dev Disabil* 2006; 27(6): 681–7.
42. *Bakken TL, Friis SV, Lovoll SV, Smeby NA, Martinsen H.* Behavioral disorganization as an indicator of psychosis in adults with intellectual disability and autism. *Ment Health Aspect Dev Disabil* 2007; 10(2): 37–47.
43. *Cherry KE, Penn D, Matson JL, Bamburg JW.* Characteristics of schizophrenia among persons with severe or profound mental retardation. *Psychiatr Serv* 2000; 51(7): 922–4.
44. *Charman T, Campbell A, Edwards L.* Theory of mind performance in children, adolescents and adults with a mental handicap. *Cognit Dev* 1998; 13(3): 307–22.
45. *Kravetz S, Katz S, Alfa-Roller I, Yehoshua S.* Aspects of a Theory of Mind and self-reports of quality of life by persons with mental retardation. *J Dev Phys Disabil* 2003; 15(2): 165–83.
46. *Giaouri S, Alevriadou A, Tsakiridou E.* Theory of mind abilities in children with Down syndrome and non-specific intellectual disabilities: An empirical study with some educational implications. *Procedia Soc Behav Sci* 2010; 2(2): 3883–7.
47. *Lo ST, Siemensma E, Collin P, Hokken-Koelega A.* Impaired theory of mind and symptoms of autism spectrum disorder in children with Prader–Willi syndrome. *Res Dev Disabil* 2013; 34(9): 2764–73.
48. *Bora E, Yucel M, Pantelis C.* Theory of mind impairment in schizophrenia: meta-analysis. *Schizophr Res* 2009; 109(1–3): 1–9.
49. *Brüne M.* “Theory of mind” in schizophrenia: a review of the literature. *Schizophr Bull* 2005; 31(1): 21–42.
50. *Corcoran R, Mercer G, Frith CD.* Schizophrenia, symptomatology and social inference: investigating “theory of mind” in people with schizophrenia. *Schizophr Res* 1995; 17(1): 5–13.
51. *Sprong M, Schothorst P, Vos E, Hox J, van Engeland H.* Theory of mind in schizophrenia: meta-analysis. *Br J Psychiatry* 2007; 191(1): 5–13.
52. *American Psychiatric Association.* Diagnostic and statistical manual of mental disorders. 5th ed. Arlington: American Psychiatric Publishing; 2013.
53. *Filippova E, Astington JW.* Further development in social reasoning revealed in discourse irony understanding. *Child Dev* 2008; 79(1): 126–38.
54. *Zhou L, Burgoon JK, Zhang D, Nunamaker JF.* Language dominance in interpersonal deception in computer-mediated communication. *Comput Human Behav* 2004; 20(3): 381–402.
55. *Farrar MJ, Maag L.* Early language development and the emergence of a theory of mind. *First Lang* 2002; 22(2): 197–213.
56. *Fisher N, Happé F, Dunn J.* The relationship between vocabulary, grammar, and false belief task performance in children with autistic spectrum disorders and children with moderate learning difficulties. *J Child Psychol Psychiatry* 2005; 46(4): 409–19.
57. *Hansen MB, Markeman EM.* Appearance questions can be misleading: a discourse-based account of the appearance–reality problem. *Cogn Psychol* 2005; 50(3): 233–63.
58. *Dunn LM, Dunn DM.* PPVT-4: Peabody picture vocabulary test. 4th ed. Minneapolis, MN: Pearson Assessments; 2007.
59. *Raven J, Raven JC, Court, JH.* Manual for Raven’s progressive matrices and vocabulary scales. SOxford: Oxford Psychologists Press; 1998.
60. *Colle L, Angeleri R, Vallana M, Sacco K, Bara BG, Bosco F.* Understanding the communicative impairments in schizophrenia: A preliminary study. *J Commun Dis* 2013; 46(3): 294–308.
61. *Gavilán Ibáñez JM, García-Albea Ristol JE.* Theory of mind and language comprehension in schizophrenia: Poor mindreading affects figurative language comprehension beyond intelligence deficits. *J Neurolinguistics* 2011; 24(1): 54–69.
62. *Bosco FM, Gabbatore I.* Theory of mind in recognizing and recovering communicative failures. *Appl Psycholinguistics* 2017; 38(1): 57–88.
63. *Mitchley NJ, Barber J, Gray JM, Brooks DN, Livingston MG.* Comprehension of irony in schizophrenia. *Cogn Neuropsychiatry* 1998; 3(2): 127–38.
64. *Godbee K, Porter M.* Comprehension of sarcasm, metaphor and simile in Williams syndrome. *Int J Lang Commun Disord* 2013; 48(6): 651–65.
65. *Sullivan K, Winner E, Tager-Flusberg H.* Can adolescents with Williams syndrome tell the difference between lies and jokes? *Dev Neuropsychol* 2003; 23(1–2): 85–103.
66. *Bosco FM, Parola A, Valentini MC, Morese R.* Neural correlates underlying the comprehension of deceitful and ironic communicative intentions. *Cortex* 2017; 94: 73–86.
67. *Vance M, Wells B.* The wrong end of the stick: language-impaired children’s understanding of non-literal language. *Child Lang Teach Ther* 1994; 10 (1): 23–46.
68. *Norbury CF.* The relationship between theory of mind and metaphor: Evidence from children with language impairment and autistic spectrum disorder. *Br J Dev Psychol* 2005; 23(3): 383–99.

69. *Filippova E, Astington JW*. Further development in social reasoning revealed in discourse irony understanding. *Child Dev* 2008; 79(1): 126–38.
70. *Bosco FM, Gabbatore I, Angeleri R, Zettin M, Parola A*. Do executive function and theory of mind predict pragmatic abilities following traumatic brain injury? An analysis of sincere, deceitful and ironic communicative acts. *J Commun Disord* 2018; 75: 102–17.

Received on February 14, 2018.

Revised on June 28, 2018.

Accepted on July 23, 2018.

Online First September, 2018.