PARALINGUISTIC ABILITIES OF ADULTS WITH INTELLECTUAL DISABILITY

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The aim of this research was to determine the ability level of paralinguistic production and comprehension in adults with intellectual disability (ID) with regard to the level of their intellectual functioning and presence of co-morbid psychiatric conditions or dual diagnosis (DD).

The sample consisted of 120 participants of both genders, ranging in age between 20 and 56 years (M = 31.82, SD = 8.702). Approximately 50% of the sample comprised participants with a co-existing psychiatric condition. Each of these two sub-samples (those with ID only and those with DD) consisted of 25 participants with mild ID and 35 participants with moderate ID. The Paralinguistic Scale from *The Assessment Battery for Communication* (ABaCo, Sacco et al., 2008) was used to assess the abilities of comprehension and production of paralinguistic elements.

The results showed that the participants with mild ID are more successful than the participants with moderate ID both in paralinguistic comprehension tasks ($p = .000$) and in paralinguistic production tasks ($p = .001$). Additionally, the results indicated the presence of separate influences of both ID levels on all of the paralinguistic abilities ($F [116] = 42.549$, $p = .000$) and the existence of DD ($F [116] = 18.215$, $p = .000$).

Keywords: *paralinguistic production, paralinguistic comprehension, dual diagnoses*

1. Introduction

Persons with intellectual disability (ID) often exhibit inappropriate types of socio-communicative behaviour that can, to some extent, be explained by a wrong perception of social situations, problems in detecting and understanding contextual characteristics, as well as problems in identifying emotional signals (Sukumaran, 2012). Paralinguistic communicative abilities are non-verbal abilities based on the ability to comprehend and produce the elements that accompany communication. Facial expression and prosody, as basic paralinguistic elements, can be defined as accompanying communicative signals that answer the question: "How has something been said?" (Angeleri, Bosco, Gabbatore, Bara, & Sacco, 2012; Gil, Aguert, Le Bigot, Lacroix, & Laval, 2014). Paralinguistic segments contribute to the variability of the speech flow and the additional undertone of the spoken message (Ward, 2004; Wilson & Wharton, 2006) as well as predict the behaviour of other people, recognizing emotions and understanding communicative intentions (Sacco et al., 2008; Wittfoth, Schröder, Schardt, Dengler, Heinze, & Kotz, 2010), and thus correlate with the pragmatic aspects of communication (Adell, Bonafonte, & Escudero, 2005).

Many research papers have assessed several elements of paralinguistic abilities of persons with autistic spectrum disorders (Castelli, 2005; Grossman, Bemis, Skwerer, & Tager-Flusberg, 2010; Lindner & Rosén, 2006; McCann, Peppé, Gibbon, O'Hare, & Rutherford, 2007; Peppé, McCann, Gibbon, O'Hare, & Rutherford, 2006; Tanaka, Kashioka, & Campbell, 2011; Wang, Lee, Sigman, & Dapretto, 2006; Wang & Tsao, 2015; Yirmiya et al., 1989). This issue has frequently been studied in adults with ID and syndrome specifics (Carvajal, Fernández-Alcaraz, Rueda, & Sarrión, 2012; Fernández-Alcaraz, Extremera, García-Andres, & Molina,

2010; Hippolyte, Barisnikov, Van der Linden, & Detraux, 2009; Pinheiro, Galdo-Álvarez, Rauber, Sampaio, Niznikiewicz, & Gonçalves, 2011; Plesa-Skwerer, Faja, Schofield, Verbalis, & Tager-Flusberg, 2006; Plesa Skwerer, Schofield, Verbalis, Faja, & Tager-Flusberg, 2007). Only certain segments of paralinguistic abilities in persons with Williams syndrome (Hargrove, Pittelko, Fillingane, Rustman, & Lund, 2013; Rosner, Hodapp, Fidler, Sagun, & Dykens, 2004) and Down syndrome (Bellugi, Lichtenberger, Jones, Lai, & St George, 2000; Dykens, Shah, Sagun, Beck, & King, 2002; Järvinen-Pasley et al., 2008) have been assessed.

By reviewing the literature, we observe that the ability to recognise, comprehend, and produce paralinguistic elements of communication has infrequently been assessed in adults with ID. Although the paralinguistic segments of communication have numerous functions, only the ability to recognise emotional reactions using facial and prosodic expressions has frequently been assessed in adults with ID. The results of the studies have shown that adults with ID have demonstrated significantly lower achievement than typically developing participants in the tasks that demand recognising emotions using facial expression (Owen, Browning, & Jones, 2001), and that these individuals express difficulties in recognising negative emotions in the tasks of facial and vocal expressions, especially fear (Plesa-Skwerer et al., 2006) and disgust (Owen et al., 2001).

Paralinguistic production was not assessed in the above-mentioned papers nor was the assessment of all of the paralinguistic abilities conducted. We are not familiar with any research on all of the paralinguistic abilities in persons with ID with regard to the level of their intellectual functioning or the appearance of co-existing psychiatric conditions (this co-morbidity will be referred to as “dual diagnosis” – DD in the text). There are indications that the severity of cognitive deficit correlates with the ability to recognise emotional facial expression (McAlpine, Kendall, & Singh, 1991; Mcalpine, Singh, Kendall, & Ellis, 1992; Rojahn, Lederer, & Tassé, 1995); however, there are no data on how cognitive deficit influences other paralinguistic abilities. Additionally, the findings in the literature have shown that the presence of psychiatric disorders in a typical population influences the processing of social and emotional stimuli from the environment (Cusi et al, 2012), recognising and producing both paralinguistic affective and non-affective segments in communication (Colle, Angeleri, Vallana, Sacco, Bara, & Bosco, 2013); however, there is no information on paralinguistic abilities in persons with DD. We believe that it is important to extend this type of research to persons with ID because the incidence of psychiatric disorders is higher in this population than in typically developing persons (Deb, Thomas, & Bright, 2001).

The present research was conducted with aims of determining the ability level of paralinguistic production and paralinguistic comprehension in adults with intellectual disability and assessing the influence of ID level and the presence of DD on paralinguistic abilities.

2. Method

2.1. Sample

The sample consisted of 120 participants of both genders, ranging in age between 20 and 56 years (M = 31.82, SD = 8.70). The complete sample was divided into two subsamples, i.e., participants with ID and participants with DD (n = 60 participants in each subsample). The participants with DD belong to the category of schizophrenia spectrum disorders according to DSM-5 classification, displaying symptoms in at least one of the following areas - delusion, hallucinations, abnormal motor behaviour, negative symptoms and disorganized speech and thoughts. All participants with DD used antipsychotics and their medical charts included information on occasional hospitalization in psychiatric institutions, and their lower intellectual functioning did not have a known cause. On the other hand, the participants with ID neither had co-morbid psychiatric disorders nor used medical therapy, and 50 participants from this group had ID of unknown aetiology, while 10 participants had Down syndrome. There were no participants with autism spectrum disorders in the complete sample (ID and DD).

Both subsamples consisted of 25 (41.7%) participants with mild ID (IQ range, 50 to 69) and 35 (58.3%) participants with moderate ID (IQ range, 35 to 49). Four groups of participants were formed as follows: participants with mild ID (ID_{mild}); participants with moderate ID ($ID_{moderate}$); participants with DD whose IQ is within mild ID (DD_{mild}); and participants with DD who function at the level of moderate ID ($DD_{moderate}$). Bearing in mind that the information on IQ and medical documentation of the participants indicated that different assessment tests were used, and that the assessments were conducted at different time, and that the information on IQ did not exist for some of the participants, but only the category of disability was known, we used Raven's progressive matrices (Raven & Raven, 1998) as a control variable, which confirmed that all the participants from our sample had under-average intellectual abilities. The results of the Mann-Whitney U test showed that there are no statistically significant differences between the participants with ID_{mild} and DD_{mild} with regard to their achievements on Raven's progressive matrices ($U = 277.50$; $Z = -.682$; $p > .05$), or between the participants with $ID_{moderate}$ and $DD_{moderate}$ ($U = 556.50$; $Z = -.661$; $p > .05$). Table 1 presents age and achievements on Raven's progressive matrices for the subsamples.

Table 1. Descriptive presentation of the participants' age and achievements on Raven's progressive matrices

	ID				DD			
	ID_{mild}		$ID_{moderate}$		DD_{mild}		$DD_{moderate}$	
	M	SD	M	SD	M	SD	M	SD
Age	31.24	8.84	34.17	8.75	31.80	9.2	29.91	7.96
Achievements on Raven's progressive matrices	15.60	6.14	12.40	3.45	13.92	4.62	11.89	3.52

With regard to the place of living, half of the participants with ID lived with their families (N=30), while the others (N=30) were in larger institutions (the institution in which our participants lived has 300 users over the age of 10). In the sample of the participants with DD, 31 participants lived with their families, while 29 were in larger institutions. Mann-Whitney U test showed that there are no statistically significant differences within the sample with regard to the place of living ($U = 450.00$; $Z = .000$; $p > .05$). All the participants who lived with their families were users of day care centres for persons with intellectual and developmental disabilities.

All of the participants were diagnosed in childhood, and repeated diagnosis, as well as obligatory psychiatric assessment, were conducted when they were admitted to a social care institution. The data on the level of intellectual functioning and dual diagnoses were obtained from the participants' personal medical records; informed consent was previously obtained from the participants and their parents.

The subsamples were equal with regard to gender distribution, i.e., there were 30 male and 30 female participants in both groups. Both groups of participants were compared with regard to age using *t*-test of independent samples, and no statistically significant differences were noted (t [118] = 1.42, $p = .158$).

The exclusion criteria in forming both groups were as follows: severe visual and hearing impairment, bilingualism and traumatic brain injury.

2.2 Material

2.2.1. Assessment of paralinguistic communicative abilities

The Paralinguistic Scale from *The Assessment Battery for Communication* (ABaCo, Sacco et al., 2008) was used to assess the abilities of comprehension and production of paralinguistic elements. This scale represents a clinical instrument for assessing pragmatic abilities. ABaCo was translated completely from Italian into Serbian, using the so-called "double blind translation" method. The original version of the instrument was translated into Serbian by a teacher with a BA degree in Italian, and the Serbian translation was translated back into Italian by a court interpreter. These two versions were compared and corrections were made to produce the final version of the battery. The total number of items in the AbaCo battery is 172, where 100 items are presented as short videos, and 72 items are tasks in which the participants are expected to complete the examiner's request (to give a verbal answer to a question, or to respond to a request adequately). In video tasks, the examiner shows a video scene and then asks a question with regard to the communicative situation from the video. Video scenes are between 20 and 25 seconds long, and the number of uttered words if from 5 to 9. The uttered text in the video scenes was translated from Italian into Serbian. Video tasks were synchronised, whereby the male speaker is a person with experience in national television and the female speaker is a PhD student in speech and language pathology.

The Paralinguistic Scale includes 32 tasks, which assess the abilities of comprehension and production of elements that accompany communication. Twenty tasks are video recordings

used to assess the ability of paralinguistic comprehension. The tasks that assess paralinguistic comprehension are divided into three subscales: Comprehension of Basic Paralinguistic Elements (includes eight items that assess the ability to understand questions, statements, requests, and orders uttered in an imaginary language accompanied by mime and prosodic elements; the maximum number of points that a participant can receive in this subscale is eight); Comprehension of Emotions in Communication (includes eight items that assess the ability to understand anger, happiness, fear, and sadness in situations in which the speaker uses an imaginary language together with mime and prosody; the maximum number of points that a participant can receive is eight); and Comprehension of Paralinguistic Contradiction (includes four tasks in which the speaker says something that is contrary to the paralinguistic indicators; in this subscale, a participant can receive two points for each task and a total of eight points in the complete subscale). In assessing comprehension, the participants are expected to understand the type or modality of a communication act or emotion. A total of 24 points can be achieved in the scale of Paralinguistic Comprehension.

The remaining 12 tasks are in the form of questions and are used to assess paralinguistic production. All of the tasks that assess paralinguistic production are divided into two subscales: Production of Basic Paralinguistic Elements (includes four items that assess the participants' ability to reply using appropriate mime and intonation to the requested formulation – question, statement, request, and order; the maximum number of points a participant can get is four) and Production of Emotions in Communication (includes eight tasks that assess the participants' ability to reply by appropriate mime and intonation to the requested emotion – anger, happiness, fear, and sadness; the maximum number of points a participant can get is eight). In assessing production, the participants are expected to produce paralinguistic segments (mime and intonation), which correspond to a communication act or emotion. A participant can achieve a total of 12 points in the scale of Paralinguistic Production.

According to the scale authors, Cronbach's alpha for the Paralinguistic Scale is .70 (Bosco, Angeleri, Zuffranieri, Bara, & Sacco, 2012), whereas the results of our research showed that Cronbach's alpha for the Paralinguistic Production subscale is .95, and .79 for the Paralinguistic Comprehension subscale.

Bearing in mind that the test situation was recorded during the assessment, and also that the replies were transcribed, two independent examiners received videos and transcripts, on the basis of which the participants received points. The degree of concordance between two independent examiners, who both have a PhD in special education and experience in applying the battery, was calculated for the complete sample (N=120), by examining video materials and transcripts of the replies. The degree of concordance was obtained by calculating Cohen's kappa coefficient (k). For the scale of Paralinguistic Production ($k = .814$, $p < .001$) and the scale of Paralinguistic Comprehension ($k = .872$, $p < .001$), according to the recommended Landis and Koch's values (Landis & Koch, 1977). The obtained values indicate almost complete concordance between the examiners. K coefficient values obtained for the complete

Paralinguistic Scale indicate a significant concordance between the examiners ($k = .763$, $p < .001$).

2.3 Procedure

The assessment was conducted after forming the sample and obtaining consent from the participants and their guardians. The participants with ID and DD (day care centers or residential institutions) were interviewed in their social care institutions. After providing introductory explanations and discussing the nature of the tasks, the examiner performed the assessment individually in a space without distraction. Video tasks from the Paralinguistic Scale were presented on a laptop, after which a participant was queried concerning the contents of the video. The length of the videos ranged from 20 to 25 seconds. When a participant did not understand what he/she was supposed to do, the video was played once again.

2.4. Data analysis

The descriptive data analysis included calculating the mean values (M) and standard deviations (SD) for all subscales of the Paralinguistic Comprehension scale and Paralinguistic Production scale, whereas the one-way analysis of variance was used to determine the differences between groups (ID_{mild}, $ID_{moderate}$, DD_{mild}, $DD_{moderate}$) and Tukey's post hoc test was used to statistically determine the differences between all of the compared groups. A two-way analysis of variance was used to check the influence of two different factors (ID level and presence of DD) on paralinguistic abilities. Pearson correlation test was used to determine the relation between paralinguistic abilities (comprehension and production) and intelligence in all four groups of participants.

3. Results

3.1. Paralinguistic comprehension and paralinguistic production in persons with ID and DD

Bearing in mind that there were 10 participants with Down syndrome in the group with ID, assessing differences between the participants with Down syndrome and the participants with unknown aetiology ID was conducted on all subscales of the Paralinguistic Scale, on the basis of the results median and the application of Mann-Whitney U test. The obtained results showed that these two groups are equal with regard to paralinguistic abilities, i.e. that there are no statistically significant differences in any of the tested variables. As a result, the group with ID was observed as a whole in the further course of the research.

Table 2 shows the achievements of all of the participants in the Paralinguistic Comprehension and Paralinguistic Production subscales and the total scores of paralinguistic abilities. The participants with ID exhibited better results than the participants with DD in all of the subscales,

as well as in the complete scale. The participants with ID_{mild} achieved better results than the participants with $ID_{moderate}$.

Table 2. Achievements in the Paralinguistic Comprehension and Paralinguistic Production subscales and in the Scale of Paralinguistic Abilities in total

	ID				DD						
	ID_{mild}		$ID_{moderate}$		DD_{mild}		$DD_{moderate}$				
	M	SD	M	SD	M	SD	M	SD	df	F	p
Comprehension of basic paralinguistic elements	3.00	1.29	2.29	1.23	2.68	1.28	2.11	1.47	3	2.603	.055
Comprehension of paralinguistic contradiction	5.68	1.82	4.23	.94	4.72	1.54	3.49	1.07	3	7.213	**.000**[a]
Comprehension of emotions in communication	6.44	1.32	5.29	1.86	5.32	1.57	4.26	2.15	3	13.888	**.000**[b, c]
Paralinguistic comprehension - total score	15.12	2.24	11.82	2.37	12.72	2.98	9.86	3.69	3	16.319	**.000**[a ,b, c, d, e]
Production of basic paralinguistic elements	3.32	1.15	2.57	1.19	3.00	.76	1.91	1.46	3	7.738	**.000**[a]
Production of emotions in communication	4.60	3.22	1.71	2.59	2.44	3.11	1.34	2.40	3	7.535	**.000**[a, b, d]
Paralinguistic production - total score	7.92	3.89	4.28	3.14	5.44	3.57	3.25	3.35	3	9.546	**.000**[a, b]
Paralinguistic abilities - total score	23.04	4.89	17.01	3.91	18.16	5.14	13.11	5.78	3	20.291	**.000**[a, b, c, d,]

[a] = $ID_{mild} > DD_{moderate}$
[b] = $ID_{mild} > ID_{moderate}$
[c] = $DD_{mild} > DD_{moderate}$
[d] = $ID_{mild} > DD_{mild}$
[e] = $ID_{moderate} > DD_{moderate}$

A one-way variance analysis was used to determine statistically significant differences in the assessed variables among the groups, which showed that there are statistically significant differences in all of the subscales of paralinguistic comprehension and production, except in the Comprehension of Basic Paralinguistic Elements subscale (Table 2).

Tukey's post hoc test was used to determine which groups exhibited differences.

The results showed that the differences in achievements in paralinguistic comprehension exist in the Comprehension of Paralinguistic Contradiction and the Comprehension of Emotions in Communication subscales. In the Comprehension of Paralinguistic Contradiction subscale, the differences were determined between the groups with ID_{mild} and $ID_{moderate}$ ($p = .000$) in favour of the participants with ID_{mild}. In the Comprehension of Emotions in Communication subscale, it was determined that the ID_{mild} group was significantly more successful than the $ID_{moderate}$ group ($p = .000$) and that the participants with DD_{mild} achieved significantly better results than those with $DD_{moderate}$ ($p < .001$). Additionally, differences were determined in the total score of paralinguistic comprehension between the following groups: the participants with ID_{mild} achieved significantly better results than the participants with $ID_{moderate}$ ($p < .001$), the participants with ID_{mild} were more successful than the participants with DD_{mild} ($p = .022$), the participants with ID_{mild} were more successful than the group with $DD_{moderate}$ ($p = .000$), the group with $ID_{moderate}$ had better results than the group with $DD_{moderate}$ ($p = .031$), and finally, the group with DD_{mild} was significantly more successful than the group with $DD_{moderate}$ ($p = .002$).

The differences in paralinguistic production were determined in the Production of Basic Paralinguistic Elements and Production of Emotions in Communication subscales. In the Production of Basic Paralinguistic Elements subscale, the differences were determined between the group of participants with ID_{mild} and the participants with $DD_{moderate}$ ($p < .001$), in favour of the group with ID_{mild}. In the Production of Emotions in Communication subscale, the differences were determined between the groups of participants with ID_{mild} and $ID_{moderate}$ ($p = .001$), as well as between the participants with ID_{mild} and the participants with $DD_{moderate}$ ($p < .001$), and the participants with ID_{mild} and DD_{mild} ($p = .036$), where in all three cases the participants who functioned at the level of mild ID were more successful than the participants who functioned at the level of moderate ID. Additionally, the differences were determined in the total score of paralinguistic production between the following groups: ID_{mild} and $ID_{moderate}$ ($p = .001$) as well as ID_{mild} and $DD_{moderate}$ ($p < .001$) in favour of the participants with ID_{mild}.

The differences in all of the paralinguistic abilities were determined among the following groups: the ID_{mild} group achieved better results than the $ID_{moderate}$ group ($p < .001$); the ID_{mild} group was significantly more successful than the DD_{mild} group ($p= .004$); the participants with ID_{mild} were more successful than the participants with $DD_{moderate}$ ($p < .001$); and finally, the DD_{mild} group achieved better results than the $DD_{moderate}$ group ($p = .001$).

3.2. Determining the relations between the achievements on Raven's progressive matrices and paralinguistic abilities

The relation between paralinguistic abilities and achievements on Raven's progressive matrices for all four groups of participants was tested by Pearson correlation coefficient. The obtained results indicate that positive correlations exist between intelligence and certain paralinguistic abilities in every tested group. With regard to that, in the group with ID_{mild} correlations of moderate value are present between the total paralinguistic comprehension ability and intelligence ($r = .432$, $p < .05$), while in the group with DD_{mild} it was observed that intelligence highly correlates with paralinguistic comprehension ($r = .739$, $p < .01$) and moderately with total paralinguistic abilities ($r = .438$, $p < .05$). In the participants with $ID_{moderate}$, a positive moderate correlation was determined between intellectual abilities and paralinguistic comprehension ($r = .384$, $p < .05$), as well as in the participants with $DD_{moderate}$ ($r = .515$, $p < .01$).

3.3. Determining the influence of ID level and the presence of DD on paralinguistic abilities

The influence of two factors, the level of ID and the presence of DD, on paralinguistic abilities was assessed using two-way variance analysis. The results showed that both factors are significant in all of the variables, except the Comprehension of Basic Paralinguistic Elements variable, which is only influenced by the level of ID. Fisher's eta-squared coefficient (η^2) indicates that the level of ID has a greater influence on all of the variables than the presence of DD (Table 3). Additionally, the influence of the interaction between these two factors (the level of ID and the presence of DD) was assessed. However, the results showed that there is no interaction between these two factors in paralinguistic abilities, i.e., they have independent effects on all of the variables.

Table 3. Influence of ID level and the presence of DD on paralinguistic abilities

		Df1	**Df2**	**F**	**Sig.**	**η^2**
Comprehension of basic paralinguistic elements	ID level	1	116	6.789	**.010**	.055
	DD	1	116	1.001	.319	.009
Comprehension of paralinguistic contradiction	ID level	1	116	29.704	**.000**	.204
	DD	1	116	11.941	**.001**	.093
Comprehension of emotions in communication	ID level	1	116	11.075	**.001**	.087
	DD	1	116	10.401	**.002**	.082
Paralinguistic comprehension - total score	ID level	1	116	32.741	**.000**	.220
	DD	1	116	16.154	**.000**	.122
Production of basic	ID level	1	116	17.066	**.000**	.128

paralinguistic elements	DD	1	116	4.843	**.030**	.040
Production of emotions in communication	ID level	1	116	14.823	**.000**	.113
	DD	1	116	5.988	**.016**	.049
Paralinguistic production - total score	ID level	1	116	20.654	**.000**	.151
	DD	1	116	7.513	**.007**	.061
Paralinguistic communicative abilities - total score	ID level	1	116	42.549	**.000**	.268
	DD	1	116	18.215	**.000**	.136

4. Discussion

The aim of this research was to assess the abilities of paralinguistic production and paralinguistic comprehension in adults with ID with regard to the level of ID and the presence of DD. Globally, the participants with mild ID, regardless of the presence of co-morbid psychiatric disorders, have significantly higher paralinguistic communication ability than the participants with moderate ID. However, while there are no significant differences in this ability between the participants with $ID_{moderate}$ i $DD_{moderate}$, the participants with DD_{mild} are worse than the participants with ID_{mild}, and they are not significantly better from the participants with $ID_{moderate}$. A significant influence of ID and DD on the total paralinguistic competence of the participants was determined.

The results showed that with regard to total paralinguistic comprehension, the participants with ID_{mild} achieve better results than the participants with $ID_{moderate}$ and that the participants with no co-existing psychiatric condition achieve better results than those with DD within the same level of ID. Also, the influence of the level of intellectual functioning on paralinguistic comprehension ($\eta^2 = .220$) is double than that of the presence of DD ($\eta^2 = .122$). When we add that moderately and highly statistically significant correlations are dominant between the total score on this part of the scale and the assessed non-verbal intelligence, it is clear that there is a definite relation between these variables. However, suppressive influence of DD on paralinguistic comprehension is present, which is supported by the fact that there is no statistically significant difference between DD_{mild} and $ID_{moderate}$.

A similar pattern is observed in the total achievement when assessing paralinguistic production, only this time, for more significant differences, it is necessary that the participants are mentally healthy apart from having higher intelligence. In other words, significant differences in total paralinguistic production were obtained only between the participants with ID_{mild} and those with moderate ID (regardless of whether they have DD). Apart from the fact that the influence of ID and the influence of DD on the total paralinguistic production are lower than on its comprehension, the differences probably occur because the relation of ID and DD influences is higher in production (almost 3:1), than in comprehension (somewhat under 2:1)

(Table 2). With regard to this, a study which used the same instrument as applied in this research is interesting, the results of which indicate that the participants with schizophrenia express differences in all aspects of paralinguistic production (Colle et al., 2013). Such a finding corresponds to some extent with the results obtained in this research, however, it is clear that in the population with ID, the level of intellectual functioning has a greater influence than the presence of DD.

By assessing the influence of ID and DD on the obtained results, we determined that these factors have a greater impact on total comprehension than on the production of paralinguistic elements. Also, unlike the ability of paralinguistic comprehension, the productive component does not significantly correlate with the assessed non-verbal intelligence. The possible explanation is similar for both groups of results. First, the applied instrument for testing intelligence is similar to the tasks used for assessing the comprehension of paralinguistic elements - the participants have to understand requests, but their answers do not require verbal production. In assessing paralinguistic productive component, other requests are present which hinder producing satisfactory answers. Difficulties related to speech and language production are expressed, which are often dominant in the tested population **(**e.g. Belva, Matson, Sipes, & Bamburg, 2012; Roberts, Price, & Malkin, 2007), and, apart from that, other requests related to processing social information are present.

It is well known that prosodic characteristics considerably contribute to the successful identification of a speech act function, whereas acoustic characteristics of voice help to detect emotional reactions and speakers' attitudes (Ishi, Ishiguro, & Hagita, 2006). In our research, in tasks involving recognising questions, statements, requests, and orders based on paralinguistic elements, no significant differences were determined between the compared groups.

Relatively low achievements of all the participants in assessing the comprehension of basic paralinguistic elements are a bit surprising, since adults with ID usually understand speech acts well, at least those in well-known contexts with minimal cognitive and social requests (Abbeduto & Hesketh, 1997). There is a possibility that the items within this part of the scale exceeded cognitive and social capacities of the participants, which led to the participants having lower scores than on the remaining two subscales which assess paralinguistic comprehension. This way of thinking is supported by findings that comprehension of basic paralinguistic elements is not the easiest task for typically developing persons either. Angeleri et al. (2008) indicate that typically developing participants put more effort into comprehending paralinguistic segments which express a propositional attitude than in comprehending segments which express emotions. Furthermore, since the obtained influence of ID is small ($\eta^2 = .055$, the lowest of all the obtained coefficients with regard to paralinguistic comprehension), the obtained results can be observed from the viewpoint of emotion specificity hypothesis. According to this hypothesis, apart from general cognitive limitations, persons with ID also have a specific emotional-perceptive deficit not related to intelligence when it is within ID limits (Rojahn, Rabold. & Schneider, 1995). On the other hand, there are authors who point out that certain basic, socially-

perceptive capacities are partially preserved in persons with ID, however, they agree that these capacities do not correlate directly with cognitive deficits (Moore, Hobson, & Anderson, 1995).

It is also possible that globally low achievement of the participants with mild and moderate ID on tasks involving basic comprehension of paralinguistic elements is related to the age of our participants. Some authors find negative correlation between chronological age and the ability to recognize facial expression in adults with ID (Simon, Rosen, & Ponpipom, 1996). Children with ID, whose emotional perception abilities are relatively preserved, notice negative emotional reactions of the environment. As a reaction to frequent stigmatization, by means of psychological factors, secondary handicapping occurs, which is reflected in gradual inhibition of emotional perception ability while growing up (Moore, 2001).

Earlier studies have demonstrated that persons with ID have difficulties in detecting emotions in tasks involving facial and vocal expressions (Plesa-Skwerer et al., 2006) and that these difficulties are more prominent in recognising and discovering emotional changes than in the activities of classifying emotions (Martínez et al., 2010). Also, it is found that, in participants with schizophrenic disorder who have average intellectual abilities, the level of intelligence influences the ability to recognize and comprehend emotions on the basis of paralinguistic indicators (Borod, Martin, Alpert, Brozgold, & Welkowitz, 1993; Schneider et al., 1995, all according to Edwards, Jackson, & Pattison, 2002).

Difficulties are also present in our research results, where it was determined that the participants with ID_{mild} were significantly more successful in comprehending emotions than the participants with $ID_{moderate}$. The same relation was determined in participants with DD. The results of other studies also indicated that the level of cognitive deficit influences the ability to recognise facial expression (Carvajal et al., 2012; Hetzroni & Oren, 2002; Moore, 2001; Simon, Rosen, & Ponpipom, 1996). Still, it is interesting that in this domain of paralinguistic comprehension, the levels of ID ($\eta^2 = .087$) and DD ($\eta^2 = .082$) are equal. When we add the fact that the participants with DD_{mild} are not significantly more successful than the participants with $ID_{moderate}$, just as the participant with ID_{mild} are not significantly more successful than those with $DD_{moderate}$, than it can be assumed that our participants' success in this segment of paralinguistic abilities is influenced by some other factors as well, regardless of whether these factors are previously mentioned specific emotional-perceptive deficits (Rojahn et al., 1995) and secondary handicapping (Moore, 2001) or lower achievement in solving tasks controlled by the right hemisphere in adults with ID (Simon et al., 1996).

The results of other studies have shown that persons with ID have difficulties in detecting emotional prosody and the meaning of messages, especially when paralinguistic signals are opposed to the uttered meaning (Plesa-Skwerer et al., 2007), which was also confirmed in our paper, with statistically significant differences being determined only between the groups of participants with ID_{mild} and $DD_{moderate}$. Even though the influence of ID level ($\eta^2 = .204$) is more than double than the influence of DD ($\eta^2 = .093$) in this case, it is obviously necessary to add DD to the difference in ID level so that the difference in the comprehension of paralinguistic contradictions is significant.

Possible reasons for the absence of differences between the participants with ID_{mild} and $ID_{moderate}$ with regard to the comprehension of paralinguistic contradiction can be found in the explanation that preserved ability to comprehend the speaker's actual mental state, which does not depend on the produced linguistic content, is necessary for solving these tasks (Angeleri et al., 2012). In order to successfully solve this task, a participant should not only detect mental state of the speaker, but also test that mental state by comparing the meaning of the uttered message with associated factors. Numerous studies indicate that persons with ID have difficulties in comprehending mental states (Brojčin, Glumbić, & Đorđević, 2014; Glumbić, 2002). Also, some authors find that adults with ID have lower achievements on tasks which assess theory of mind than children with ID. They explain that persons with ID are exposed to greater control and guidance during their lives, which can lead to progressive reduction of theory of mind capacities (Jervis & Baker, 2004). It is possible that the existing deficit in mentalization ability influences the fact that these two groups are not different in the ability to comprehend paralinguistic contradiction.

On the other hand, the literature often emphasizes theory of mind deficiency in persons with psychopathological states but with average intellectual abilities, as well as the idea that many psychiatric symptoms can be better understood if observed from the aspect of impaired theory of mind ability (Bora, Yucel, & Pantelis, 2009; Brüne, 2005; Sprong, Schothorst, Vos, Hox, & Van Engeland, 2007). Certain authors believe that the difficulties persons with psychiatric disorders have in mentalization can account for their use of language and comprehension of communication messages (Brüne, 2005). It is possible that with more severe cognitive deficit psychiatric symptoms which additionally impair the ability to comprehend paralinguistic contradictions become more obvious, which leads to detecting differences between the participants with ID_{mild} and $DD_{moderate.}$

Significant difference in the production of basic paralinguistic elements was found only between ID_{mild} and $DD_{moderate}$. This finding can explain equal achievements in basic paralinguistic production bordered by ID itself, where variations in ID level do not have a big influence, and where significant differences are detected only when another hindering factor, such as DD, is associated with the difference in ID level.

Adams and Oliver (2011) noted that persons with ID have similar emotional experiences and that their expression may be different in a way that it is limited or atypical, which is potentially related to the level of cognitive and social development in these participants, as well as to the presence of syndrome specifics or co-morbid conditions. With regard to the results of testing paralinguistic emotional production obtained in this research, they indicate that the participants with ID_{mild} are significantly more successful than both groups of participants with moderate ID. This is also confirmed by the determined significant influence of both variables (ID and DD) on paralinguistic production of emotions of our participants. That the subscale of paralinguistic production of emotions and the subscale of comprehension of emotions have the same number of items, by observing the mean values of results in these two scales, it can be determined that all of the participants were more successful in tasks involving the

comprehension of emotions than in their production, which can be explained by previously mentioned differences in the nature of the task, as well as by the requests which involve language skills and capacities to process information. This finding indicated that the level of ID also influences the ability to express emotions and that cognitive deficits, such as problems in maintaining attention, planning, keeping up, self-regulating and being flexible, which are associated with persons with ID (Vieillevoye & Nader-Grosbois, 2008), can be related to these results, bearing in mind that this type of tasks requires the participants to analyse and understand the request and realize it through paralinguistic expression. The participants with ID_{mild} achieved better results in the paralinguistic expression of emotions than the participants with DD_{mild}, which can be explained by the fact that a co-existing psychiatric disorder has an additional negative influence on social cognition, i.e., recognising one's own and others' mental states and their attribution, understanding the cause of positive and negative emotions (Deljković, Moritz, Von, Klinge, & Randjbar, 2011), as well as reducing eye contacts and decreasing facial expression and emotional tone (Bojanin, Kolar, & Kolar, 2002).

5. Conclusion

The results of our research indicated that the participants with ID_{mild} are more successful in paralinguistic abilities than the participants with $ID_{moderate}$. Additionally, the results demonstrated that both the level of ID and the presence of a co-morbid psychiatric condition influence the abilities of paralinguistic production and comprehension and that the effects of these two factors are independent, with the level of ID having a greater influence on all of the tested variables.

To determine the limitations of this research, we can mention those limitations related to the application of only one instrument for the assessment of paralinguistic abilities; therefore, there is the absence of a likely comparison of achievements in the instruments that assess the same group of abilities as well as the limitations related to the sample. With regard to the sample, it is advisable to extend the scope and structure of the assessed groups with regard to the participants' age and different aetiology of ID in future studies.

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References

Abbeduto, L., & Hesketh, L. J. (1997). Pragmatic development in individuals with mental retardation: learning to use language in social interactions. *Mental Retardation and Developmental Disabilities Research Reviews*, *3*(4), 323–333.

Adams, D., & Oliver, C. (2011). The expression and assessment of emotions and internal states in individuals with severe or profound intellectual disabilities. *Clinical Psychology Review*, *31*(3), 293–306.

Adell, J., Bonafonte, A., & Escudero, D. (2005). Analysis of prosodic features towards modelling of emotional and pragmatic attributes of speech. *Procesamiento de Lenguaje Natural*, *35*, 277–284.

Angeleri, R., Bosco, F. M., Zettin, M., Sacco, K., Colle, L., & Bara, B. G. (2008). Communicative impairment in traumatic brain injury: A complete pragmatic assessment. *Brain & Language*, *107*(3), 229–245.

Angeleri, R., Bosco, F., Gabbatore, I., Bara, B., & Sacco, K. (2012). Assessment battery for communication (ABaCo): Normative data. *Behavior Methods*, *44*(3), 845–861.

Bellugi, U., Lichtenberger, L., Jones, W., Lai, Z., & St George, M. (2000). I. The neurocognitive profile of Williams syndrome: a complex pattern of strengths and weaknesses. *Journal of Cognitive Neuroscience*, *12*(Suppl. 1), 7–29.

Belva, B. C., Matson, J. L., Sipes, M., & Bamburg, J. W. (2012). An examination of specific communication deficits in adults with profound intellectual disabilities. *Research in Developmental Disabilities*, *33*(2), 525–529.

Bojanin, S., Kolar, D., & Kolar, M. (2002). Mentalna retardacija i psihotični poremećaji. *Psihijatrija danas*, *34*(3-4), 327–343.

Bora, E., Yucel, M., & Pantelis, C. (2009). Theory of mind impairment in schizophrenia: meta-analysis. *Schizophrenia Research*, *109*(1), 1–9.

Bosco, F. M., Angeleri, R., Zuffranieri, M., Bara, B. G., & Sacco, K. (2012). Assessment Battery for Communication: Development of two equivalent forms. *Journal of Communication Disorders*, *45*(4), 290–303.

Brojčin, B., Glumbić, N., & Đorđević, M. (2014). Usvojenost teorije uma kod dece i adolescenata s lakom intelektualnom ometenošću. *Specijalna edukacija i rehabilitacija*, *13*(1), 11–34.

Brüne, M. (2005). “Theory of mind” in schizophrenia: a review of the literature. *Schizophrenia Bulletin*, *31*(1), 21–42.

Carvajal, F., Fernández-Alcaraz, C., Rueda, M., & Sarrión, L. (2012). Processing of facial expressions of emotions by adults with Down syndrome and moderate intellectual disability. *Research in Developmental Disabilities*, *33*(3), 783–790.

Castelli, F. (2005). Understanding emotions from standardized facial expressions in autism and normal development. *Autism*, *9*(4), 428–449.

Colle, L., Angeleri, R., Vallana, M., Sacco, K., Bara, B. G., & Bosco, F. (2013). Understanding the communicative impairments in schizophrenia: A preliminary study. *Journal of Communication Disorders*, *46*(3), 294–308.

Cusi, A. M., Nazarov, A., Holshausen, K., MacQueen, G. M., & McKinnon, M. C. (2012). Systematic review of the neural basis of social cognition in patients with mood disorders. *Journal of Psychiatry & Neuroscience: JPN*, *37*(3), 154–169.

Deb, S., Thomas, M., & Bright, C. (2001). Mental disorder in adults with intellectual disability. 1: Prevalence of functional psychiatric illness among a community-based population aged between 16 and 64 years. *Journal of Intellectual Disability Research*, *45*(6), 495–505.

Deljković, A., Moritz, S., Von, E. V. F., Klinge, R., & Randjbar, S. (2011). Metakognitivni trening za pacijente sa shizofrenijom – teorijske osnove i klinička primena. *Engrami – časopis za kliničku psihijatriju, psihologiju i granične discipline*, *33*(3), 39–52.

Dykens, E. M., Shah, B., Sagun, J., Beck, T., & King, B. H. (2002). Maladaptive behaviour in children and adolescents with Down's syndrome. *Journal of Intellectual Disability Research*, *46*(6), 484–492.

Edwards, J., Jackson, H. J., & Pattison, P. E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia: a methodological review. *Clinical Psychology Review*, *22*(6), 789–832.

Fernández-Alcaraz, C., Extremera, M. R., García-Andres, E., & Molina, C. (2010). Emotion recognition in Down's syndrome adults: Neuropsychology approach. *Procedia-Social and Behavioral Sciences*, *5*, 2072–2076.

Gil, S., Aguert, M., Le Bigot, L., Lacroix, A., & Laval, V. (2014). Children’s understanding of others’ emotional states: Inferences from extralinguistic or paralinguistic cues? *International Journal of Behavioral Development*, *38*(6), 539–549.

Glumbić, N. P. (2002). Theory of mind in children with mild mental retardation. *Istraživanja u defektologiji*, 1, 203-212.

Grossman, R. B., Bemis, R. H., Skwerer, D. P., & Tager-Flusberg, H. (2010). Lexical and affective prosody in children with high-functioning autism. *Journal of Speech, Language, and Hearing Research*, *53*(3), 778–793.

Hargrove, P. M., Pittelko, S., Fillingane, E., Rustman, E., & Lund, B. (2013). Perceptual speech and paralinguistic skills of adolescents with Williams syndrome. *Communication Disorders Quarterly*, *34*(3), 152–161.

Hetzroni, O., & Oren, B. (2002). Effects of intelligence level and place of residence on the ability of individuals with mental retardation to identify facial expressions. *Research in Developmental Disabilities*, *23*(6), 369–378.

Hippolyte, L., Barisnikov, K., Van der Linden, M., & Detraux, J. J. (2009). From facial emotional recognition abilities to emotional attribution: A study in Down syndrome. *Research in Developmental Disabilities*, *30*(5), 1007–1022.

Ishi, C., Ishiguro, H., & Hagita, N. (2006). Using prosodic and voice quality features for paralinguistic information extraction. In *Proceedings of the Speech Prosody 2006*, Dresden (pp. 883–886).

Järvinen-Pasley, A., Bellugi, U., Reilly, J., Mills, D. L., Galaburda, A., Reiss, A. L., & Korenberg, J. R. (2008). Defining the social phenotype in Williams syndrome: a model for linking gene, the brain, and behavior. *Development and Psychopathology*, *20*(01), 1–35.

Jervis, N., & Baker, M. (2004). Clinical and research implications of an investigation into theory of mind (TOM) task performance in children and adults with non-specific intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*,17, 49–57.

Lindner, J. L., & Rosén, L. A. (2006). Decoding of emotion through facial expression, prosody and verbal content in children and adolescents with Asperger's syndrome. *Journal of Autism and Developmental Disorders*, *36*(6), 769–777.

Martínez, R., de Ipiña, K. L., Irigoyen, E., Asla, N., Garay, N., Ezeiza, A., & Fajardo, I. (2010). Emotion elicitation oriented to the development of a human emotion management system for people with intellectual disabilities. *Trends in Practical Applications of Agents and Multiagent Systems*, *71*, 689–696.

McAlpine, C., Kendall, K. A., & Singh, N. N. (1991). Recognition of facial expressions of emotion by persons with mental retardation. *American Journal on Mental Retardation*, *96*, 29–36.

Mcalpine, C., Singh, N. N., Kendall, K. A., & Ellis, C. R. (1992). Recognition of facial expressions of emotion by persons with mental retardation. A matched comparison study. *Behavior Modification*, *16*(4), 543–558.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and its relationship to language in school-aged children with high-functioning autism. *International Journal of Language & Communication Disorders*, *42*(6), 682–702.

Moore, D. G. (2001). Reassessing emotion recognition performance in people with mental retardation: a review. *American Journal on Mental Retardation*, *106*(6), 481–502.

Moore, D. G., Hobson, R. P., & Anderson, M. (1995). Person perception: Does it involve IQ-independent perceptual processing? *Intelligence*, *20*(1), 65–86.

Owen, A., Browning, M., & Jones, R. S. (2001). Emotion recognition in adults with mild-moderate learning disabilities: An exploratory study. *Journal of Intellectual Disabilities*, *5*(3), 267–281.

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.

Pinheiro, A. P., Galdo-Álvarez, S., Rauber, A., Sampaio, A., Niznikiewicz, M., & Gonçalves, Ó. F. (2011). Abnormal processing of emotional prosody in Williams syndrome: an event-related potentials study. *Research in Developmental Disabilities*, *32*(1), 133–147.

Plesa-Skwerer, D., Faja, S., Schofield, C., Verbalis, A., & Tager-Flusberg, H. (2006). Perceiving facial and vocal expressions of emotion in individuals with Williams syndrome. *American Journal on Mental Retardation*, *111*(1), 15–26.

Plesa-Skwerer, D., Schofield, C., Verbalis, A., Faja, S., & Tager-Flusberg, H. (2007). Receptive prosody in adolescents and adults with Williams syndrome. *Language and Cognitive Processes*, *22*(2), 247–271.

Raven, J., & Raven, J. C. (1998). *Priručnik za Ravenove progresivne matrice i ljestvice rječnika. Standardne progresivne matrice*. Jastrebarsko: Naklada Slap.

Roberts, J. E., Price, J., & Malkin, C. (2007). Language and communication development in Down syndrome. *Mental Retardation and Developmental Disabilities Research Reviews, 13*(1), 26–35.

Rojahn, J., Lederer, M., & Tassé, M. J. (1995). Facial emotion recognition by persons with mental retardation: A review of the experimental literature. *Research in Developmental Disabilities, 16*(5), 393–414.
Rojahn, J., Rabold, D. E., & Schneider, F. (1995). Emotion specificity in mental retardation. *American Journal on Mental Retardation,* 99, 477–486.

Rosner, B. A., Hodapp, R. M., Fidler, D. J., Sagun, J. N., & Dykens, E. M. (2004). Social competence in persons with Prader-Willi, Williams and Down's Syndromes. *Journal of Applied Research in Intellectual Disabilities, 17*(3), 209–217.

Sacco, K., Angeleri, R., Bosco, F. M., Colle, L., Mate, D., & Bara, B. G. (2008). Assessment Battery for Communication - ABaCo: A new instrument for the evaluation of pragmatic abilities. *Journal of Cognitive Science, 9,* 111–157.

Simon, E. W., Rosen, M., & Ponpipom, A. (1996). Age and IQ as predictors of emotion identification in adults with mental retardation. *Research in Developmental Disabilities, 17*(5), 383–389.

Simon, E. W., Rosen, M., & Ponpipom, A. (1996). Age and IQ as predictors of emotion identification in adults with mental retardation. *Research in Developmental Disabilities,* 17(5), 383–389.

Sprong, M., Schothorst, P., Vos, E., Hox, J., & Van Engeland, H. (2007). Theory of mind in schizophrenia meta-analysis. *The British Journal of Psychiatry, 191*(1), 5–13.

Sukumaran, P. S. (2012). Functional social skills of adults with intellectual disability. *Disability, CBR & Inclusive Development, 23*(2), 72–80.

Tanaka, H., Kashioka, H., & Campbell, N. (2011). Laughter as a gesture accompanying speech – towards the creation of a tool for the support of children on the autistic dimension. *Proc. GESPIN, Bielefeld.*

Vieillevoye, S., & Nader-Grosbois, N. (2008). Self-regulation during pretend play in children with intellectual disability and in normally developing children. *Research in Developmental Disabilities, 29*(3), 256–272.

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.

Wang, J. E., & Tsao, F. M. (2015). Emotional prosody perception and its association with pragmatic language in school-aged children with high-function autism. *Research in Developmental Disabilities*, *37*(1), 162–170.

Ward, N. (2004). Pragmatic functions of prosodic features in non-lexical utterances. In *Speech Prosody 2004, International Conference*, Nara, Japan.

Wilson, D., & Wharton, T. (2006). Relevance and prosody. *Journal of Pragmatics*, *38*(10), 1559–1579.

Wittfoth, M., Schröder, C., Schardt, D. M., Dengler, R., Heinze, H. J., &. Kotz, S. A. (2010). On emotional conflict: Interference resolution of happy and angry prosody reveals valence-specific effects. *Cerebral Cortex*, *20*(2), 383–392.

Yirmiya, N., Kasari, C., Sigman, M., & Mundy, P. (1989). Facial expressions of affect in autistic, mentally retarded and normal children. *Journal of Child Psychology and Psychiatry*, *30*(5), 725–735.