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THE NATURE OF CHILD-ADULT INTERACTION. FROM TURN-TAKING TO UNDERSTANDING POINTING AND USE OF POINTING GESTURES

Analyses of interactions between an adult and a one-year-old child are often connected with studying early communicative competences, e.g. the child's participation in turn-taking sequences, in joint attention, and use of pointing gestures. Infants' communicative behaviors were studied using a structured observational measure – the Early Social Communication Scales (Mundy et al., 2003) in a study of 358 12-month-old children. An exploratory factor analysis revealed: (i) a distinction between the categories of initiation and response among the behaviors displayed, (ii) simple and complex behavior categories occurring; (iii) the presence within one factor of behaviors fulfilling various functions (e.g. requesting and sharing interest). An analysis of the results showed that communicative competences can be classified according to their level and ignoring their function, and made it possible to suggest modifications to the way in which behaviors are coded on the ESCS and to complement the procedure of studying early communicative competences.
Key words: child-adult interaction, infancy, turn-taking, joint attention, pointing gestures

Introduction

Most psychologists working in the field of language in children today agree with the thesis that children's linguistic competence develops on the basis of their early communicative competence (Bokus, 2010; Kurcz & Okuniewska, 2011). This thesis also expresses an important claim of the communicative approach in studies on children's language represented by the work of Grace Wales Shugar (e.g. 1995). In an issue of *Psychology of Language and Communication* dedicated to

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the memory of Professor Shugar, therefore, it is worth presenting some analysis and the results of research on the nature of infant-adult interaction. We hope that this discussion will provide an answer to the question of what the most important elements/components of early child-adult social interaction are, i.e. what early communicative competencies among children around their first birthday can be identified. In the introduction we shall briefly discuss the changes taking place in early social interaction as well as analyzing the concepts associated with preverbal development of communication (turn-taking, pointing gestures, joint attention). We shall then present the results of research conducted using the Early Social Communication Scales (Mundy et al., 2003), offering a thorough analysis of the results using exploratory factor analysis. In the conclusion we shall look at the implications of our results.

Turn-taking

Turn-taking can be defined as a characteristic of interaction in a dyad (swapping roles during a discourse understood as an exchange of verbal and/or nonverbal messages), or alternatively as a certain competence developing in a child to participate in such exchanges, i.e. social interaction. If we accept the second meaning of turn-taking, we should note that Trevarthen (1979) used this concept to describe changes in intersubjectivity. He defined intersubjectivity as "linking of subjects who are active in transmitting their understanding to each other" (p. 347), and stated that primary intersubjectivity emerges between two and three months of age, when the baby and the caregiver – in a face-to-face relationship – *alternately* vocalize to each other and make expressions. That is to say that the exchange is a type of proto-conversation. Secondary intersubjectivity, on the other hand, emerges around the end of the first year, when after a period of individual exploration of objects children begin to integrate their behaviors directed to people and to objects.

Trevarthen (1979; Trevarthen and Hubley, 1979) describes the course of change between primary and secondary intersubjectivity on the basis of longitudinal research conducted on an infant girl named Tracey. The researchers established that at two/three months the child began to become involved in communicative interaction with her mother. At four/five months she became more interested in objects, which she started to manipulate competently. From six to eight months Tracey participated exclusively in dyadic relations: either with her mother or with an object. For example, when her mother gave her a toy, she would focus all her attention on the object – she did not give the toy to her mother, nor did she look at her during independent play. Around the end of the ninth month, a significant change took place – after receiving the object Tracey began to look alternately between the toy and her mother's face. Then, at eleven months, for the first time she happily gave the toy to her mother on request. From this point, playing a give-and-take game became a frequent com-

ponent of the interaction between them. Involvement in give-and-take play is an expression of secondary intersubjectivity and an example of triadic relations (person-person-object). According to Bruner (1975), participating in such play is an extremely important part of development, as in this exchange the child learns to swap the role of recipient with that of agent in relation to the recipient who was the agent a moment before. Tomasello (2002) considers the emergence in a child of the skills of engaging in interactions and triadic relations as so important that he calls them the "nine-month revolution". The competence to initiate and react in a situation of exchanging messages with another person, or turn-taking, is therefore a foundation of any social interaction.

Pointing gestures

Contemporary research on the development of preverbal communication has been influenced considerably by the conclusions reached by Bates, Camaioni and Volterra (1975), and in particular the differentiation they make between two types of gestures – protoimperative and protodeclarative pointing gestures. The researchers used the distinctions introduced by Austin in the theory of speech acts (1962) to analyze communication among infants. In his groundbreaking study *How to Do Things with Words*, Austin (*ibid.*) stated that apart from state-ments that are descriptions of events that can be considered to be true or false, language also contains sentences that are not descriptions but actions (e.g. re-questing, promising etc.). He then developed this differentiation of constatives and performatives into the theory of illocutionary acts, according to which a person uttering a sentence performs three types of acts simultaneously: locution, illocution and perlocution. When we say something, we utter sentences with a specific meaning and reference (locution), and at the same time inform, promise, state, command etc. (illocution), while our utterance causes something, and we achieve something as a result (perlocution). Employing these distinctions, Bates et al. (1975) acknowledge that before children begin to use speech they com-municate with the help of nonverbal performatives. For them, the course of the development of communication in children is based on passing through three stages: (1) perlocutionary, in which the child exerts an influence on the recipient but does not do so in an intentional manner; (2) illocutionary, in which children intentionally use nonverbal signals (e.g. pointing gestures) to express requests (*protoimperative gesture*) or direct the attention of adults to an object or event (*protodeclarative gesture*); (3) locutionary, in which children utter sentences and use speech sounds using the same performative structure which they previously used nonverbally. In their studies of communicative behaviors, the authors nar-row the description of children's illocutionary actions exclusively to analysis of imperatives and declaratives, although they emphasize that the scope of perfor-matives among adults is significantly broader. In intentionally employing the first type of performative – protoimperative (the "proto-" prefix shows the nonverbal

character of the action), children use adults as an auxiliary medium in obtaining the desired object. The use of the protoimperative is exemplified by the behavior of a 12-month-old girl observed by Bates et al. (*ibid.*). The child first focused her mother's attention on herself, then turned towards the kitchen and, upon being carried there, pointed to the sink with the aim of being given water to drink. In other words, we can call such behaviors *behavioral requests*. When they use the second type of performatives – protodeclaratives, on the other hand, children attempt to direct the attention of the adult to a particular object or event. For example, they show the adult an object they are holding, give it to the adult or point to it and at the same time look at him/her to make sure.

Two issues related to the above specifications should be noted. Firstly, in discussing the controversies that come with defining declaratives, Bates et al. (*ibid.*) consider it useful to consider them as a particular kind of imperative. Secondly, in his discussion of Austin's theories, Levinson (1983) pointed out that the consequences of a statement are not only perlocutionary acts but also illocutionary ones, which have direct and inherent consequences. That is to say that for an illocutionary act to be fulfilled its addressee should understand the meaning and power of the statement (e.g. approve a proposal). In other words, without a response from the partner of the interaction, we cannot give a true assessment as to the categories of acts into which a given behavior or statement should be classified. According to Levinson (1983), this interactive aspect of an illocutionary action was not later developed, although recently Leavens (2012) has claimed that only by considering the context of the behavior in the analysis is it possible to distinguish protoimperatives from protodeclaratives.

Joint attention

As stated in the above description, the first authors to give a thorough account of coordination of attention and interest towards the caregiver and object were Trevarthen and Hubley (1979). According to Mundy (2013), however, joint attention, meaning an infant's ability to coordinate attention with a social partner in order to share experiences with them, was described previously by Rheingold, Hey and West (1976). Even then, in the 1970s, different types of joint attention began to be distinguished. Scaife and Bruner (1975), for example, wrote about gaze following, i.e. children's ability to redirect their attention following cues given by an adult (the direction of the gaze, head movement, gesture, vocalization). We can call such behaviors *responding to joint attention* (Seibert, Hogan and Mundy, 1982). They should also be distinguished from behaviors initiated by children themselves, i.e. when a child spontaneously begins an interaction and undertakes visual contact or uses gestures to this end, which Seibert et al. (1982) called *initiating joint attention*.

Subsequent research examined how joint attention changes in development. Bakeman and Adamson (1984) showed that between 6 and 18 months, children

increasingly actively participate in episodes of joint attention, and participate more frequently and for longer periods in situations requiring coordination of attention regarding an object and the adult. Carpenter, Nagell and Tomasello (1998), meanwhile, wrote that between 9 and 15 months there is successive emergence of such abilities as 1) joint engagement expressed in turn-taking behaviors using an object, 2) following the attention and behavior of another person, and then 3) directing that person's attention and behavior. Discussing joint attention, Tomasello (1999) argued that it encompasses a whole range of social skills which are triadic in character and in which children begin to participate around the end of their first year. These are gaze following, joint involvement, social reference, use of protoimperative (related to requesting objects) and protodeclarative (related to sharing interest in an object) pointing gestures, and learning through imitation. The concept of "joint attention" thus became very broad, and rather imprecise as a result. It is therefore worth considering what might constitute a criterion for allocation of the skills comprising joint attention.

Mundy and Newell (2007) suggest distinguishing children's early communicative competencies based on the *functions* they fulfill. According to them, we should therefore distinguish behaviors in the "joint attention" category from those based on "requesting an object or behavior" and those expressed in simple, dyadic turn-taking. The first category of behaviors are aimed at joint attention, shared interest in an object; the second, at obtaining the object; and the third, at being in an interaction. To put it differently, neither requesting an object alone nor just being in an interaction creates joint attention. In suggesting that, for example, when a child expresses a request using a pointing gesture accompanied by looking alternately at the object and the adult this is not a manifestation of joint attention, Mundy and Newell (*ibid.*) differ from the positions of Tomasello (1999) and Carpenter et al. (1998) discussed above.

An important characteristic of the approach to studying triadic relations initiated by Seibert et al. (1982) and continued by Mundy et al. (2003) is the significance they impute to the *responding – initiating dimension*. The authors apply this distinction to each of the three mentioned competencies (joint attention, requests, and social interactions). Importantly, they also develop their research tool: the Early Social Communication Scales (ESCS). They argue that in some of the types of behaviors arising in this way (meaning: initiating and responding to joint attention; initiating requests) we can distinguish *lower- and higher-level behaviors*. However, they analyze the remaining types of behaviors (meaning: responding to requests and responding to and initiating social interaction) on one level.

In summary, if we wish to describe the nature of early child-adult interaction we must refer to several important issues. Firstly, we should ask which elements of interaction can be distinguished at the end of the first year. Secondly, we should consider whether a different function of behaviors is really important (requesting

an object vs. joint interest in it), or if the initiation-response dimension is important with reference to each type of behavior in the interaction, as well as how frequently the specified competences generally occur in the child-adult interaction. Below, we present the results of research in which a Polish adaptation of the ESCS (Białecka-Pikul, Białek, Stępień-Nycz, & Karwala, in print) was used. This aimed firstly to obtain answers to the questions given above, meaning referring to the premises of Mundy's (2003, 2007, 2013) model. Factor-based explorative analyses also allowed us to specify the elementary components of communicative competencies of 12-month-old infants revealed in interaction with adults.

Method

Subjects

Some 358 children[1] aged around 12 months participated in the research (mean age 52 weeks, standard deviation 1.35 weeks, range 50-56 weeks) – 158 girls and 200 boys. The children were mostly from a large-city environment (80% of the group), and their parents were generally educated to degree level (76% of the group). Parents indicated their interest in taking part in the study after receiving an invitation via regular mail or e-mail. The children were studied between March and June 2012.

Research procedure

The study was carried out in the Child Development Psychology Lab at the Institute of Psychology of the Jagiellonian University in Krakow. Children participated in the studies together with their parents. The actual research was preceded by free play during which each child had the opportunity to get to know the new place and the tester. The study lasted about 30 minutes and took the form of structured play during which the tester proposed various activities and objects to the child. The meeting with the child was filmed using two cameras placed in opposite corners of the room in which the research was taking place. From the point of view of the child's position in the room, one camera was in the left corner in front of the child, and the other was in the right corner behind the child, filming the behavior of the tester.

Measures: Early Social Communication Scales (ESCS)

A set of objects and toys was used to measure the children's early nonverbal communication competencies. The experimenter and the child sat opposite each other at a table (the child sat on his/her parent's lap), and to the right of the experimenter were toys that were visible to the child but out of his/her reach. On

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[1] Information on the size of the group was given each time during presentation of the results, as lack of data meant that the number was not always complete.

the walls of the room were four posters – one to the left and one to the right of the child (90°) as well as two behind the child's back (165°). During the procedure, the person conducting it presented the toys to the child, invited the child to engage in a turn-taking exchange, e.g. with a car, showed a book and wind-up toys and pointed to the posters on the walls, and many times asked the child to give a toy or an object.[2]

After the study, the child's behaviors were coded using the Interact software designed for analysis of observational data (Dumas, 1990). Specific child behaviors were coded (29 categories of behaviors) separately for each type of behavior (the six types distinguished by the authors of the scale). The behaviors of a given type were then summed. In some types of behaviors, following the authors of the scales, behaviors representing lower and higher levels of functioning were identified (see Table 1).[3] Detailed information on the research procedure and coding method can be found in the manual written by the authors of the scales (Mundy et al., 2003). In order to illustrate the way in which the study was carried out and the classification of child behaviors, we can give the example of the "object spectacle" and "social interaction" tasks. In the former, the adult manually activates a mechanical wind-up toy which moves around the table. The toy remains out of the child's reach and the adult is sensitive to the child's signals. The child's behaviors can be classified as initiation of joint attention (e.g. looking alternately between the moving toy and the adult or pointing at the active toy) or as initiation of requests (e.g. making eye contact with the adult when the toy is inactive or pointing at the inactive toy). In the "social interaction" task, on the other hand, the adult sings a few bars of a children's song and then gently touches or tickles the child. The child's reactions can be classified in one of the "responding to social interaction" subcategories, i.e. making eye contact (e.g. the child looks at the adult after being touched or tickled), acting (e.g. the child expresses excitement and claps) or appealing (the child displays behaviors from both the above categories).

The coding was performed by trained judges, and 20% of the collected material was coded by two judges in order to calculate the extent to which their assessments agreed. This accord was deemed satisfactory at a level of (Pearson correlation) between 0.56 and 0.86 for all six subscales.

Results

To begin with, in order to check the theses of Mundy's model, three confirmatory factor analyses were conducted on the data. In the first model, the existence of three factors was assumed – joint attention, social interaction and

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[2] A description of example tasks can be found in Białecka-Pikul et al. (in print).
[3] Furthermore, regarding initiating joint attention and initiating requests, behaviors targeted at the caregiver were coded but not included in the summary results.

Table 1. List of behavior types assessed on the Early Social Communication Scales

Behavior types/subscale	Behavior levels	Categories, i.e. behaviors coded in a given type
Initiating Joint Attention (IJA)	Lower Level (IJA_LL)	Making eye contact and looking alternately at the object and the experimenter in order to initiate a joint attention episode – number of behaviors
	Higher Level (IJA_HL)	Pointing, pointing with simultaneous eye contact and showing the object in order to initiate a joint attention episode – number of behaviors
Responding to Joint Attention (RJA)	Lower Level (RJA_LL)	Following the proximal pointing of the adult (pointing at a picture in a book) – percentage of situations in which the child followed the pointing
	Higher Level (RJA_LL)	Following distant pointing of the adult (pointing at a poster) – percentage of situations in which the child followed the pointing
Initiating Social Interaction (ISI)	None	Initiating turn-taking play and teasing the adult – number of behaviors
Responding to Social Interaction (RSI)	None	Eye contact with the adult and the child's behaviors and requests as a reaction to being tickled by the adult; the child taking turns in play with the adult; the child responding to the adult's invitation to use objects on him/her (comb, hat, glasses) – number of behaviors
Initiating Behavioral Requests (IBR)	Lower Level (IBR_LL)	Making eye contact in order to obtain an object, reaching for an object, showing an object in order to cause the adult to behave in a certain way (e.g. turn on a toy) – number of behaviors
	Higher Level (IBR_HL)	Pointing to an object, pointing with simultaneous eye contact – in order to obtain an object; giving an object to an adult, giving an object with simultaneous eye contact – in order to cause specific behavior from the adult (e.g. turning on a toy) – number of behaviors
Responding to Behavioral Requests (RBR)	None	Satisfying an adult's request (reaction to the command "give me", accompanied by an outstretched hand gesture or not) – percentage of situations in which the child satisfied the adult's request.

behavioral requests. The second model assumed the existence of six factors – according to this model, initiating specific behaviors and responding to them constitute different competencies. The six factors analyzed were therefore

Table 2. Results of the confirmatory factor analysis testing three models based on the concept of Mundy (2003, 2007, 2013).

Goodness-of-fit index	Model 1 (6 factors)	Model 2 (3 factors)	Model 3 (2 factors)	Values showing a good fit of the model to the data
Variance function	3.71	3.69	3.76	Near 0
chi2	1284.41	1281.42	1306.45	
df	325	324	324	
chi2/df	3.95	3.95	4.03	Near 1
p-value	< 0.001	< 0.001	< 0.001	> 0.05
Root mean square of the residuals (RMS)	0.11	0.107	0.107	< 0.05
Steiger-Lind RMSEA	(0.09) 0.095 (0.1)	(0.09) 0.095 (0.1)	(0.094) 0.099 (0.104)	< 0.05
Jöreskog-Sörbom GFI	0.78	0.79	0.77	> 0.95
Akaike information criterion	4.02	4.004	4.076	lower

initiating joint attention, responding to joint attention, initiating social inter-action, responding to social interaction, initiating requests, and responding to requests. The third model assumed that behaviors related to joint attention, social interaction and requests are all manifestations of the same basic skills of early social communication, whereas skills related to initiating these behaviors and responding to them are something different. This model therefore assumed two factors – initiating various types of social behaviors and responding to these behaviors. However, the analysis revealed that none of the above three models obtains a sufficiently high goodness-of-fit to be accepted. The numerical data is presented in Table 2.

The results we obtained encouraged us to take on the challenge of carrying out a thorough and exploratory analysis of the collated data. The aim of this analysis was to follow an empirical path to determine the factors that could actually be distinguished. We therefore adopted an inductive strategy using detailed factors in the analysis, i.e. categories of behaviors rather than general types.

Table 3 presents descriptive statistics for all the factors taken into account in the scales. In the range of analyzed variables, very large individual differentiation of results was observed. As a result, instead of the average and standard deviation, measures of central tendency which are more appropriate here are presented: the median and quartile range. In addition, the number of children (in percent) who displayed at least one of the behaviors coded within a given indicator is given.

Table 3. Descriptive statistics of all ESCS indicators for 12-month-old children

No.	Variable/behavior category	Measures of central tendency			Number of children manifesting a given behavior (in percent)
		Median	Quartile range	Range	
1	Initiating joint attention – eye contact	11	9 (6-15)	0-37	97.8
2	Initiating joint attention – pointing	0	2 (0-2)	0-34	48.34
3	Initiating joint attention –alternate gaze	3	4 (1-5)	0-20	80.39
4	Initiating joint attention – pointing with eye contact	0	0	0-3	12.71
5	Initiating joint attention – showing	0	1 (0-1)	0-9	29.56
6	Initiating joint attention – behaviors directed towards caregiver	0	1 (0-1)	0-19	47.79
7	Responding to joint attention – following proximal pointing	83	50 (50-100)	0-100	97.51
8	Responding to joint attention – following distant pointing – front	50	75 (25-100)	0-100	89.23
9	Responding to joint attention – following distant pointing – back	0	25 (0-25)	0-100	42.54
10	Initiating social interaction – initiating turn-taking play	1	1 (0-1)	0-3	68.79
11	Initiating social interaction – lower-level teasing	0	0	0-13	21.55
12	Initiating social interaction – higher-level teasing	0	0	0-11	6.08
13	Responding to social interaction – eye contact	4	3 (2-5)	0-6	93.92
14	Responding to social interaction – acts	0	0	0-2	15.19
15	Responding to social interaction – appeals	0	2 (0-2)	0-6	43.65
16	Responding to social interaction – responding to invitations	1	2 (0-2)	0-4	74.03
17	Responding to social interaction – turn-taking play with a ball	8	9 (3-12)	0-22	87.85
18	Responding to social interaction – turn-taking play with a car	3	5 (1-6)	0-17	83.7
19	Initiating behavioral requests – eye contact	7	8 (3-11)	0-31	93.92
20	Initiating behavioral requests – reaching	6	7 (3-10)	0-40	95.03
21	Initiating behavioral requests – request	0	1 (0-1)	0-19	35.08

22	Initiating behavioral requests – pointing	0	4 (0-4)	0-26	50
23	Initiating behavioral requests – pointing with eye contact	0	0	0-6	20.44
24	Initiating behavioral requests – giving	2	3 (1-4)	0-16	77.35
25	Initiating behavioral requests – giving with eye contact	2	4 (1-5)	0-15	75.69
26	Initiating behavioral requests – behaviors directed towards caregiver	0	1 (0-1)	0-7	30.39
27	Responding to behavioral requests – counted attempts with gesture	3	3 (2-5)	0-12	91.44
28	Responding to behavioral requests – counted attempts without gesture	3	4 (1-5)	0-11	85.64
29	Imitation	0	2 (0-2)	0-12	48.07

Before presenting the results of the factor analyses, we should emphasize that some of the behaviors were manifested by almost all the children (e.g. initiating joint attention and requests, responding to joint attention or social interaction), while others very rarely appeared in the range of behaviors (e.g. initiating social interaction through teasing or initiating requests or joint attention by pointing and eye contact). It will be worth returning to this observation after analyzing the results of the exploratory factor analysis.

The first step was to carry out a factor analysis using the principal component method, and taking as the differentiation criterion eigenvalues larger than 1. This criterion allowed 11 factors to be identified, explaining a total of 61% variance of the relationship between the variables. However, an analysis of the scree plot (Cattell, 1966) demonstrated that it is more legitimate to distinguish six factors, as to the right of the sixth factor there begins a gentle fall in the value of the factor eigenvalues. In addition, variables of very low variation were removed from further analysis (initiating joint attention – pointing with eye contact, initiating joint attention directed to the caregiver, initiating social interaction – higher-level teasing, initiating behavioral requests), as were those not correlating with any other variables (initiating requests directed to the caregiver, initiating social interaction, lower-level teasing), and those lacking high factor loadings in any distinguished factor (responding to social interaction-actions). Ultimately, 22 variables were considered in the further analyses.

In order to assess the suitability of conducting a further factor analysis, Bartlett's (1954) test of sphericity was employed and the Kaiser-Mayer-Olkin measure (KMO) was calculated. The Bartlett sphericity test result was $U = 1312.15$, $df = 231$, $p < 0.0001$, meaning that the correlation matrix between the analyzed

Table 4. Eigenvalues of factors (distinction method: principal axis)

Factor	Eigenvalues	Percentage of total variance
1	2.48	11.28
2	1.39	6.32
3	1.18	5.38
4	1	4.55
5	0.92	4.16
6	0.65	2.94

variables is not an individual matrix. The KMO measure was 0.63; a value equal to 0.5 (Kaiser, 1974) or 0.7 (Stanisz, 2007) is deemed to be a critical value justifying a factor analysis. The KMO value obtained together with the significant sphericity test result therefore gave grounds for conducting a factor analysis.

The method used for determining the factors in the next analysis was the principal axis method, and the determining criterion was the assumed value of the six previously distinguished factors. This time the six factors made it possible to explain 34.63% of the variance in the relationship between the variables. The eigenvalues of the factors are presented in Table 4.

Although the solution explains only 34% of the variance, an analysis of the matrix of the reproduced and residual correlations points to a relatively low percentage (15%) of non-redundant residuals with absolute values larger than or equal to 0.05, which proves that the factor solution obtained can be used to explain the majority of significant correlations between the variables. In the next step, the above factor solution then underwent a simple oblimin rotation.[4] Table 5 presents the factor loadings for specific factors.

The first factor can be defined as "Pointing", as it groups together those behaviors in which the child uses pointing gestures or imitation to initiate contact. Importantly, this includes both behaviors whose aim is to initiate joint attention and those which seek to initiate requests directed to the adult. This factor describes the child as a person who is active in contact and begins this contact by making a gesture, both requesting an object and wishing to share his/her interest in the object with the adult.

The second factor groups two variables as the indicator "Responding to social interaction, but without using an object": eye contact, meaning looking at the adult after he/she has initiated a behavior towards the child (singing a song and tickling the child), and an appeal, i.e. the child performing a specific action (making a gesture, making a loud noise, clapping) together with eye contact after the adult tickles the child. These variables have opposing loadings, and there are probably two reasons for this. Firstly, in accordance with the rules of

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[4] This rotation enables the identified factors to be correlated.

Table 5. Factor loadings after oblimin rotation

Variables/categories of behaviors	Factor					
	1	2	3	4	5	6
Initiating requests – pointing	0.83					
Initiating joint attention – pointing	0.59					
Initiating joint attention – pointing with eye contact	0.58					
Imitation	0.33					
Responding to social interaction – request		-0.82				
Responding to social interaction – eye contact		0.63				
Initiating requests – eye contact			0.64			
Initiating joint attention – alternate gaze			0.58			
Initiating joint attention – eye contact			0.49			
Responding to joint attention – following distant pointing (front)				0.69		
Responding to joint attention – following distant pointing (back)				0.53		
Initiating requests – reaching				0.37		
Responding to joint attention – following proximal pointing				0.31		
Initiating social interaction – turn-taking					0.55	
Responding to social interaction – turn-taking (playing with a ball)					0.48	
Responding to social interaction – turn-taking (playing with a car)					0.38	
Initiating requests – giving					0.36	
Initiating requests – giving with eye contact						-0.74
Responding to social interaction – responding to an invitation						-0.53
Responding to requests – without gesture						-0.38
Initiating joint attention – showing						-0.23
Responding to requests – with gesture						0.17

the coding, when an appeal was noted eye contact was not coded separately. Secondly, it seems that in Polish as opposed to American culture, the dominant reaction of infants to being tickled by strangers is making eye contact in order to check the adult's intention, and not e.g. clapping their hands, accompanied by looking at the adult. The more cautious reaction, perhaps even fear, displayed by Polish children may have been caused by the relative infrequency of this kind of behavior, along with more frequent behaviors involving eye contact. This factor therefore describes behaviors which are simple forms of interaction with the adult, only through eye contact, in which the child actively reacts to the situation of the interaction but is not occupied by and does not share the adult's interest in the object.

The third factor can be called "Eye contact", as it encompasses behaviors initiating contact through gaze. This involves both initiation of joint attention and requests, but at the same time these are always behaviors in which the child only uses looking to make or maintain contact. That is to say that the child does not use gestures (first factor), and only through eye contact and alternating gazes does he/she express interest in an object or ask for it.

The fourth factor contained all the indicators concerning responding to joint attention – i.e. following the pointing of an adult – both proximal (pointing in a book lying in front of the child) and distant (pointing to a poster on the wall next to the child or behind him/her). This factor also covered initiating requests by reaching towards toys. In the original ESCS category, this behavior is included among lower-level initiating behavioral requests, and can be seen as the most elementary form of active expression of a child's own needs – attempting to reach an object that is beyond the hand's grasp. The fact that both reaching and following pointing appear within one factor – behaviors which emerge in development earlier than making pointing gestures – demonstrates that these simplest forms of coordinating the course of triadic reactions in one-year-old children occur together. It was therefore concluded that the general name "Simple participation in interactions" best renders the nature of this factor.

The fifth factor can be called "Active coordination of the course of social interaction, especially in turn-taking play with an object". It groups together behaviors involving turn-taking, both initiated by the child without the play being previously demonstrated by the adult and when the child takes the next turns in such play started by the adult. Initiating requests by giving also contains an element of turn-taking – the occurrence of this behavior is coded when the child gives an object to the adult so that the latter can repeat the action or put the object aside. In all behaviors, therefore, the child directs the object to the adult, either as part of turn-taking play or when requesting that the adult do something with the object.

The last distinguished factor causes the greatest difficulties. It brings together behaviors from many different categories, but which essentially refer to simple requests and showing. The negative result obtained in these categories means that we can identify their common denominator as a lack of giving and showing and a low level of responding to the adult's requests, as well as responding to them only when he/she also makes a gesture (the only element with a positive factor loading), which would mean that we could call this category of behaviors "Passive approach".

An analysis of the identified factors demonstrated that they are practically not connected with one another, although the rotation that was employed made it possible to correlate them. An exception was the small negative correlation between the first and sixth factors (r = -0.28*) and the fourth and sixth ones (r = -0.23*). This result is in accordance with our understanding of the factors,

as passivity seems to be the opposite of active pointing as well as reaching and actively responding to the adult's initiative, which are expressed by understanding a pointing gesture.

Discussion

On the basis of the presented results we can state that the elements of behaviors identified using an exploratory factor analysis which are tested by the Early Social Communication Scales are not entirely convergent with the theoretical proposal of the authors of the scales. Their assumption was that differences would be revealed between the three types of communicative behaviors: behavioral requests, social interaction, and joint attention. In our analysis, the behaviors included in these three categories occur in almost all of the factors identified in the research on 12-month-old children. To begin with, then, we might consider which components of communicative competence can be distinguished when observing child-adult interaction.

When the children were 12 months old, active behaviors involving initiating interaction were identified – i.e. Factor 1: Pointing and Factor 3: Eye contact. In other words, the children either initiated interaction through eye contact, as the majority did (over 80%), or used a pointing gesture to make such contact (around 50%). It is important to note that these factors are not correlated. They can be considered to be different forms of active coordination of the process of triadic interaction, although at 12 months the use of pointing is emerging and developing whereas eye contact is already a competence used by almost all children.

Furthermore, 12-month-old children were able to both react to an adult initiating interaction (Factor 2) and respond to an initiative from the adult (Factor 4). Both these factors refer to behaviors which occurred in over 90% of children.

Let us now switch our attention to a comparison of the described factors with the theses advanced by Mundy (2007, 2013). Firstly, initiating behaviors (joint attention and requests) is indeed a competence that appears to be distinct from responding to them (particularly joint attention). The factor referred to here as Simple participation in triadic interaction (Factor 4) certainly concerns behaviors involving responding to an adult's initiative, while Factor 1 (Pointing) means behaviors concerning initiating interaction through a gesture. We can therefore state that this offers empirical confirmation of the part of Mundy's model which claims that initiating and responding should be distinguished, and that these competencies do not have to be assumed as one general category of behavior.

Furthermore, we can stress that the description of Factor 5, which we called Active coordination of interaction, brings it close to the description of turn-taking in social interaction. Importantly, this applies to both when this is initiated by the child and when the child engages in turn-taking initiated by the adult. Therefore,

there is no doubt that we are observing children's competences to participate in turn-taking interaction.

However, the results do not confirm the thesis that we can distinguish behaviors in child-adult interaction based on their function and aim. In our study, behaviors from the category of requests and joint attention appeared in the first, third and fourth factors. The significance of this result means that it should be given more attention, the views of other researchers should be considered and it should be analyzed using the means of identifying various functions of behavior contained in the ESCS.

The definition of initiating joint attention by a child that is dominant in the contemporary literature and used in the ESCS, in particular the child's use of protodeclarative pointing gestures, differs from the definition introduced by Bates et al. (1975). According to these authors, a child uses a protodeclarative pointing gesture when he/she directs an adult's attention to an object or event. For Carpenter and Call (2013), however, today this type of gesture is considered to involve directing the attention of another person to objects in order to share attention and interest in these objects with that person. The ESCS also refer to sharing interest in an object or event. In contemporary research, therefore, infants' gestures are usually interpreted in a cognitively rich way (for more on cognitively rich and lean interpretation of competences among infants, see Białek & Filip, 2013), and motivation and competence to share interest with other people and understand the mental states of other people are attributed to them (Tomasello, Carpenter & Liszkowski, 2007). Consequently, as Leavens (2012) notes, protodeclarative pointing gestures are distinguished from protoimperative pointing gestures (or, more generally, joint attention from behavioral requests) when referring to hypothetical and non-observable psychological processes. Leavens (*ibid.*) also discusses experimental procedures used for triggering pointing in a child. Protoimperative pointing gestures are most frequently triggered by displaying a small object just out of the child's reach, whereas protodeclarative pointing gestures are elicited by presenting large objects from a distance. Therefore, different motivations for pointing are inextricably linked to various contexts used to prompt pointing, and it is impossible to define a protodeclarative motivation separately from the "protodeclarative context". Nothing in the structure of a pointing gesture implies its functions; they are not inherently protoimperatives or protodeclaratives, and are used in an imperative or declarative context (Leavens, 2012).

In keeping with the rules for coding observed behaviors contained in the ESCS, a child is deemed to be using a pointing gesture that manifests joint attention when doing so, for example, if the toy presented by the experimenter moves around the table. If the child performs the pointing gesture after the toy stops, on the other hand, this is treated as initiating a behavioral request, i.e. a protoimperative gesture. Similarly, when the child looks alternately at the adult and the toy moving around the table, this is considered to be initiating joint at-

tention, but if the child looks at the adult after the toy has stopped moving, this eye contact is treated as a request.

Mindful of the arguments for which the authors of the scales introduced such distinctions, we can also express doubt as to whether the contexts of eliciting these behaviors in the child are varied enough to retain certainty over the differing motivations guiding infants' early communication. The results of our factor analysis seem rather to indicate that at least among children aged 12 months, it is the level and not the function that differentiates a behavior. Within the ESCS, it is consequently worth considering adding together the behaviors that do not take into account the division into various categories and their potentially different functions (i.e. joint attention and behavioral requests) and only take into account the observable form of behavior. However, in order to be more certain about the motivation behind a child's behavior, i.e. what kind of illocutionary action he/she is expressing in making a pointing gesture, it would be necessary to manipulate the context of the study or the adult's reaction. This shows that a more comprehensive study of infants' communication competences would require an analysis of the sequence of behaviors (e.g. several rounds of interaction, and a possible change in the way the adult reacts) or creating a situation in which the child discerns the changes taking place outside of the adult's field of vision (e.g. behind his/her back). This would make it possible to demonstrate that the child has the intention to interest the adult in an object or event. Such a modification of the scales would allow the current views on the nature of protodeclarative gestures to be reviewed, and the motivations behind children's various communicative behaviors to be more accurately differentiated.

To conclude, we should also emphasize that one interesting result we obtained was to demonstrate the significance of the two levels of initiating contact – lower and higher, i.e. without a gesture and with a gesture. Behaviors involving pointing create a factor (No. 1) that is distinct from behaviors involving exchanging gazes (Factor 3). It seems that in terms of development, when a child can point he/she can stop or continue to use simpler forms of interaction through looking. We can interpret the obtained result by stressing how important and complex a type of behavior a gesture is, making it possible to transmit a more precise message. Recognizing this characteristic of communicative behaviors, the authors of the ESCS scales themselves distinguished lower- and higher-level behaviors, but without giving clear justification for this decision. Our analysis confirmed the legitimacy of this differentiation, demonstrating its importance at a very general level.

Finally, we ought to consider the implications of the results. Firstly, in showing the nature of adult-child interaction at 12 months we stated that pointing gestures are used by children at this age both to request and to share attention. Secondly, the results suggest that we need to clarify the concept of joint attention, emphasizing: 1) two main dimensions which were also discovered in our analy-

ses: initiating and responding; and 2) simple, less cognitively complex behaviors without gestures and cognitively complex behaviors in which the child uses gestures. Moreover, the more diverse context of such behaviors being triggered should thus be taken into account in further research. Thirdly, from the point of view of the possibility of using the obtained results in practice, we must without doubt stress the great significance of looking and pointing gestures for interaction with a child. Not only must we use them ourselves, as children are excellent at interpreting such signals, but we must also intensively focus our attention in such a way as to make eye contact and discern the gestures which the child uses.

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