

# The Scale of Early Childhood Communication Signals: Evaluation of Child-Parent Interaction

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The research is aimed at developing a scale for evaluating the communication signals of an early-age child, which can help to assess the predictors of the development of behavioral, cognitive, and socio-emotional skills in a child. This system of fixing the child's communication signals is based on the periodization of the ontogeny of communication between M. Lisina and her followers (E. Smirnova, D. Godovikova, S. Meshcheryakova, etc.), which allows us to consider specific forms of communication between a child and an adult in the new social situation of modern children's development. The materials of an empirical study conducted on a sample of dyads of mothers and young children are presented. The study (N=55) involved dyads of mothers and children aged 2,4 to 3,3 years (M=2,9; SD=0,40), of which 62% were girls. The study included a video recording of a mother's playtime interaction with a child for 15 minutes. The resulting video clips were analyzed and encoded using the "Observer-XT 14" program. To evaluate video protocols, experts used the evaluation of the child-parent interaction method "Evaluation of child-parent interaction" [ECPI-2 ed.], the scale of "Child communication signals". The method of main components was used for processing expert assessments, which allowed us to distinguish three factors of children's indicators ["Exploratory activity"; "Personal autonomy"; "Emotional alienation"]. Based on the results, we can talk about the stability of indicators-factors that characterize the child's communication signals. Based on the array of experimental data [49,500 seconds of video tape], a model has been developed for analyzing dynamic changes occurring in the process of child-parent interaction. All factors are stable over time: autocorrelation dynamic series are characterized by high values of correlation coefficients. It is noted that the formation of personal autonomy when interacting with a significant adult and the emotional alienation of a child from an adult can ambivalently influence the child's research activity.

**Keywords:** assessment scale, observation method, independence, personal autonomy, early age, video analysis, behavior, Observer-XT.

**Funding.** The reported study was funded by Russian Foundation for Basic Research (RFBR), «Cross-cultural peculiarities of interaction between a significant adult and a child in Russia and Vietnam», project number 19-513-92001.

**Acknowledgements.** The authors are grateful young scientists, clinical psychologists of the Department of neuro-and pathopsychological development of MSUPE Garifullina A.D. and Park V.V. for their help in coding cases with the program "The Observer – XT 14".

**For citation:** Shinina T.V., Mitina O.V. The Scale of Early Childhood Communication Signals: Evaluation of Child-Parent Interaction. *Kul'turno-istoricheskaya psikhologiya = Cultural-Historical Psychology*, 2022. Vol. 18, no. 1, pp. 17–27. DOI: <https://doi.org/10.17759/chp.2022180102> (In Russ.).

# Шкала коммуникативных сигналов ребенка раннего возраста: оценка детско-родительского взаимодействия

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Исследование направлено на разработку шкалы оценки коммуникативных сигналов ребенка раннего возраста, с помощью которой возможно оценить предикторы развития поведенческих, когнитивных и социально-эмоциональных навыков у ребенка. Данная система фиксации коммуникативных сигналов ребенка опирается на периодизацию онтогенеза общения М. Лисиной и последователей (Е. Смирновой, Д. Годовиковой, С. Мещеряковой и др.), которая позволяет рассмотреть специфические формы общения ребенка со взрослым в условиях новой социальной ситуации развития современных детей. Представлены материалы эмпирического исследования, проведенного на выборке из диад матерей и детей раннего возраста. В исследовании (N=55) приняли участие диады матерей и детей в возрасте от 2,4 до 3,3 лет (M=2,9; SD=0,40), из которых 62% были девочки. Исследование включало в себя видеозапись игрового взаимодействия мамы с ребенком в течение 15 минут. Полученные видеопротоколы были проанализированы и закодированы с помощью программы «Observer-XT 14». Для оценки видеопротоколов экспертами использовалась методика оценки детско-родительского взаимодействия «Evaluation of child-parent interaction» [ЕСPI-2 ред.], шкала «Коммуникативных сигналов ребенка». Для обработки экспертных оценок использовался метод главных компонент, позволивший выделить три фактора детских индикаторов («Исследовательская активность» — «Exploratory activity»; «Личностная автономия» — «Personal autonomy»; «Эмоциональная отчужденность» — «Emotional alienation»). На основании полученных результатов можно говорить об устойчивости показателей-факторов, характеризующих коммуникативные сигналы ребенка. С опорой на массив экспериментальных данных (49 500 секунд видеоленты) разработана модель для анализа динамических изменений, происходящих в процессе детско-родительского взаимодействия. Все факторы стабильны во времени: автокорреляционные динамические ряды характеризуются высокими значениями коэффициентов корреляций. Отмечается, что формирование личностной автономии при взаимодействии со значимым взрослым и эмоциональная отчужденность ребенка от взрослого могут амбивалентно влиять на исследовательскую активность ребенка.

**Ключевые слова:** шкала оценки, метод наблюдения, самостоятельность, личностная автономия, ранний возраст, видеоанализ, поведение, Observer-XT.

**Финансирование.** Исследование выполнено при финансовой поддержке Российского фонда фундаментальных исследований (РФФИ) в рамках научного проекта № 19-513-92001 «Кросс-культурные особенности взаимодействия значимого взрослого и ребенка в России и Вьетнаме».

**Благодарности.** Авторы благодарят за помощь в кодировании кейсов программой «Observer — XT 14» молодых ученых, клинических психологов кафедры нейро- и патопсихологии развития МГППУ А.Д. Гарифуллину и В.В. Пак.

**Для цитаты:** Шинина Т.В., Митина О.В. Шкала коммуникативных сигналов ребенка раннего возраста: оценка детско-родительского взаимодействия // Культурно-историческая психология. 2022. Том 18. № 1. С. 17–27. DOI: <https://doi.org/10.17759/chp.2022180102>

## Introduction

Rapid changes in modern society, high intensity of the information stream, the shift in communication with

its transfer to online media — all these has a considerable influence on the mental development and formation of a child's personality. That leads to a gap between the generations of parents and children as well as to lower

importance of an adult figure and his or her role in the parent-child interaction. This social situation of development demands scientific reconsideration and finding new ways of assessment of the parent-child interaction of “the changing child in the changing world” [12].

Nowadays we can see a surge of interest of foreign researchers in studying interaction by means of videos and observation scales. The state-of-the-art review allows us to see both advantages and disadvantages of the methods of assessment of the early parent-child interaction [13]. The assessment of the parent-child relationship NCAST (Nursing Child Assessment Satellite Training) studies the ability to give clear and precise signals to an adult and the ability to demonstrate a reaction to the words or actions of the adult [16]. The scale Manchester Assessment of Caregiver-Infant (MACI) marks the child's behavior according to three parameters: child's attention towards the adult, child's positive affect, child's liveliness [14]. The evaluation of the psychological interaction of the child and adult in the process of feeding as well as of structured and non-structured play, the Parent-Child Early Relational Assessment (PCERA) [17], includes 28 characteristics of a child's behavior.

Speaking of the Russian psychology, the approach designed in M.I. Lisina's scientific school of ontogenesis of communication is considered being one of the most elaborated and thorough [9; 10]. M.I. Lisina considers communication as the process of interaction where every subject becomes an object of cognition and gets the opportunity to better understanding his or her needs as well as to cognizing and evaluating oneself. Thus, communication between the child and the adult becomes the basis of personality development in ontogenesis.

The aim of our research is an assessment of communicative signals of a child of an early age in the process of the spontaneous game for designing a scale of assessment and defining the dynamics of the intensity of the signal towards the significant adult.

### **The Methodological Basis of the Research**

In our research, we are guided by M.I. Lisina's thesis postulating that the most important characteristic is the activity of a person, his or her subjective attitude reflected in the communication process via initiative towards the communication partner and in return reactions to his or her actions. Thus, the quality of interaction, so important at an early age, depends on how the partners act in turn and how they perceive the actions of each other in the communication process. “If, when listening to you, a child looks at your face smiling in response to your affectionate words, fastens his or her gaze upon your face — you can be sure that communication is

in progress; but suddenly, attracted by the noise in the next room, the child turns away or bends the head while watching a beetle in the grass — and communication process pauses: it is interrupted by the exploratory activity of the child” [10, p. 22]. The given citation illustrates the quality of interaction depending on its manifestations in the mutual and independent activity.

Based on the principles of the activity approach and sharing the views of her teacher A.V. Zaporozhetz regarding communicative activity, M.I. Lisina supposes that “...the communication motives should be fulfilled (be made tangible) in those traits of a person or other persons for cognition and evaluation of which the individual starts interaction with somebody” [9, p.13]. She marks out the following group of qualities: (1) cognitive qualities: the adult is a source of information about the objective world and organizes new impressions for the child; (2) liveliness qualities: the significant adult is a partner in the mutual activity and relays how to act correctly; (3) personality traits: the adult shows his or her emotional experience in the interaction process.

As for the new formations which effect personality development of a child, M.I. Lisina marks out the attitude of the child to the objective world, to other people, and to him- or herself. Personality development of the child is shown especially brightly during the critical periods in the mutual influence of those lines. At the same time, the shift to the new stage of the interaction of the significant adult with the child of an early age occurs.

Considering communication as a special kind of activity, it is necessary to define the main structural components, to mark its object and main inducing needs and motives as well as to characterize the actions and operations. V.V. Davydov indicates structural components of the communicative activity as the actions and means of communication [6]. A communication action is a unit of communicative activity, i.e., the whole act addressed to another person and aimed at him or her as at its object. Two main categories of communication actions are the initial acts and the return actions. The means of communication are those operations by means of which the communication actions are performed.

This methodological base predetermines designing the scale of communicative signals of a child which allows fixing the manifestations of the child in the process of communicative activity with the significant adult.

### **Research Methods**

The assessment of the communicative signals of a child has been performed by the technique Evaluation

of Child-Parent Interaction (ECPI-2) [4; 5]. The dyads of mothers and children (N=55) in the age from 2,4 to 3,3 years (M=2,9; SD=0,40) have been taken part in the research; 62% of the children are female. The procedure includes the following instruction for the parent: "Play with your child the way you usually do at home". 15 minutes of the parent-child interaction have been documented by means of video recording, which allows analyzing the video case and marking micro-actions of the child afterward. That gives the opportunity to discern the signals of the child in the process of interaction also it influences the evidence-based approach in the process of analysis of the obtained results and design recommendations for the parents and specialists taking part in the early interventions in the development of a child of the early age.

We have managed to get the whole picture of the child's behavior while communicating with the parent due to the software the Observer XT-14, providing visualization of the frequency and length of each indicator of the communicative signals of the child and registration of the medium and general indicators of duration as well as quantitative characteristics of each indicator. The evaluation protocol of indicators of the communicative signals of the child includes: (a) designing the coding scheme; (b) statistical analysis; (c) rating analysis of validity carried out by several observers in the same project; (d) data input. Ethic consents of the parents have been obtained. The analysis of the video records has been carried out by two behavioral analytics after having special training and reaching the indexes of concordance of expert marks at 87%-level of results correspondence in the independent analysis [3].

### Designing the Scale of the Communicative Signals of a Child

We have been guided by two main lines of the behavior of a child of the early age conditioned by the age characteristics: communicative and objective activity. The former is aimed at communication with an adult and the latter – at studying an object.

While coding the communicative activity we have marked the initial acts and response actions towards the object and towards the adult expressed by communicative signals as the means of communication. For studying the communicative signals "child-object (O)" five indicators of evaluation of the independent activity of the child have been introduced. The communicative signals "child-adult" (A) have been studied by five indicators of evaluation of the child's signals aimed at interaction with the adult (Figure 1).

In the process of three-year video-research (2016–2019) a coding system allowing to fix an indicator in the process of video-case analysis considering the characteristics of that indicator [4; 5] has been designed. Each indicator has either a positive or negative value and that corresponds to the substantive characteristics (Table 1). For each indicator, a montage of demonstrations has been selected and that allowed to compile a video library. This is supposed to be a sufficient advantage and significant resource for training specialists working with children and parents, especially in the centers of early intervention.

### Results

A dynamic model was developed to analyze the results. It allows you to draw conclusions and build re-

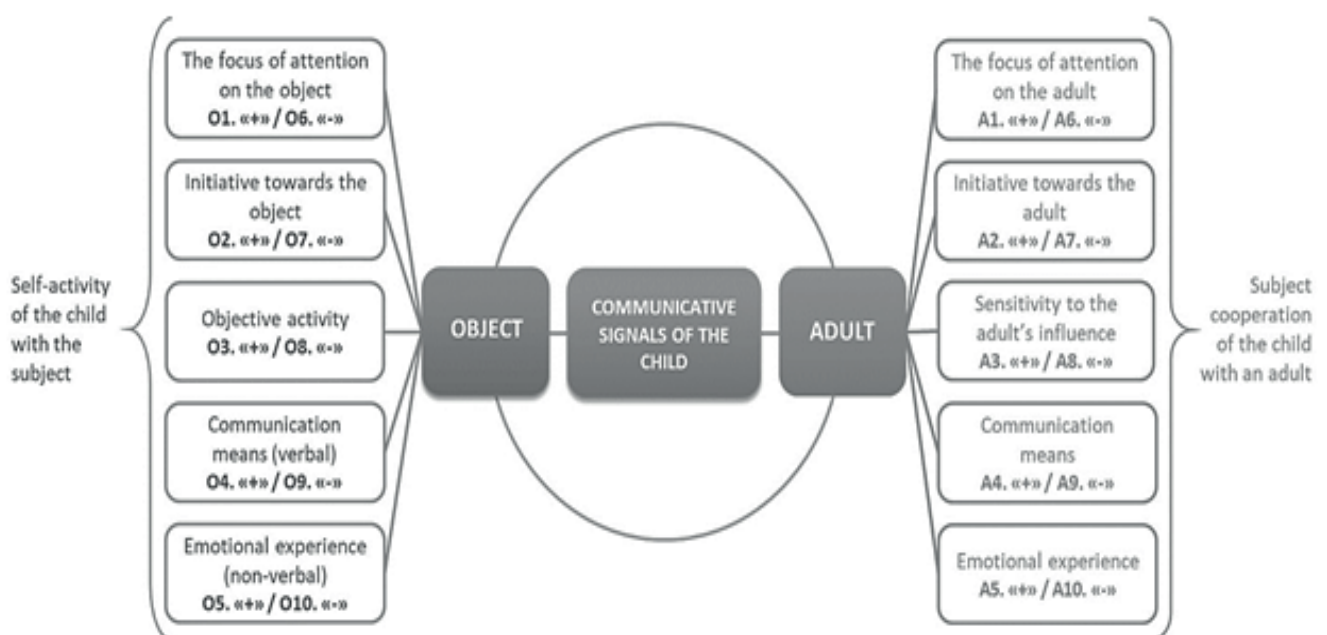


Fig. 1. The scale of evaluation of communicative signals of the child: substantive indicators

Table 1

**System of Coding Child – Object (CO)**

The child sends communicative signals towards the object in the process of 15-minute play with the adult

Indicator	Characteristic	Indicator	Characteristic
<b>O 1.</b> The focus of attention on the object «+»	Concentration on the object	<b>O 6.</b> The focus of attention on the object «-»	Vacant look
<b>O 2.</b> Initiative towards the object «+»	Makes a choice of the object	<b>O 7.</b> Initiative towards the object «-»	Does not make a choice of an object
<b>O 3.</b> Objective activity «+»	The child explores an object him- or herself	<b>O 8.</b> Objective activity «-»	Stereotypic manipulations with the object
<b>O 4.</b> Communication means (verbal) «+»	Sends verbal signals towards the object	<b>O 9.</b> Communication means (verbal) «-»	Shows poor verbal reactions with negative shade
<b>O 5.</b> Emotional experience (non-verbal) «+»	Sends positive emotional non-verbal signals towards the object	<b>O 10.</b> Emotional experience (non-verbal) «-»	Shows negative emotional reactions

Table 2

**System of Coding Indicators Child – Adult (CA)**

The child sends communicative signals towards the adult in the process of 15-minute play with the adult

Indicator	Characteristic	Indicator	Characteristic
<b>A 1.</b> The focus of attention on the adult «+»	Concentrates attention on the adult's eyes	<b>A 6.</b> The focus of attention on the adult «-»	Does not look at the adult
<b>A 2.</b> Initiative towards the adult «+»	Involves the adult into the activity	<b>A 7.</b> Initiative towards the adult «-»	Does not involve the adult in the activity
<b>A 3.</b> Sensitivity to the adult's influence «+»	Supports every adult's initiative	<b>A 8.</b> Sensitivity to the adult's influence «-»	Does not support adult initiatives
<b>A 4.</b> Communication means «+»	Sends verbal signals towards the adult	<b>A 9.</b> Communication means «-»	Demonstrates poor verbal reactions with the negative shade
<b>A 5.</b> Emotional experience «+»	Sends positive emotional non-verbal signals towards the adult	<b>A 10.</b> Emotional experience «-»	Shows negative emotional reactions while staying with the adult

search forecasts based on empirical data obtained as a result of measurement procedures. (Table 3).

For all sessions with a total duration of 15 minutes, a time series consisting of 1000 intervals of equal duration was constructed for each of the 20 indicators, and the presence (coded 1) or absence (coded 0) of a communicative signal from the child corresponding to this indicator was recorded on each of them. As a result, 20

dichotomous (of zeros and ones) time series with 1000 measurements were presented for analysis. Further, each time series (for each indicator) was divided into 4 equal periods and in each period the proportion of measurements (out of 250 that fell into this period) was determined, the result of which was one, i.e. there were behavioral manifestations of a communicative signal corresponding to this indicator. For each indicator and each

Table 3

**Average Percentage of Communicative Signals for each Indicator for each Time Period**

Indicator	Positive indicators				Negative indicators			
	1	2	3	4	1	2	3	4
O 1. Focus of attention on the object	<b>0,536*</b>	<b>0,616</b>	<b>0,567</b>	0,257	<b>0,108</b>	<b>0,093</b>	<b>0,108</b>	0,053
O 2. Initiative towards the object	<b>0,161</b>	<b>0,194</b>	<b>0,183</b>	0,088	0,010	0,005	0,009	0,012
O 3. Objective activity	<b>0,356</b>	<b>0,394</b>	<b>0,371</b>	0,196	<b>0,031</b>	<b>0,037</b>	<b>0,035</b>	0,013
O 4. Communication means	<b>0,042</b>	<b>0,046</b>	<b>0,045</b>	0,026	0,000	0,000	0,001	0,000
O 5. Emotional experience	<b>0,031</b>	<b>0,034</b>	<b>0,025</b>	0,014	0,000	0,000	0,001	0,001
A 1. Focus of attention on the adult	0,054	0,045	0,048	0,037	0,088	0,063	0,056	0,036
A 2. Initiative towards the adult	<b>0,020</b>	0,015	<b>0,017</b>	0,009	0,002	0,002	0,000	0,000
A 3. Sensitivity towards the adult's influence	<b>0,264</b>	<b>0,273</b>	<b>0,257</b>	0,137	<b>0,067</b>	<b>0,066</b>	<b>0,064</b>	0,027
A 4. Communication means	0,127	0,117	0,137	0,073	0,012	0,019	0,016	0,009
A 5. Emotional experience	<b>0,078</b>	0,059	<b>0,082</b>	0,050	0,010	0,020	0,017	0,010

Note: \*The values significantly exceeding corresponding values for another period are marked by the bold font

of the four time periods, there was a certain proportion of presence averaged over all subjects corresponding to the indicator of a communicative signal. The results are presented in table 3. Bold font demonstrates indicators that significantly exceed the indicators for the same indicator calculated for a different period (marked with the usual font). In 11 of the 20 indicators, the least manifestation of communicative signals was found in the fourth (last) time period. Fatigue probably affects. No significant differences were found for 9 indicators, although a general tendency to decrease communication signals is present in all 20 indicators.

In order to test the possibility of enlarging the indicator system by combining them into more capacious categories, a data matrix was formed consisting of 55x4 rows (for each subject in each of the 4 periods) and 20 columns, each corresponded to its indicator. Using the principal component method, three factors were identified for indicators of the child's behavior.

Further, we are going to review the dynamics and characterize the indexes of the intensity of the factors.

The first factor is Exploratory Activity.

One can see that the indicators are either positive or negative (Table 4). The positive indicators characterize the child's independence in studying the object (objective activity +, attention focus on the object+, means of communication with the object +, initiative towards the object +, emotional reactions towards the object +), and the negative ones relate to the refusal of interaction (the focus of attention of the adult -, the focus of attention on the object -). Figure 2 shows that during the periods from 1 to 3, the index corresponding to the first factor has been attributed by the experts almost the same number of times. Thus, it is possible to speak about certain stability of those demonstrations in the playing activity during the first three-quarters of the session and in the end, fatigue of the child or the parent can probably take place.

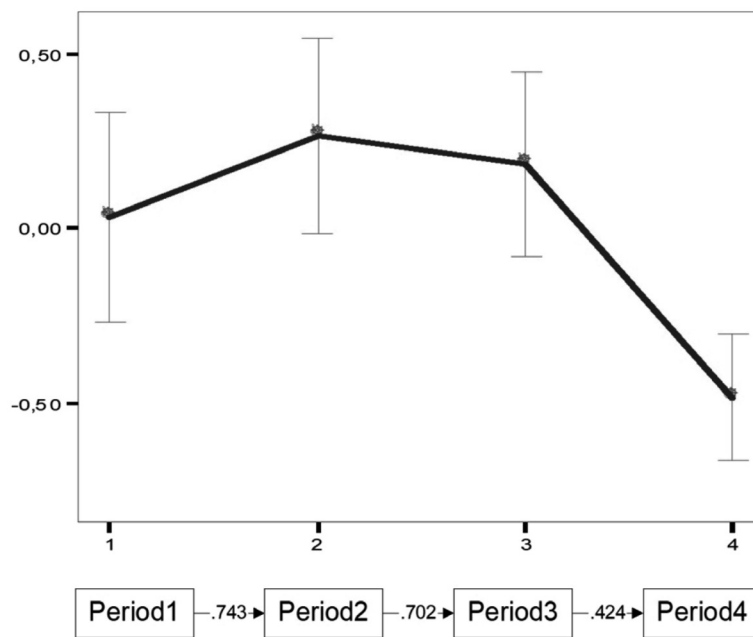


Fig. 2. Dynamics of the Factor1: Exploratory Activity

Table 4

**Factor Loadings of the Indicators of Parent-Child Interaction on Factor 1: Exploratory Activity**

Indicator	Factor loadings
F1(+)	
Objective activity +	0,779
Attention focus on the object +	0,778
Means of communication with the object +	0,622
Initiative towards the object +	0,618
Emotional reactions towards the object +	0,552
F1(-)	
Attention focus on the adult -	-0,556
Attention focus on the object -	-0,319

The second revealed factor is Personal Autonomy: the positive markers are aimed at the adult (emotional reactions towards the adult +, means of communication towards the adult +, initiative towards the adult +, sensitivity to the adult +, attention focus on the adult+); see Table 5. On the chart, we can observe a significant reducing shift in the fourth period although the general dynamics of the factor is relatively stable (Figure 3).

The third factor, Emotional Alienation, seems to have an ambivalent character. In a certain moment, a child can feel him- or herself involved into interaction with the adult and alienated from him or her (Table 6). It is interesting that alienation demands a certain force and persistence from the child. We would like to mention that in the fourth period a decline of the curve occurs and that is typical for all the charts (Figure 4).

On the second step of the analysis, we have decided to unite all three child's factors together and design a model using several rules: the measured variable of the previous period cannot predict the variable of the following period; the measured variable of the following pe-

riod cannot predict the variable of the previous period; variables of errors (remainders) from various periods can neither predict each other nor correlate with each other; the variables of the same period cannot predict each other. Path analysis was used.

It is interesting to pay attention to the relations between the child's factors: they can be presented as a triangle (Figure 5).

Based on the diagram, one can make the following interpretation: the exploratory activity of the child (what the parent wants to achieve) in the third period is determined by the initial interaction with the parent, and then by alienation from the adult. It can be interpreted as distancing from the adult and transfer to independent activity. Each of those stages of communication takes time; hence, a high level of interruption of the child's actions decreases the child's activity. Analyzing this model and the data obtained in the research, one can conclude that a high degree of emotional alienation between the child and the adult can support the independent exploratory activity of the child.

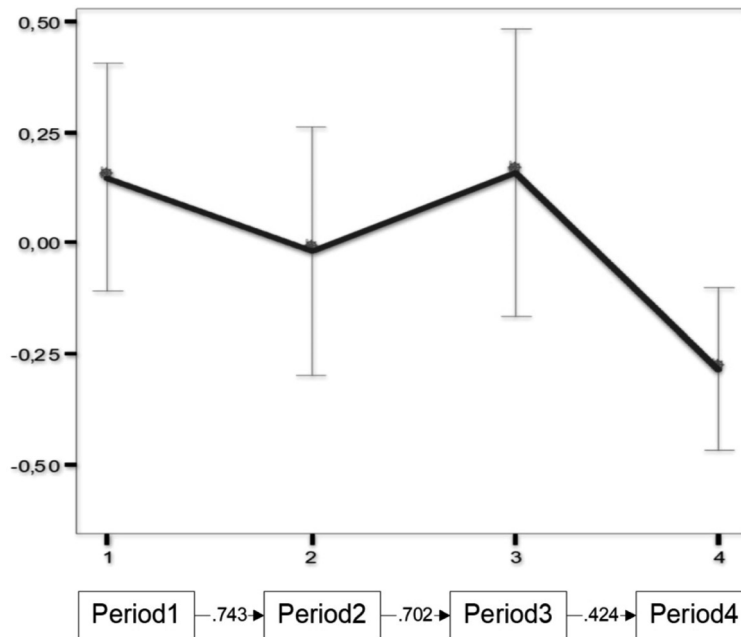


Fig. 3. Dynamics of the Factor1: Exploratory Activity

Table 5

Factor Loadings of the Indicators of Parent-Child Interaction of Factor 2: Personal Autonomy

Indicator	Factor loadings
<i>F2(+)</i>	
Emotional reactions towards the adult +	0,737
Communication means towards the adult +	0,680
Initiative towards the adult +	0,671
Sensitivity towards the adult +	0,661
Attention focus on the adult +	0,601

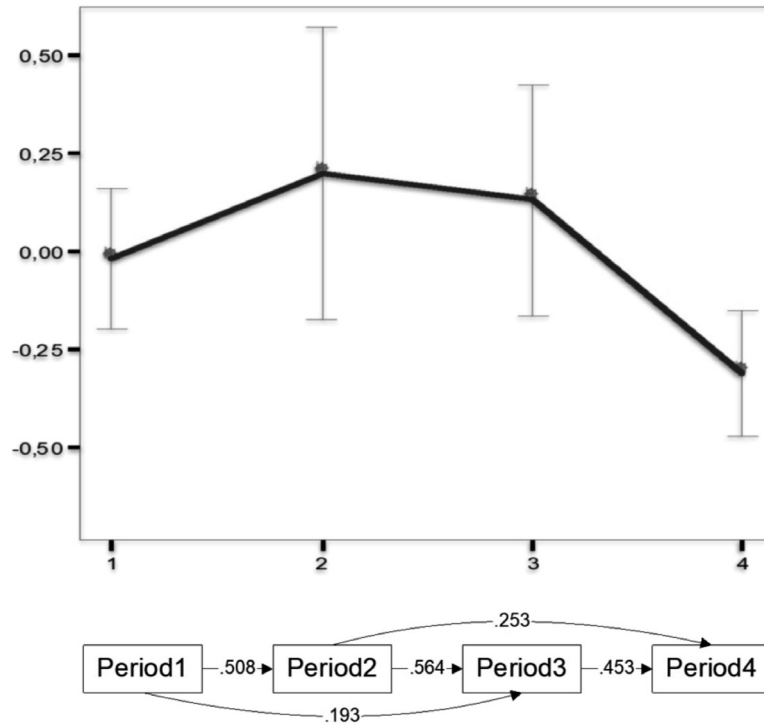
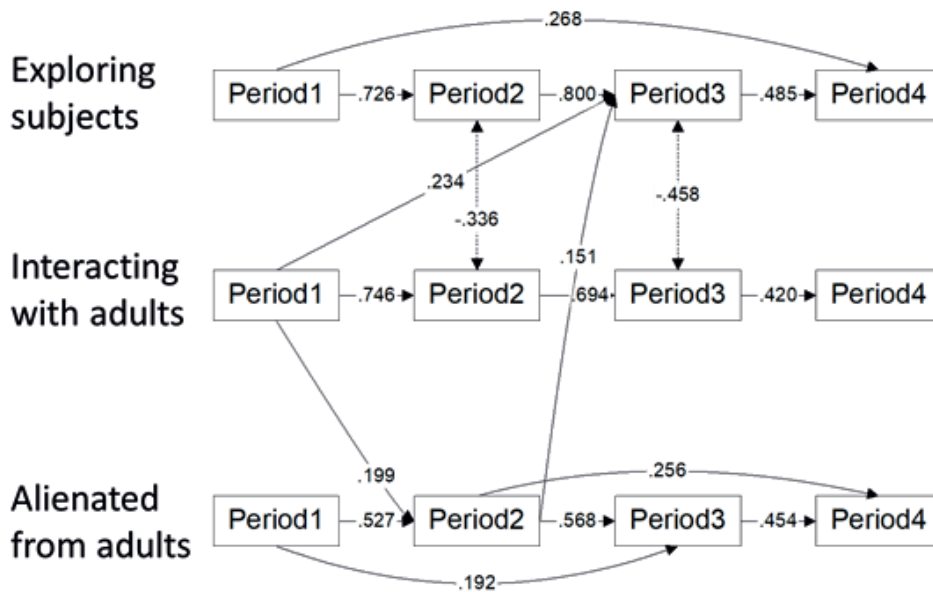


Fig. 4. Dynamics of the Factor 3: Emotional Alienation

Table 6

Factor Loads of the Indicators of Parent-Child Interaction of Factor 3: Emotional Alienation

Indicator	Factor load
<i>F3(+)</i>	
Emotional reactions towards the adult -	0,902
Communication means towards the adult -	0,839
Sensitivity towards the adult -	0,667
Objective activity -	0,381
Communication means towards the object-	0,218



$\chi^2 = 39.284$  ,  $df = 49$  ,  $p = 0.83$  ,  $CFI = 1.0$  ,  $RMSEA = 0.0$

Fig. 5. The relations between the child's factors during the time periods



## Discussion

In the process of results analysis, three factors of the child's indicators reflecting medium values of the factors in each period have been marked out. We are going to describe the characteristics of each factor.

**The first factor, "Exploratory Activity"**, reflects the indicators characterizing independent studying the object by the child.

Interpretation: The child explores the object him- or herself, tries to fulfill the need to manipulate with it independently, and show initiative towards exploring the object. The child examines his or her exploratory abilities; a stimulus to self-development, formation of exploratory competence, and eagerness to learn something new is being formed.

**The second factor, "Personal Autonomy"**, reflects the indicators characterizing the interaction of the child with the adult.

Interpretation: Personal Autonomy relates to a high level of integrity and openness to the experience when the child is able to express the emotional reactions including negative ones openly and that speaks for the emotional authenticity of personality. The child is the author of his or her actions and acts according to his or her internal state. The child's initiative is connected with his or her active subjectivity, freedom of choice of actions, ability to present the ways of actions with the object to the significant adult.

**The third factor, "Emotional Alienation"**, reflects the indicators characterizing authentic behavior of the child, when the child can express emotionally his or her state; it shows firmness, independence, the persistence of the child and demonstrates emotional alienation from the adult.

Interpretation: The child is oriented neither on the adult nor on the object. The child refuses to interact with the object chosen by the adult; he or she is upset and shows negative reactions towards the adult. He or she experiences negative emotions. This behavior script fixes the emergence of the symptoms of the 3-year crisis, "negativism" [2]. That is a negative emotion connected with the child's attitude towards the adult. The child does not explore the object only because the process is initiated by the adult.

## Conclusions

1. As the result of the research, the system of communicative signals of a child of an early age allowing to trace their intensity has been designed. The model of the analysis of dynamics of the child's communicative behavior at an early age when interacting with the significant adult has been introduced. All the factors are stable in time: auto-correlational dynamical rows are characterized by high values of the correlation coefficients. Development and transforma-

tion of the parent-child interaction occur in the continuous contact in the process of spontaneous play of the child.

2. Support of the child's initiative and independence influences the formation of personal autonomy as a mature form of self-regulation at an early age. Autonomy relates to a high level of integrity and openness to the experience when the child can express the emotional reactions, including negative ones openly and that speaks for the emotional authenticity of the personality. The communicative space of parent-child interaction [1; 11] stimulates his or her exploratory activity. The spontaneous game can be characterized as the territory of the actual development of a child providing opportunities for studying his or her needs and interests.

3. The child's interactions with the adult and alienation of him or her can play an ambivalent part in the exploratory activity of the child: they can have both positive and negative impacts. A dynamical change of the factors can be traced: Personal autonomy → Emotional alienation → Exploratory activity. Parents should not be afraid of the emotional alienation of the child and prevent it in the process of interaction. Persistent initiative of the parent, his or her involvement in the activity can deprive the child's opportunity to get an experience of real exploration of the object and that can prevent the development of personal autonomy and independence at an early age. It is especially important at the end of the early age and relates to the personality transformations in the 3-year crisis.

## Research Perspectives

Attention to the details, thorough approach to data collection and analysis, laid in the M.I. Lisina's research paradigm, nowadays can be realized due to application of digital technologies and video-observation in the process of interaction with the option of the record by the software Observer-XT 14. In our research, we were guided by M.I. Lisina's thesis postulating that the most important characteristic is the activity of a person, his or her subjective attitude reflected in the communication process via initiative towards the communication partner and in the return reactions to his or her actions.

Continuing M.I. Lisina's ideas on the fundamental role of communication for the formation of the cognitive activity, the child's independence in the process of interaction with the adult, it is necessary to reconsider specific forms of communication of the child and adult for a certain micro-phase of social-economic development with précising certain mental new formations in the conditions of transformations of the society. The further work on clinical video-observations and experimental probes for standardization of the scale of evaluation of the independence of the child; broadening the sample

alongside with its differentiation not by gender only but by social-demographical and cross-cultural characteristics; including the significant adult into interaction with children of other age periods of ontogenesis shall be carried out [7]. It is especially important for adolescents, for whom the formation of readiness to an independent life is the parameter of stability in the world of adults [15].

According to the contemporaries' and followers' memoirs, Maya Ivanovna Lisina had a gift to understand

and perceive the signals of a child's behavior, be sensitive to every shadow of reaction demonstrated by children. The Scale of Communicative Signals of a Child will allow considering all sides of the parent-child interaction in full scope using video-observation for revealing needs and emotional experience. This will help to understand the internal world of the child and allow the specialists and parents to be more sensitive to the requirements and interests of children.

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Получена 07.04.2020

Принята в печать 01.03.2022

Received 07.04.2020

Accepted 01.03.2022