

Development of communicative skills in 8- to 16-month-old children: A longitudinal study

*Eeva Klintfors, Ulla Sundberg, Francisco Lacerda, Ellen Marklund, Lisa Gustafsson,
Ulla Bjursäter, Iris-Corinna Schwarz, Göran Söderlund*

Department of Linguistics, Stockholm University, Stockholm, Sweden
eevak, ulla, frasse, ellen, lisag, ullabj, iris, goran @ling.su.se

Abstract

The aim of this study was to assess development of communicative skills in 8- to 16-month-old children. Information on 24 Swedish children's speech comprehension and production, as well as their utilization of communicative gestures was collected. A version of the MacArthur Communicative Development Inventory, the Swedish Early Communicative Development Inventory (SECDI), was used. The number of comprehended phrases, size of receptive and productive vocabularies, as well as the subjects' gesture score was estimated according to standardized scoring instructions. The study was performed longitudinally based on 71 completed forms. The children's performance was validated with existing norm-data collected from a large set of randomly selected children. The results showed an overall agreement with the norm-data. The performance of the subjects was though less stable and delayed about one month as compared to the norm-data. Adequacy of SECDI for screening language delay is discussed.

Index Terms: language acquisition, vocabulary size, receptive vocabulary, productive vocabulary

1. Introduction

This study is performed within two interdisciplinary projects: Modeling Interactive Language Learning¹ (MILLE, supported by the Bank of Sweden Tercentenary Foundation) and Learning and Development of Contextual Action² (CONTACT, supported by the European Commission). The main aim of these projects is to study how general purpose mechanisms may lead to emergence of linguistic structure (*e.g.* words) under the pressure of exposure to the ambient language. The projects use data from speech production and speech perception (eye-tracking) experiments, questionnaires based on parental reports, as well as from video recordings of adult-infant interaction.

The aim of this study is to explore the *development* of children's linguistic competence. Therefore a longitudinal

questionnaire study based on adults' judgments of their children's receptive and productive communicative skills was conducted. A specific goal has been to follow the progress of a set of variables over time in the same set of Swedish children rather than studying a set of variables in a group of children of different ages, using different subjects at each age (*i.e.* cross-sectionally).

2. Background

2.1. Language acquisition in ecological perspective

According to the proposed Ecological Theory of Language Acquisition (ETLA), the emergence of an initial linguistic referential function may – presupposed that the language learner interacts with his/her ecological environment – be accounted for on the basis of general-purpose perceptual, production and memory mechanisms [1]. As opposed to view language acquisition as determined by an individual's innate capacities [2;3], the current theory, just like several other scholars today [4;5], agree on that genes and environment interact to determine complex cognitive outcomes. Thus, according to our view, biologically determined general propensities to perceive or generate sounds in particular ways, are likely to contribute with developmental biases that become apparent components of language acquisition. As an example, given the exceedingly short pharyngeal tract in relation to the oral cavity observed in the newborn infant [6], the spectral characteristics of the infant's utterances – although proportionally shifted to higher frequencies – can not essentially be the same as the adult's. Thus, analogous anatomic and physiologic characteristics of articulatory gestures of the infant and the adult result in not linearly related acoustic outputs. Yet, another example is provided from the domain of perceiving sounds: newborn infants seem to have an overall frequency response curve that is essentially similar to the adult's, though shifted upwards by about 10 dB [7]. Hence, following that the infant is not believed to be gifted with specific language-learning capabilities, the infant's perceptual capabilities at birth are expected to be determinants for perception of sounds.

2.2. The importance of within-subject design

While the performances of separate groups of subjects are measured and compared in between-subject research designs, within-subject designs compare the performance of the same subjects in different conditions. To study how the same subjects mature with the passage of time, longitudinal developmental studies (within-subject design) are to prefer [8]. Within-subject designs eliminate the problem with extraneous variables affecting the performance of one group of subjects and not the other because only one group of

¹ Dept. of Linguistics, Stockholm Univ. (SU, Sweden), Dept. of Psychology, Carnegie Mellon Univ. (CMU, USA), and Dept. of Speech, Music and Hearing, Royal Institute of Technology (KTH, Sweden).

² Dept. of Psychology, Uppsala Univ. (UU, Sweden), Dept. of Linguistics, Stockholm Univ. (SU, Sweden), Dept. of Communication, Computer and System Sciences/Laboratory for Integrated Advanced Robotics, Univ. of Genova (UNIGE, Italy), Neurolab/Dept. of Biomedical Sciences – Human Physiology, Univ. of Ferrara (UNIFE, Italy), and Computer Vision Lab/Dept. of Electrical & Computer Engineering, Inst. Superior Técnico de Lisbon (IST, Portugal).

subjects participates. Naturally the temporal arrangement of within-subject experiments may introduce a threat to the internal validity in form of sequencing effects. Participation in an earlier condition may affect the performance in a subsequent condition. For example, in the current experiment the adults' judgments of their children's communicative skills might become more affirmative toward the end of the study because of the practice in the task that they receive simply by participating in earlier parts of the study. Nevertheless, adults may show less affirmative performance in the latter part of the experiment because of fatigue.

3. Method

The instrument used to collect data on 24 Swedish children's early communicative skills was The Swedish Early Communicative Development Inventory (SECDI) [9]. This inventory is a Swedish version of the MacArthur Communicative Development Inventory (CDI) [10] based on parental reports. The words and gestures form of the inventory, which is primarily designed for children 8- to 16-month-old, was used.

The collected data was compared with existing norm-data based on 474 completed forms from 228 children randomly selected from the county of Darlecarlia. Most of these children were assessed repeatedly at different ages.

3.1. Subjects and materials

The subjects were 24 children (13 girls, 11 boys, age range 6.1- to 20.6-months) randomly selected from the National Swedish address register (SPAR). Since the age range of these children exceeded the age range (8- to 16-months) for which the words and gestures form of the SECDI is primarily designed for, 14 forms (out of total 85 forms) from children younger than 8-months or children older than 16-months were excluded from the analysis resulting in the following number of forms: 13 (8-months), 11 (9-months), 9 (10-months), 6 (11-months), 9 (12- months), 10 (13-months), 7 (14-months) and 6 (15-months). Swedish was the primary language spoken in all the families with the exception of two mothers who primarily spoke French and Russian respectively. The parents of the subjects were not paid to participate in this study.

The subjects visited the phonetic laboratory of Stockholm University approximately once per month. Each visit started off with a perception (eye-tracking) experiment, and then after a video-recording of adult-infant interaction, the experimenter entered the room and filled the questionnaire based on parental information. Occasionally (*e.g.* if the child showed signs of fatigue) the parent filled the form at home, and sent it back to the laboratory within about a week.

The words and gestures form of the SECDI inventory is divided in two parts: Part I for Early words and Part II for Actions and gestures. These parts are divided in the following subsections:

Part I: Early words

- Section A First signs of understanding
- Section B Comprehension of phrases
- Section C Starting to talk
- Section D Vocabulary checklist (19 semantic categories)

Part II: Actions and gestures

- Section A First communicative gestures
- Section B-E Gesture checklist (4 gesture categories)

The parent (or experimenter) marked *understand* and/or *understands and says* for the relevant items for each section. All affirmative answers were added to obtain the child's comprehension and production scores.

4. Results

The performance of the subjects was compared with the existing norm-data for 8- to 16-month- old children. For Section B Comprehension of phrases (Part I: Early words) the number of phrases that the child understands (maximum 27) was added to obtain his/her phrase comprehension score. The 10th, 50th, and 90th percentiles for number of comprehended phrases are shown in Figure 1 along the corresponding percentiles for norm-data.

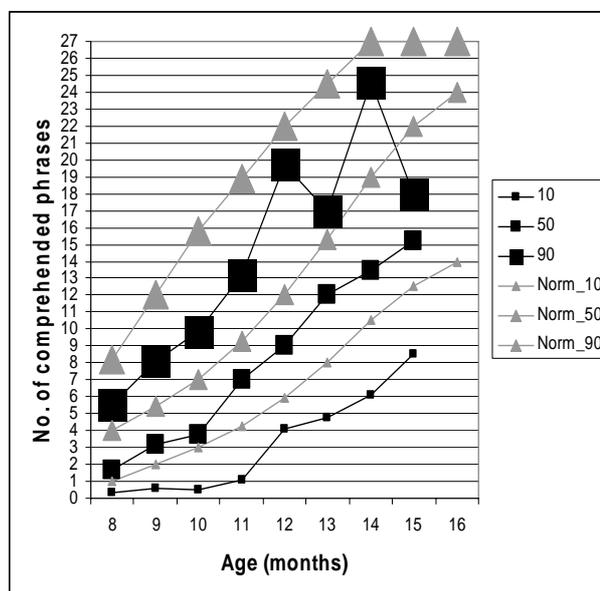


Figure 1: Comprehension of phrases for 8- to 16-month-old children. The 10th, 50th, and 90th percentiles for current subjects are plotted in squares, the norm-data levels in triangles.

For Section D Vocabulary checklist (Part I: Early words) the number of items (maximum 370) marked either as *understands* and/or *understands and says* across the 19 semantic categories were added to obtain the child's total vocabulary comprehension score. The percentiles for number of comprehended words are shown in Figure 2.

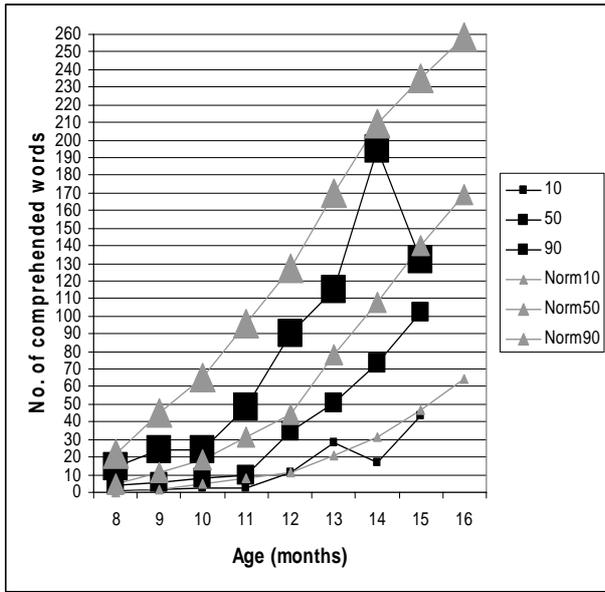


Figure 2: Receptive vocabulary for 8- to 16-month-old children. The 10th, 50th, and 90th percentiles for current subjects are plotted in squares, the norm-data levels in triangles.

The number of items (maximum 185) marked as *understands and says* across the 19 semantic categories was added to obtain the child's total vocabulary production score. The percentiles for number of produced words are shown in Figure 3.

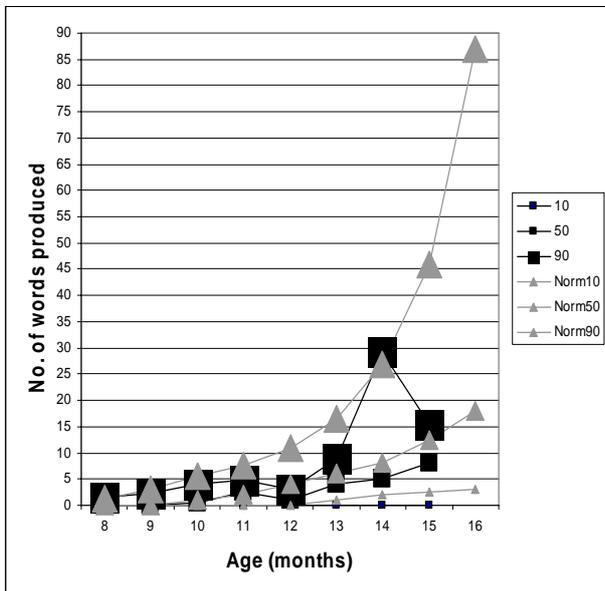


Figure 3: Productive vocabulary for 8- to 16-month-old children. The 10th, 50th, and 90th percentiles for current subjects are plotted in squares, the norm-data levels in triangles.

For Section A-E First communicative gestures and Gesture checklist (Part II: Actions and gestures) the sum of affirmative answers (maximum 75) across all the categories made the total gesture score. The percentiles for number of produced gestures are shown in Figure 4.

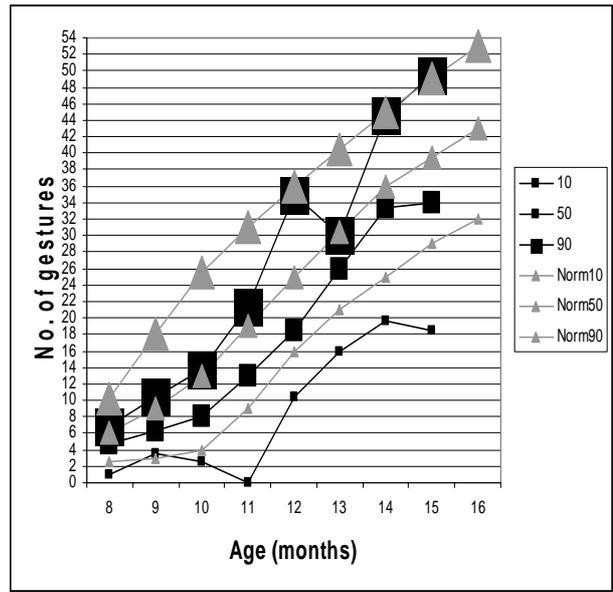


Figure 4: Gesture score for 8- to 16-month-old children. The 10th, 50th, and 90th percentiles for current subjects are plotted in squares, the norm-data levels in triangles.

5. Discussion

The aim of the current study was to explore the development of communication habits in Swedish 8- to 16-month-old children. Specifically, the children's word and phrase comprehension, word production, and use of communicative gestures were studied in a longitudinal perspective.

The results showed a vast agreement with norm-data regarding number of comprehended phrases and words, number of words produced, as well as number of gestures used. The performance of the current subjects was though overall less stable (more varying scores in between the different age groups) and showed a shift downwards of about one month for scores along each percentile level. In quest of reason for these slightly deviant results, it is important to keep in mind that the ratio of children assessed repeatedly at different ages for the norm-data was 228:474, while the corresponding ratio in the current study was 24:71. In other words, for the norm-data the number of completed form per child was on average two, while the parents of the children in the current study completed on average three forms per child. Therefore it is suggested that the parents in the current study might have become more consistent in marking affirmative answers.

The validity and reliability of SECDI has according to the creators of the instrument been investigated thoroughly and found to be adequate in all respects [11]. The slightly deviant results from the current study though suggest that caution has to be taken on type of data collected (longitudinal vs. cross-sectional) when using SECDI for screening purposes of children with language delay.

The results for vocabulary comprehension and productive vocabulary in the current study were compiled across 19 semantic categories. In future, scores for each semantic category might be computed to study composition of the vocabulary in detail. For studies of relations between major parts of speech in child language a division in (a) common nouns, (b) predicates, and (c) close class words is suggested by Eriksson and Berglund [11].

6. Acknowledgements

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