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LOGICAL PATTERNS AND NEGATION IN PRESCHOOLERS' DISCOURSE

In the present study the negative context has been analyzed for the occurrence of logical structures in the discourse of children aged five to seven. The discourse under study occurred in a social situation of pretend play in which an adult and a child constructed scenarios together, both participants enacting adult play roles. The material selected for analysis included the role-play discourse of 28 dyadic sessions (28 children each with the same adult). Logical patterns were defined as basic propositions + logical support and were found to occur within episodes, identified by a method of double coding (logical and pragmatic). Thirty-five episodes containing 102 logical patterns were found with a mean per episode of 3 patterns. The method used was a modified version of that proposed by Garvey & Eisenberg (1985). Separate treatment was given to logical patterns produced by child, and by adult, as well as those constructed together. The identified constructions were analyzed in terms of type (causal vs replacive), form (simple vs elaborated), and context (negative vs neutral). The results of the study suggest the existence of an age-related evolution toward greater complexity in the construction of logical patterns together with broader scope in their pragmatic application extending beyond the earlier negative context.

Introduction

Basic logical competence is available to children early, at least by around school age. This competence comprises a repertory of inferences. In propositional reasoning it includes Modus Ponens, several schemas for reasoning about alternatives, comprehension of the meaning relations expressed by conjunctions like "and", "but", "or", "because", "if - then", and negation. It also includes the principle that the properties of a class are inherited by its subclasses, some notion of possibility and necessity, and some understanding of the entailments and presuppositions of several mental verbs like "believe", "know", "remember" (see for review M.D.S. Braine & B. Romain, 1983). According to John Macnamara (1986)

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who analyzed how a child learns proper names and personal pronouns, the concepts of truth and its opposite, falsity, are part of children's very early knowledge, which is a component of basic logical competence. This competence also includes a number of primary notions and principles among which a fundamental one is contradiction. In Macnamara's view, this basic competence does not come from learning, since it is common to all human minds.

We can observe how this competence is realized on the linguistic plane in the child's ability to construct coherent logical discourse with a partner. One such study, conducted by Catherine Garvey and Ann R. Eisenberg (1985), analyzed clause relations in the conversation of a young child with her mother from age two to two and a half. This study dealt with the emergence of two patterns of clause relations which made up what they called logical patterns. One was the replacive relation, which is a subcategory of the adversative relation, and the other was the causal relation.

The replacive pattern takes the form: -X (not X) but Z, e.g., "the cat doesn't say "Woof", it says "Meow".

The causal pattern takes the form: X because Y, where the Y-element was subcategorized as:

Y-causal – a relation of physical causality, where cause derives from the physical world, e.g., "It broke because you dropped it";

Y-reason – a relation of reason, or motive, or enabling condition, or imputed justification, e.g., "She's crying because she can't go to the party";

Y-outcome – a relation of outcome, e.g., "Sit over there so you can see the TV".

The general formula for all these patterns can be presented as: basic proposition + logical support.

Children's ability to operate with logical support for expressed propositions emerges very early, between ages two and three, as Garvey and Eisenberg's study showed, and the ability is manifested in the course of cooperative conversation between mother and child. The mother initiated, either by producing or eliciting the majority of both replacive and causal patterns, both with approximately equal frequency. The child initiated primarily the replacive pattern, but responded to use of both patterns. A developmental trend was shown in the child's tendency to operate on the mother's logical supports (to acknowledge, deny or modify them). The authors found the main context for the occurrence of logical supports to be the negative context. Their contexts were the recurring sequences of utterances serving given speech acts, such as assert, question, request, refuse, agree, etc. A negative context contains a negating response or negative formulation expressed by either child or mother.

Children older than three years can be expected to use such clause relations in a more mature way constructing a coherent logical discourse with a partner. These logical patterns are especially useful for expressing elaborated discourse negation, which is realized by providing reasons for, or alternatives to, the negated utterance (Keller-Cohen, Chalmer & Remler, 1979). A simple discourse negation rejects or denies a prior proposition or presupposition claiming only: not X, but does not add new supportive information (because Y or but Z). The absence of new information apparently interrupts the exchange of information between speakers and in such cases the co-present speaker may probe for elaboration. Deborah Keller-Cohen and co-workers (op. cit.) have pointed out that a model adult response to a child's simple negation is a probe that requests a reason

or alternative. In such instances the pattern is actually distributed between two speakers, for example, the child replying "No", the adult asking "Why not?" and the child then supplying the reason, which results in the causal pattern (-X because Y) constructed together.

Main goals of the study

The present study was exploratory and undertook to follow up the analyses of Garvey and Eisenberg (1985) in children's discourse with an adult partner in the preschool years. The main goals of the study were the following:

- to identify the different logical patterns of clause relations in the discourse of children aged five to seven with an adult partner, treating those identified by Garvey and Eisenberg as the basic ones;
- to determine the contexts in which children use logical supports;
- to explore the extent to which discourse negation in children uses the identified patterns of clause relations.

Material¹

The material used for the analyses was the discourse produced during sociodramatic play in which an adult and a child constructed scenario texts together. The play situation was new to the child, and the adult was unfamiliar. One and the same young female was the children's partner in all dyadic sessions. The scenarios were constructed in a quasi-natural setting with the aid of three toy telephones and a few relevant toys. The story theme and role assignments were proposed by the adult. The themes of the stories were "Sick child" and "Car trouble", and each of them contained a central problem for solution implied in the theme. They were played out in three scenes in which adult and child changed roles. In the first ("Sick child") the child had the roles of parent and doctor, and the adult complementary roles of nurse and parent. In the second ("Car trouble"), the child's roles were car driver, repair mechanic and head of the service station, and the adult's complementary roles were repair mechanic and car driver. Sessions lasted about 15 minutes and were video-recorded. Analyses were performed on the basis of transcriptions.

The design feature of this material was that both players enacted adult roles. Thus the child was ascribed equal social status with the partner. Furthermore, solution of the problems occurring in successive scenes required close cooperation between the partners so that understanding could be reached leading to resolution of the scenario story. It was assumed that such conditions created for the discourse would be favorable for providing logical supports. The analyses concerning identification of logical patterns and contexts of their occurrence were performed on 28 scenario texts on the theme "Car trouble" for 28 children aged from five to seven (15 were five years old and 13 were six years old). The analyses concerning the realization of discourse negation were also performed on the scenario texts on the theme "Sick child". These data consisted of 52 scenario texts for 26 children (12 were five years old and 14 were six years old).

¹The material used for the analyses came from the research conducted by Shugar & Zamečka (1985).

Method

The basic unit of analysis was the episode. Episodes were stretches of interactional discourse that had thematic unity and that contained sequences of moves within the speaker's utterance and across speakers' utterances. In other words, the episode was an interactionally and thematically coherent sequence. Within moves, clause relations were identified that qualified for logical composition analysis. Two codes were used following Garvey and Eisenberg's (1985) method with modification to fit our material².

The first (Code I) followed the linguistic propositions and their clause relations through the discourse episode using a notation system for basic proposition (X) and logical arguments (Z or Y according to the type of relation). The second (Code II) indicated the speech acts making up the moves within and across utterances. The example below illustrates this double coding system.

Example 1. Discourse episode sample³

Scenario roles: Child in the role of head of service station

Adult in the role of mechanic employee

Scenario text	Code I	Code II
<p>Adult: Przed chwilą jakaś pani do mnie dzwoniła i mówiła, że jej się samochód zepsuł koło lasu, <i>A lady just phoned to me and said her car broke down by the woods,</i> i to jest biały fiat, <i>and it is a white Fiat,</i> i prosiła właśnie, żebyśmy tam pojechali. <i>and she just asked us to go there.</i> Szefie, ale ja mam dużo samochodów do zreperowania, <i>But boss I've got a lot of cars to re-pair,</i> może szef by mógł pojechać? <i>maybe you can go?</i></p>	<p>F → !X_a (because) Y_c</p> <p>but (-X_a because) Y_r</p> <p>maybe ?X_a because Y_r1</p>	<p>premise from which: indirect request for action + causal support</p> <p>inferred refusal of action + reason support</p> <p>request for action</p>
<p>Child: No też nic bardzo, <i>I can't either</i> bo mam aż siedem samochodów, <i>'cos I've got even seven cars,</i> to troszeczkę później może przyjadę. <i>maybe I can go a little later.</i></p>	<p>-X_a because Y_r1</p> <p>(in this case) maybe X_a1</p>	<p>refusal of request + reason support</p> <p>offer</p>

²Detailed descriptions of coding categories are presented in Rytel (1987).

³English translations of Polish examples are close approximations.

Adult:

To może ja już pojadę w takim razie,
dobra?

*Well maybe I'll go now in that case,
O.K.?*

(yes[-X_a because Y_{r1}])

inferred acceptance of refusal + reason
support

Child:

Dobra.
O.K. then.

in which case
(-X_{a1} rather) X_a

inferred refusal offer + counter offer
acceptance of counter offer

yes [rather X_a]

Code I legend

- F - premise
- X - proposition
- a - concerning action
- Y - support
- c - causal type
- r - reason type

- !X - exclamation point indicates directive force
- ?X - question mark indicates question force
- - minus sign indicates negation
- X, Y_{1,2,...} - successive propositions involved in a sequence
- Parentheses indicate inferred logical operations
- Square brackets indicate preceding pattern which is referred to

Results

In the 28 dyadic sessions examined 35 episodes were distinguished for further analysis. A total of 102 clause relation patterns of interest were identified in these episodes, within which a total of 128 logical supports were noted. There was an average of about 4 logical supports per episode (mean = 3.7). Figures 1 and 2 present the distribution between partners for the occurrence of logical patterns (Fig. 1) as well as logical supports (Fig. 2).

Figure 1. Logical pattern frequencies (in percents)

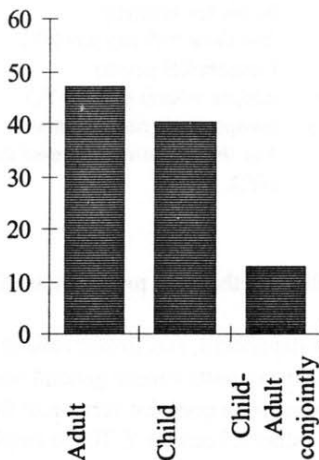
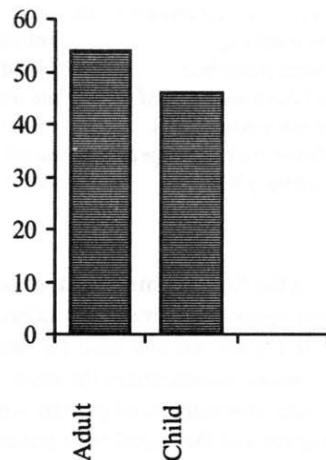


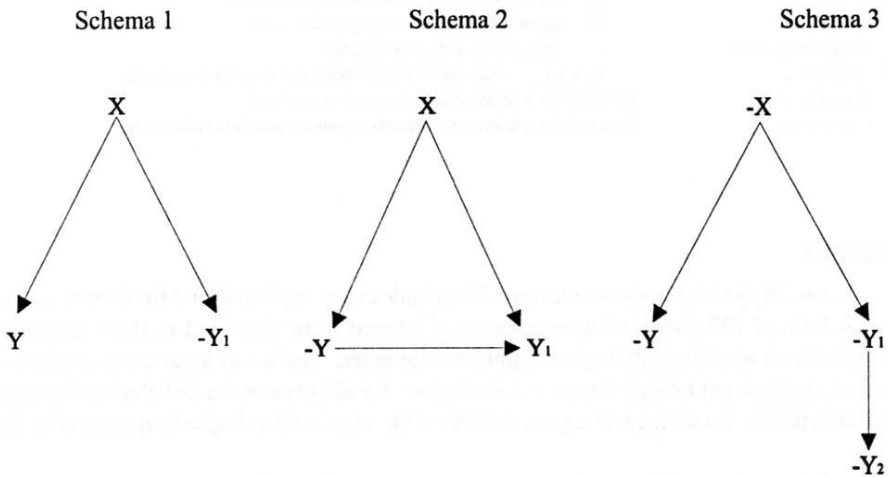
Figure 2. Logical support frequencies (in percents)



As we can see in Figures 1 and 2, each partner produced about the same number of logical patterns (47.1% for the adult and 40.2% for the child) and supports (53.9% and 46.1%, respectively). Patterns that were constructed conjointly were much fewer (12.7%), and constituted about one-quarter of patterns produced individually.

The clause pattern produced most frequently by both child and adult was the causal pattern (X because Y). Other clause patterns occurred with very low frequency. Causal patterns made up 87.8% of the children's patterns, 95.8% of the adult's patterns and 84.6% of the patterns constructed conjointly.

Causal patterns were used in different forms, either in a simple basic form or elaborated. About one-quarter of all causal patterns were more or less elaborated. Some kinds of causal pattern elaboration are illustrated by the schemata below:



Chyba zreperuję narzędziami
(mój samochód),
*I guess I'll repair (my car) with
some tools (X)*
bo mam potrzebne
'cos I have what I need (Y)
i nie ma nigdzie stacji.
*and there isn't a garage around
anywhere (-Y1).*

Potrzebna mi jest szyba,
I need a windshield (X),
nie mam szyby w amochodzie
I haven't got a windshield (-Y)
bo mi się wybiła.
'cos it got broken (Y₁)

Samochód nie jest zreperowany,
The car isn't repaired yet (-X)
bo nie ma benzyny
'cos there isn't any gas (-Y)
i jeszcze kół pewno
and the wheels either (-Y₁)
bo opony nie nadmuchane
'cos the tires aren't pumped up
(-Y₂).

In the first schema more than one support (Y) is supplied for the basic proposition (X). These supports are mutually independent.

In the second and third schemata the supports (Y) are dependent, and linked causally. One reason substantiates the other. A more particular reason supports a more general one.

Another elaborated pattern was identified that can be called a conjoint version of the replacive and the causal ones and can be presented as: -X rather Z because Y. The example below illustrates this pattern:

Example 2

Adult:
(mechanic)

Ale on mi mówił, że ma cztery samochody
(do zreperowania).

But he told me that he has four cars (to repair) (X).

Child:
(head of service station)

Nie, pięć,
No, five, (-X but Z)

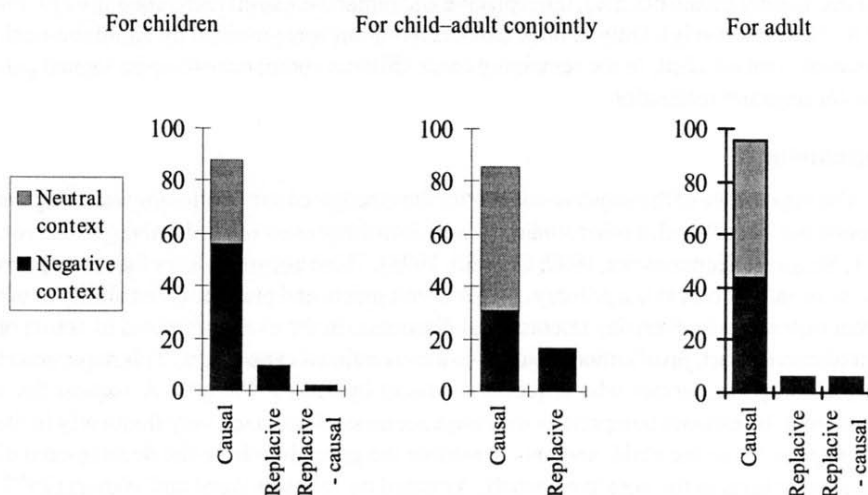
bo jeden jeszcze dojechał.

'cos another one came. (because Y)

In this pattern the alternative to the basic proposition does not stand alone but needs support. Only four cases of such a pattern were found in the material: one from the child, one from the adult and two constructed together.

Searching for other than negative contexts did not produce unambiguous results. Children use supports in any kind of speech act without clearly non-negative identifiable contexts, so we refer to them as neutral. Figure 3 presents frequencies of logical patterns produced individually by each partner and constructed conjointly both in negative and neutral contexts.

Figure 3. Logical pattern proportions: types and contexts (in percents)



Children produced most of the logical patterns in the negative context. For the adult, the patterns occurred with approximately equal frequency in both types of contexts. Only causal patterns constructed conjointly by the partners occurred more frequently in the neutral context. It seems that for children the negative context is the dominant one for using logical patterns and thus for providing supports. As Jackson and Jacobs (1980) pointed out, any conversational act is potentially arguable, hence may generate the need for providing support. Perhaps that is the reason for our difficulties with specification of clearly non-negative contexts. The problem of using supports in the service of interpersonal reasoning in child discourse and the determination of their occurrence and the functions which they serve in both contexts requires further investigation.

In the material there appeared 52 cases of discourse negation⁴. Table 1 presents the frequencies of occurrence of simple and elaborated negation in children.

Table 1. Frequencies of simple and elaborated negation in children

Age	Simple negation		Elaborated negation		Total	
	N	%	N	%	N	%
5;0-6;0 (12 children)	9	36.0	16	64.0	25	100.0
6;0-7;0 (14 children)	8	29.6	19	70.4	27	100.0

Children used elaborated negation more frequently than simple negation (T-Wilcoxon's value = 64, $p < .05$). In all cases with one exception logical patterns were used for realization of elaborated negation. Children elaborated their refusals and denials using all types of patterns, mainly causal (73.5%), the replacive and replacive-causal less frequently (17.7% and 8.8%, respectively). Only in three cases elaboration was provided by children in collaboration with an adult, in the remaining cases children spontaneously used logical patterns for negation realization.

Conclusions

The importance of the negative context for the emergence and continuing use of logical supports has been found in other studies as well as in the present one (Eisenberg & Garvey, 1981; Shugar & Słonczewska, 1989; Orsolini, 1993). There are grounds for the assumption that the negative context is a primary one for development and practice of the ability to use logical operations in everyday interactional discourse. In the event of refusal of action or contradiction of fact, justification seems to be a conventional expectation. This requirement is signaled by the partner who requests a support by asking "Why?". A request for a support and its response comprise an exchange sequence that occurs very frequently in the early experience of the child, and may constitute the groundwork for the development of logical operations in the negative context. As stated by Johnson-Laird and Watson (1977, p. 77) "perhaps the simplest possible deduction is negation: if the negation of a proposition is true, than that proposition is false".

Preschool children seemed to recognize that the negative context is the proper place for locating logical supports. They gave evidence of this in their tendency to construct in this context more complex chains of sequences supporting their statements. At the same time, they interacted with a more mature adult who constructed the same kinds of complex chains.

⁴Detailed presentation of results concerning discourse negation in children can be found in Rytel (1992).

To sum up, in light of the evidence, negation remains the primary context for logical operations which with age evolve toward more complex patterns and with more extensive scope in their pragmatic application (going beyond the earlier negative context). In many cases of refusal and denial in the discourse the child supplied an argument to justify her move. It seems to follow that successful discourse negation indeed constitutes a vector of two components: information in contradiction of the prior proposition and an argument substantiating the contradiction. The regularity with which such arguments occur following an act of refusal or denial suggests the hypothesis that the requirement for an argument is inherent in the very nature of the act of contradiction. Perhaps contradiction constitutes in itself an immanent carrier of argumentation.

Acknowledgments

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