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Stylistic diversity in children's communication with mothers at 30 months

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Although developmental researchers endorse a multifaceted view of early communication, where language, non-verbal behaviour and socio-affective exchange contribute concurrently to the social construction of shared meanings, past studies of social development usually focused on component parts of interpersonal communication. This research integrates three aspects of communicative exchange in order to clarify stylistic differences among 30-month-old children. To achieve this objective, data from three different coding procedures (speech acts, information content and affective states) were coded for 52 children and then merged on the basis of onset time. Fifteen distinct descriptors were identified in the analyses of tri-modal communicative processes. Three different communicative styles were identified in person-centred cluster analyses of these descriptors. Analysis of variance revealed that 13 of the constructs significantly differentiated the groups. The first group was characterised as highly engaged in play but with low affect expression; these children's mode of communication centred more on mother's feelings and personal references. Children in the second cluster asked more questions and made more statements about objects. Finally, children in cluster three engaged in more complex evaluative discourse while orienting maternal behaviour to ongoing activity. Results are discussed in terms of the importance of a qualitative, holistic approach to the study of diversity in children's communicative performance and in contemporary research on early learning.

Keywords: mother–child communication; typological approach; language; affective expression; information exchange

Introduction

Research on children's communicative abilities has been dominated by studies of maternal language use (Furrow & Nelson, 1984; Furrow, Nelson, & Benedict, 1979; Menyuk, Liebergotts, & Schultz, 1995; Olson, Bayles, & Bates, 1986). From this perspective, particular characteristics of maternal language are considered as facilitators of children's speech development. In defending the usefulness of such investigations, researchers argue that knowledge of more effective speech strategies could be incorporated explicitly within parental discourse interaction and thus increase children's emerging communicative competence. Even in the research on children's communicative performance, the general assumption is that adults provide representational contexts for children's speech, that it is the adult's responsibility to keep the conversation going and that parents

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must compensate for children's communicative inadequacies (Snow, 1989). Generally, adults adjust their speech when interacting with children (Olsen-Fulero, 1982). However, studies examining different cultures show that although adult speech to offspring varies considerably from culture to culture, most children successfully acquire communicative skills within the context of their particular ethnic environments (Barrett, 1994; Slobin, 1990). The demonstrated diversity and context specificity of both adult and child speech leave the fundamental question of universality of language acquisition processes or generalisability of documented adult facilitative strategies unanswered.

Although researchers agree that communication entails dyadic interaction, they have focused primarily upon how maternal linguistic strategies influence speech development (Barnes, Gutfreund, Satterly, & Wells, 1983). Relatively less is known about the effect of children's emerging speech styles on mother–child discourse. If adult–child communication is understood as the negotiation of meaning and common purpose, then conceptualisation of discourse as unidirectional facilitation cannot adequately account for the reciprocal nature of interaction (D'Odorico, Salerni, Cassibba, & Jacob, 1999). Yoder and Kaiser (1989), discussing child-driven and mother-driven models of language acquisition, conclude that a simple mother-driven model is inadequate for explaining language development because of the cumulative bi-directional influences between maternal and child speech. The basic motivation for the development of communicative competence is the need for interpersonal understanding. Symbols acquire stable meanings because they are repeatedly used in exchanges of information about the world of objects and social relations. In mother–child dyads, both partners achieve levels of shared understanding that facilitate internalisation and foster the elaboration of joint mental representations. Communicative skills, acquired during interpersonal interaction with others, generate individual differences in levels of social involvement, and ultimately facilitate later social understanding.

Individual differences in discourse topics and functions generated by children are less well known, although they surely contribute to the jointly constructed conversation. Given the co-constructed nature of mother–child discourse, it seems important to examine the diversity of children's communicative styles that may affect variations in maternal speech strategies, and which in turn contribute directly to children's developing linguistic abilities.

Description of individual differences in children's communicative styles has been dominated by Nelson's analysis of variations in processes of language acquisition. However, empirical studies of referential and expressive styles have also raised a number of conceptual and methodological problems. The attempt to demonstrate stability of language styles in larger samples has been hampered by questions about how variation between children is best defined and measured (Lieven, Pine, & Barnes, 1982). Although there is a general agreement that descriptive analyses of the nature and the diversity of children's behaviour must provide the empirical base for systematic research on the development of communicative skills, there is a less consensus about precise methods for isolating differences in developmental pathways. Descriptive analyses can be conducted with either a quantitative or a qualitative theoretical bias, each approach involving choices about specific analytic techniques that entail implicit endorsements of an underlying theory of measurement.

Quantitative descriptions represent individual variation in terms of differences on underlying conceptual dimensions. Working within the context of the general linear model (GLM), such an approach often focuses on comparisons of co-variation between theoretically defined scales or factors. Although quantitative measures are

useful for contrasting mean performance of pre-selected experimental groups, they seldom lead to the identification of pre-existing homogeneous subgroups that may be evident within the population under study.

In a critique of the GLM, Hinde (1983) was one of the first developmental researchers to underscore potential pitfalls in the assumption that variability on theoretical continua is homogeneous. He recommended that researchers adopt a policy of validating quantitative findings by conducting high–medium–low non-parametric comparisons of variables under study. In a similar critique of quantitative assessments in developmental research, Bronfenbrenner (1999) emphasised the problem of assumptions about the homogeneity of regression in comparisons of theoretically relevant dimensions for early development. When reporting that two variables have correlation of 0.50, researchers generally assume that this indexes the level of association for all subsets of subjects in their sample. According to Bronfenbrenner, the magnitude of such a correlation may change dramatically when we consider children with high, medium or low scores on the basis of two measures.

Focusing on qualitative distinctions between homogeneous subgroups reflects a somewhat different preoccupation in behavioural description. Conceptually, this second approach is related to the identification of different developmental trajectories. Influenced by studies in behavioural ecology and social ethology, this approach stresses the use of multivariate techniques for isolating local norms for specific subgroups. The short-term goal is to describe and classify similarities and differences among individuals, and then to clarify how variation in patterns of early experience leads children along different developmental pathways.

Unfortunately, most attempts to derive typologies often reduce behavioural diversity to few dichotomous categories, such as the expressive referential speech styles (Nelson, 1981), field-dependent and field-independent cognitive styles (Shatz, 1983) or easy and difficult temperament (Thomas & Chess, 1977), which oversimplify variations in children's context-specific adaptive strategies. A different problem is related to the choice of analytic methods. Unless typologies are derived with appropriate multivariate techniques (e.g. cluster analyses), they are unlikely to maximally account for observed variability (Bolz, 1977). However, a relatively large number of subjects are necessary in order to perform such analyses. Such a constraint is important in studies of early communication, where the time-intensive task of direct observation rarely involves a sufficiently large number of subjects necessary for a multivariate quantitative approach.

For more than two decades, researchers at the Laboratoire d'Éthologie Humaine have begun to systematically explore how multivariate classification techniques, developed in behavioural ecology, may be profitably extended to delineate qualitative differences in modes of early social functioning (Strayer, 1989). Blicharski (2002), using pragmatic dimensions of early language, identified four subgroups of 30-month-old children with relatively homogeneous language styles: three referential and one truly expressive. She suggests that neither simple dichotomous distinctions, such as the expressive-referential styles, nor simple process explanations, such as mother-driven models of early discourse, are adequate in attempts to account for diversity in young children's observed speech.

A major advantage of a typological approach to mother–child communication is that it permits a systematic consideration of groups of children who share similarities in communicative activity (Blicharski, 2002). Differentiating types of individuals requires the use of multi-dimensional classification that offers empirically based categories of local norms for particular subgroups (Strayer, Veríssimo, & Manikowska,

1996). We anticipate that a similar in-depth analysis of communication patterns across mother–child dyads should yield interesting information about diversity in early developmental trajectories.

Multifaceted communication

Although developmental researchers usually endorse a multifaceted view of early communication, where language, non-verbal behaviour and socio-affective exchange contribute concurrently to the social construction of shared meanings (Lamb & Wosniak, 1990; Trevarthen & Aitken, 2001; Valsiner, 1987), past studies of social development usually focused on component parts of the communication system. Clinical psychologists theorise about regulation of affect, psycholinguists examine the acquisition of language, child ethologists deal with non-verbal gestures and social coordination, while cognitive researchers explore the role of objects in the social facilitation of intellectual development. Ultimately, language and speech have dominated empirical research on early communication, virtually excluding all other modes of interpersonal communication (Ratner & Stettner, 1991).

Although language communication is fundamental for cultural transmission, affective expression and non-verbal behaviour also offer powerful means for assuring information exchange between a mother and her child. This is particularly true in interactions with very young children. When the rudimentary language skills of the child preclude effective discourse, non-verbal behaviour and affective expression are most common. Internalisation of knowledge must be motivated; the child does not simply copy things that adults do or say, but rather actively selects and seeks that which is important and interesting from a personal point of view. The same type of information exchange, framed in different affective tonalities, may present different communicative intents and reorient further interaction. Ratner and Stettner (1991) argued that interest in the role of affective expression for the maintenance and effectiveness of dyadic communication probably involves the mutual regulation of selective attention.

Past analyses of toddler social relations have employed computer-based coding systems that merge separate accounts of individual activity to provide more complete, time-based transcripts of social interaction (Strayer, Moss, & Blicharski, 1989). The extension of these analytic techniques, using multiple independent coding of specific activities of two social partners, allows the reconstruction of a multifaceted transcript for ongoing dyadic interaction. In the present research, three aspects of mother–child communication are examined. Language was examined using a *speech act taxonomy* emphasising pragmatic aspects of language directly related to social functions of communication (Bierwisch, 1980). The *information exchange taxonomy* described tactics and strategies used for specific goal attainment during joint play. This more cognitive taxonomy examined the semantic content of socially directed acts as they relate directly to object play. Finally, the *affective tone taxonomy* traced variations in affective expression during mother–child interaction. This latter taxonomy is used to interpret both the form and the content of communicative acts in terms of observed emotional expression.

The proposed approach to describing dyadic interaction generates descriptive data that can address theoretically driven questions about particular aspects of early communication and, in addition, permits a more holistic assessment of the multivariate nature of social synchrony during mother–child interaction. The present study focuses on the description of variations and relationships between these different modes of child communication. Such a description leads us to the identification of specific commu-

nicative styles. The second objective is to examine possible associations between children's communicative profiles and maternal use of particular modes of communication.

Method

Participants

The 52 mother–child dyads that participated in this study were drawn from a longitudinal research programme at the Laboratory of Human Ethology in Montreal, Quebec. Both sexes were equally represented. Based on years of education and family incomes, these families are considered as 'middle-class' by contemporary standards (Strayer et al. 1989).

Procedure

For the purposes of this study, we focus our attention on mother–child play videotaped in the home when the children were 30-month-old. During the home visit, an already familiar team member proposed a number of activities to the dyad. A 20-minute segment of the video was coded using three distinct behavioural coding procedures by independent observational teams using one of the three coding frameworks: the speech act taxonomy, the information exchange taxonomy and the affective tone taxonomy. During the chosen segment of tape, children played with two toys provided by the visiting team member (Mr Potato) and a jigsaw puzzle.

Similar data collection procedures were followed for both the speech act and the information exchange taxonomies. Procedures required simultaneous coding by two trained technicians. One observer focused on the mother, and the other followed the child. Observers noted all occurrences of actions initiated by the focal subject. A code identified the social target or object reference of the behaviour. Data were entered into an OS-3 event recorder connected to a common digital time signal written on one of the audio tracks of the video recording system. The electronic coding device recorded the exact onset time of each behaviour automatically.

Taxonomy of language acts

The coding system was derived from the speech act theory of Searle and Vanderveken (1985) and empirical work with older children by Feider and Saint-Pierre (1987). The language act taxonomy in Table 1 was adopted to reflect toddlers' use of language in the home environment (Feider, Blicharski, Darjan, & Strayer, 1989). The same taxonomy was used for coding the child's and the adult's speech. In addition to Searle's five illocutionary points, a semantic distinction was incorporated to separate speech acts dealing with exchange of information – requests and assertions. Observers noted if the propositional content of the speech act focused on (1) the physical objects or elements of the environment, or (2) the psychological state of one or the other of the participants or on their relationship. This object/social distinction permitted comparisons with previous psycholinguistic work on stylistic dimensions of early language usually described in terms of an object-oriented referential dimension versus an expressive relational one (Bates, Bretherton, & Snyder, 1988; Blicharski, 2002).

For the language taxonomy, reliability was assessed three times, in the beginning, in the middle and at the end of the coding session. Cohen's kappa indices were maintained above .85 through the three periods (Blicharski, 2002; Feider et al., 1989).

Table 1. Taxonomy of speech acts.

Expressive acts	
Definition/description	Example
Affective expressive:	
Establish or maintain contact between social partners including conventionalised expressions as well expressions of emotional states, such as surprise, happiness, anger or disgust.	The child attending to the mother's explaining of the rules makes utterances such as 'hmm', 'yea', 'OK' or 'sure'. After the child completes the task or makes a mistake, the mother exclaims, 'bravo', 'oh no!', 'very well'.
Playful expressive:	
Create or maintain a playful exchange between the partners. Utterances characterised by paralinguistic, ritualised, and onomatopoeic expressions, such as changing the tone of voice, imitating sounds that objects make and singing.	The child says: 'Hello Mr Potato, how are you today?'. The child 'walking' the toy singing 'Trala la la la'. Pushing a toy truck on the floor the child makes 'brrr' sounds of the engine. Using a toy as a puppet, pretending that she is the voice of Mr Potato, the mother says: 'My arms are so long, I am going to tickle you!'.
Assertive acts	
Definition/description	Example
Descriptive assertive:	
Convey the speaker's perception of facts, events, objects or third persons. They are generally comments about the physical environment.	The child says: 'This piece is yellow' or 'this piece goes there.' Commenting on the visitor's appearance the child says: 'Marie has a very nice dress.' The mother says: 'The puzzle is finished now.' Identifying all the parts of the toy the mother says: 'This is Mr Potato's nose,' 'These are his eyes.'
Relational assertive:	
Convey information about intra- or inter-personal aspects of experience. They refer to behaviour, feelings or beliefs of the speaker or the addressee usually containing first or second person pronouns: 'I', 'me', 'you', 'us' or 'we'.	In evaluating the finished task the child says: 'I think I made a mistake.' After working once with the mother, the child affirms 'I will dress Mr Potato all by myself now.' Encouraging the reluctant child, the mother says: 'Yes, you can do it.' The mother enthusiastically says: 'We are really good at this when we work together.' Slightly irritated the mother warns 'You are going to regret it.' Commenting on the behaviour of the child, the mother declares 'You are a naughty boy, François.'
Directive acts	
Definition/description	Example
Attention requests:	
Solicit the social partner's attention. These usually take the form of brief exclamations consisting of the partners' name, that is, vocatives or attention verbs, such as 'look' or 'listen'.	The child calls out 'Mommy, Mommy!' to a mother who has just left the room. The mother says 'Look here'. Explaining the rules the mother says 'listen'. The child has run out onto the balcony; the mother calls him back 'Joseph!'.

Table 1. (*Continued*).

Direct action request:	
Represent the speaker's attempt to engage the listener in a particular course of action. Included in this category are requests that convey instructions about how to do things as well as more forceful orders, imperatives and prohibitions.	Involving the mother in the object play the child says: 'Come here, Mommy', 'Show me', or 'Give me that'. The mother assisting the child in a construction says: 'Put the big one there' or 'Push the piece in a little bit'. The mother exclaims 'Don't touch that!', as the child approaches an ashtray.
Information requests	
Definition/description	Example
Descriptive information request:	
Express the speaker's need for information about various aspects of objects and the physical environment.	The child looking for parts asks: 'Where are Mr Potato's shoes?'. While working on the puzzle the child asks the mother: 'Is this the right piece?'. Unsure, the child asks: 'How does this work, mommy?'
Relational requests:	
Refer to either the speaker, the hearer or the relationship. The speaker expresses the need for information concerning beliefs, intentions or feelings of the listener.	Placing Mr Potato's eyes in the place where his mouth is supposed to be the mother enquires 'What do you think about that?' To the child who is losing interest in the activity the mother says: 'Are you tired of this game already?' In a moment of transition the mother says: 'What are you going to do now?' The child asks in a discouraged voice: 'Do we still have to play this game?'. Comparing the model of the puzzle to the finished panel the mother asks: 'Do you see the difference?'
Relational requests include recommendations, suggestions and permissions. These were regrouped with relational requests because both categories are very rare and often the illocutionary force in these kind of utterances is polysemous as in the final example.	At the beginning of the play session the mother says: 'You can either do the puzzle first or the Potato'. Seeing that the block structure the child has build is about to fall the mother warns 'Be careful!' The child noticing the toy bag says: 'Maybe we could play with the other toys, Okay mommy?'

Information exchange taxonomy

The information exchange taxonomy complemented the data derived from the language coding by adding content to the mother–child communication descriptions. Definitions for coding elements in the information exchange taxonomy were based on the problem-solving literature where tactics and strategies are usually analysed for their pertinence to specific goal attainment. In a Vygotskian tradition, the underlying theoretical premise in the elaboration of this coding scheme was that the child's activities are co-constructed through interaction with the mother. The objective was to document the exchange of information between the partners about the task as well as to trace the socio-regulatory acts, which either maintained or disrupted the child's object exploration.

As mentioned earlier each observer noted all occurrences of tactics presented in Table 2. One observer focused on the mother, while the other followed the child. The same taxonomy was used for both child and adult behaviours. For each data point, observers noted weather the tactic was a statement, a question or a non-verbal act. The social target or object reference was also included in the notation. A tactic was identified as by the coherence of the semantic content, the activity context, the intonation and the noticeable pauses in speech and movements. If the focal subject repeated a statement, two separate entries were noted. Finally, a hierarchy was established among the tactics. This was done for two reasons. First, theoretically, most statements and gestures emitted in the course of object play can be considered as a subgoal, a step to the final solution of the activity. Second, complex tactics, such as verification of results or reality testing, are mostly composed of lower-order actions. For example, the statement 'this green piece is bigger than that blue piece' is composed of two perceptual cues. However, the fact that a comparison was evoked necessitates that reality testing be coded. Therefore in instances where a tactic could be interpreted as more than one type, a coding rule was devised: the more complex tactic took precedence over lower tactics. The following ascending order was respected: action, object, social, regulation and distancing. It is, however, important to note that given the context and the nature of the activity, most tactics were easily noted without the necessity of this type of decisions. For the information exchange taxonomy also, reliability was assessed at the beginning, middle and end of the decoding procedures. Cohen's kappa was above 0.80 across the three periods (Strayer et al., 1989).

The affective tone taxonomy

This procedure was developed in order to assess the affective state of the child and the mother during the course of the videotaped interaction (Naud, 1991). The affective state of both the child and the mother was coded each 10 seconds at the sound of a beep by three trained observers viewing the tape side by side. Five levels of description were used: (1) disagreement, (2) boredom, (3) neutral, (4) interest, and (5) pleasure. Although the procedure appeared quite simple, three observers were necessarily given the subjective judgement involved in affective evaluations. Rather than use percent agreement, correlation analyses were conduction to assess concordance between the observers throughout the entire data bank. Inter-observer reliability was assessed using Cronbach's alphas that were above 0.80 for the three observers for each of the five levels for both child and mother affect (Naud, 1991).

Results

The three coding procedures yielded six distinct datasets: three for child and three for maternal behaviour. Our first objective was to synchronise these datasets in order to represent the multifaceted nature of each participant's contribution to the communicative episode. Mathematically, the merging of the three datasets presents a probability of 320 discrete combinations (the product of eight categories of language, eight tactics and five affective states). However, preliminary descriptive statistics revealed that affective states 1, 2 and 5 occurred with very low frequencies for both partners, while behaviours occurring at affect level 4 were the most frequent. Faced with this constraint, preliminary data reduction involved regrouping affective states:

Table 2. Information exchange tactics taxonomy.

Action/object categories	
Definition/description	Examples
Subgoal:	
Verbal: Statement or question directly related with the regulation and direction of the task.	Would you like to put a chimney on your house? First put on the face and then the hat.
Offering a solution is also coded in this category.	When a mother offers a piece of the puzzle to the child.
Non-verbal: Placing objects in task appropriate places, progressing through stages of task.	When a child places a piece of the puzzle or Mr Potato.
Identification	
Verbal: Labelling or asking about the name of an object, an element or a person.	This is a hat. Is this an ear? What is that?
Non-verbal: Showing or pointing an object or a person.	
Perceptual cue	
Verbal: The perceptual cue plays a role of a descriptor in the task and most often refers to form, colour, size, weight, texture, and smell.	This rabbit has nice ears. This is a large round piece. What colour is his tongue?
Offering or requesting information pertaining to physical or sensory characteristics of objects, places or people.	This is pretty, she is nasty, etc. OH! WOW!
Attributions of beauty, niceness, nastiness; exclamations of surprise; and practising pronunciation.	Mother caressing the head of her child. When the mother shows her child how to feel perceptual or physical characteristics of objects.
Non-verbal: Sensory exploration of perceptual characteristics of objects.	
Functional cue	
Verbal: Information about the way objects work. Information about how to make an object work.	What is this for? The wheels turn like this. Put it higher; now turn it like this.
Information about the relation of an object to context. Information about ownership of objects.	Where is that piece? This goes there. This is Marcel's puzzle.
Non-verbal: Making objects work or imitating the functioning objects; imitation of noises that objects make; indicating a location with a gesture.	Mimicry in make belief games. Making the toy 'walk'.
Conduct regulation categories	
Definition/description	Examples
Approval:	
Verbal: Comment which rewards partner's behaviour; a favourable comment about personnel attributes of partner.	Yes, That is it! You are really a very good girl.
Non-verbal: Clapping, laughing, nodding of head and smiling.	hm, hm

Table 2. (*Continued*).

Disapproval:	
Verbal: Disagreement with partner's previous activity.	No, it's not like that. You are not being very nice.
Negative comments toward other.	NO!
Non-verbal: Shaking of head in disagreement, frowning, threatening.	
Task orientation:	
Verbal: Request to return to ongoing task.	You should sit up straight. Come here, look.
Non-verbal: Soliciting attention through physical contact and crying.	
Sitting or orienting posturally the child to task.	Mother sitting a child on a chair facing the toy.
Aiding a child to sit or stand up.	
Attention attracting displays.	
Distancing categories	
Definition/description	**Example**
Goal:	
Verbal: Statement or question about the final outcome of the activity.	In this game we put all of the pieces together, so that it makes a picture. What are we going to play with now? Lets' make a house.
Reality testing:	
Verbal: Statement or question evaluating the relationship between objects, events, contexts, ideas or time.	We have a puzzle just like this at school. You could do it yesterday. Both these dolls are just as pretty.
Comparing of objects, events or attributes to a standard or social norm.	Papa has glasses just like Mr Potato.
Judging level of ability, commenting on pertinence of opinion.	I can't do this; it is too difficult for me. Marie knows how to play.
Evaluating that which is believed, perceived, or done in terms of an inter-subjective reality.	What do you think? Are you tired of playing this game? Placing the ears where the feet should be for fun. Wearing mothers' shoes.
Non-verbal: Creative non-conventional use of objects.	
Verification of results:	
Verbal: Evaluating statements or questions about the relation between sub-goals and specific action.	Yes, that piece really fits well. That piece will not fit. Why does this not work? Look now, it works.
Predicting consequences of proposed action.	If I put the big piece on top, the house will fall down. This piece is up side down. Be careful. There is a piece missing.
Verifying results of past activity.	

disagreement (1), boredom (2) and neutral (3) into a global category, labelled low affect. Interest (4) and pleasure (5) states were recoded as high affect. The compression of the affective information substantially reduced the number of theoretically possible coding units – from 320 to 128.

Merging procedures

With specially designed software, the data from the three taxonomies were merged separately for each partner. The language data served as the action base reference for synchronising the two other transcripts. Using the video onset time, each speech act was qualified in terms of the other two taxonomies, that is, what type of information was communicated at the time and what was the ongoing affective tone of the focal subject. In order to achieve this objective, the information exchange data were treated as a state measure rather than an action code. Following the merging procedure, each multi-modal category represented a combination of one speech act, one representational tactic and one affective state. The new raw data obtained by this merging procedure were then submitted to a count programme which calculated the frequency of the multi-modal communicative categories separately for each partner.

Data reduction

From the 128 possible combinations, 102 were actually observed in the children's data. However, a large number of these multi-modal constructs occurred with very low frequencies. In order to permit further analyses, only combinations showing a total frequency occurrence superior to 52 (the number of subjects) were retained, 31 categories met this cut-off criterion, whereas 50 were retained in the mothers' data. The elimination of low-frequency combinations resulted in the loss of 12% of the total behavioural production of the child. Finally, the reduced raw data were transformed into relative frequency measures. Given that our primary interest is the description of children's communicative styles, our first set of analyses was conducted with child data. The contribution of maternal behaviour to these styles will be considered later.

Scale derivation

The analytical approach for the derivation of molar classes of child communication is an extension of methods developed for classification of peer group social behaviour. Our objective was to identify co-variations between the different multi-modal descriptors of communication in order to derive molar behavioural categories. The obtained correlation matrix was submitted to cluster analysis using complete linkage methods. The obtained dendrogram illustrates all possible correlations between the multi-modal categories. Each molar construct regroups two or three multi-modal categories indicating systematic co-variation in the use of these behaviours.

Two problems are normally associated with cluster analyses, the first relates to the choice of method used to decide how to select cluster from the obtained dendrogram. In other words, which associations should be retained as meaningful molar categories. The second problem is the stability of these associations. In order to respond to these two problems, data were randomly split into two sub-sets, and secondary cluster analyses were again performed. Visual inspection of the three dendrograms revealed that

all three could be subdivided yielding 15, 12 or 9 dimensions. In order to maximise the concordance between the split half and the total dendrograms, each split half was compared with the total dendrograms using a Cohen's kappa analyses. The 15-category solution presented a kappa of 0.73 and the 12-category solution revealed a 0.61 kappa, while the 9-category solution presented a kappa of 0.52. Although, all comparisons showed an important degree of stability, the 15-category solution was retained since it presented the greatest degree of part-whole stability.

These cluster analyses revealed that children's use of our multi-modal categories is best represented in terms of 15 distinct behavioural constructs. However, before we proceed into the identification of children's communicative styles, the coherence of each category should be examined. First, the relative frequency measures were transformed into *Z* scores in order to control for large variation between individual categories. Secondly, the 15 derived molar constructs were submitted to Cronbach's alpha analyses in order to verify the coherence of each category. Two categories presented an alpha index lower than .60. Table 3 presents the means, standard deviations and alpha scores for each construct.

The obtained molar constructs were labelled in terms of their underlying behavioural composition. The 15 constructs can be described in terms of five major classes of social or play activity. The four constructs comprising the *Action Class* always occur in conjunction with high-affective states. On a linguistic plane, *action statements expressive* are characterised by relational assertives and expressive speech acts; these are matched with subgoal tactics. *Action statements perceptual* are based on descriptive assertive speech acts. Both subgoal statements and perceptual cues are associated with this play-related behavioural construct. In the *functional pretend play* category relational assertive and expressive speech acts are matched with functional cues. The *distancing action engaged* category regroups attention and action requests with distancing tactics.

The *questions* class regroups two constructs: one related to action and the other related to object information. *Action questions* are based on relational information

Table 3. Mean standard deviation and alpha for the communicative constructs.

Category	Mean	SD	Alpha
Object questions	1.42	1.47	0.78
Expressive regulatory	13.10	4.66	0.45
Approval demanding expression	4.67	2.79	0.70
Disagreement relational perception	0.94	1.10	0.72
Conventionalised approval	2.51	2.78	0.74
Disagreement relational action	1.31	2.17	0.59
Object attribute regulation	1.78	2.02	0.64
Attention request	2.49	2.22	0.74
Distancing action engagement	2.14	1.62	0.72
Person labelling	0.97	1.66	0.74
Action statement expression	5.14	3.15	0.66
Functional pretend play	1.58	1.31	0.73
Action questions	2.43	1.97	0.76
Relational engaged	2.23	2.17	0.75
Action statement perception	6.16	3.19	0.75

requests' regrouping subgoals and perceptual cues, while *object questions* are based on descriptive information requests and are similarly matched with subgoals and perceptual cues. Both question constructs occur in high-affective states.

The *social regulation* class of behaviours regroups constructs which serve to elicit or control mothers' actions. In the *attention request* either subgoals or perceptual cues are associated with attention and action request speech acts, while the *expressive regulatory* construct regroups expressive speech acts with orienting mother to task and perceptual cue tactics. High-affective states underlie both these constructs. In the *object attribute regulatory* construct the affective state is ambivalent. Action and attention requests are associated with perceptual cues in low-affective states, while descriptive assertive speech acts are matched with perceptual cues and high-affective states.

The *positive affect* class of behaviours regroups constructs which express the children's interest or enthusiasm in the play activity with their mothers, underlying positive affect is the rule. On a speech act plane, the *approval expressive* construct is made of action and attention requests and affective expressive. These are linked with approval tactics from the information exchange taxonomy. The *person labelling* construct regroups relational assertive and expressive speech acts with identification tactics. From the speech act taxonomy, the *relational engaged* category links relational assertions and relational requests with expressive utterances. These three are associated with approval and distancing tactics. Finally, the *negative affect* class of constructs represents behaviours that are grounded on low-affective states. First *disagreement relational action* category associates relational assertive and expressive speech acts with subgoals and perceptual cues. The *disagreement relational perceptual* construct is also based on relational assertive speech acts but is now linked with approval and perceptual cues. Finally, in the *conventionalised approval* category expressive speech acts are associated with approval and perceptual cues. In these final two constructs, approval tactics that are usually associated with enthusiasm are used by the children in the context of either boredom or disagreement.

Child communication styles

The derivation of communicative styles depends on the identification of children showing similarities or differences in their relative use of the 15 behavioural constructs. To assess differences in individual communicative profiles necessary for such a classification, we constructed a matrix representing the distance between each pair of subjects across the 15 descriptive scales. This matrix was examined using a person-centred hierarchical cluster analysis. Clusters were formed using the Ward method where squared Euclidean distances served as indices of similarity. With the Euclidean measures, association between two individuals is established with reference to the sample mean. The stability of the obtained classification was analysed using split-half and Cohen's kappa procedures described in the preceding section. These analyses suggested that a three-group solution maximised the stability from split-half to global dendrograms (kappa = .63).

Styles description

The first cluster was composed of 15 children, the second regrouped 17 children and, finally, the third was composed of 20 children. No differences between the three groups were found in total hourly rate of communicative behaviour. One-way

analyses of variance were conducted for each of the 15 final scales using cluster membership as an independent variable. The resulting statistics on the effect of cluster membership are presented in Figure 1. Thirteen constructs significantly differentiated among the three clusters ($p < 0.05$).

Of the three groups, children in the first cluster showed the highest frequencies of approval demanding expressive, disagreement relational perceptual conventional approval, disagreement relational action and relational distancing. These children used functional pretend play and object questions the least. These children engaged in exuberant playfulness centred on object or person attributions. They showed an extreme emotional style, frequently requesting maternal attention. In their discourse, they referred to behaviour, believes and feelings. In their object play, they were directive, offering solutions and evaluating joint action, often making favourable comments. However, they were evaluated as being ill at ease or nervous during the visit.

Children in the second cluster used object questions and functional pretend play, action questions and action statement perceptual constructs more frequently than other children while they showed the lowest frequencies for approval expressive and disagreement relational action. These children progressed through stages of the play activity showing interest and pleasure. They concentrated on how objects worked and where objects were, requesting information about various aspects of the physical environment. These children also often referred to and asked about beliefs and feelings, but most of all focused their communication on play-related actions.

Children in the final cluster used more expressive regulatory, attention requests, distancing action engaged and action statement expressive than other children. They used least object questions, disagreement relational perceptual, relational engaged and action statement perceptual. Children in Cluster 3 regulated their own and their mothers play activity. They oriented the mother to task through playful and cheerful expression and by frequently referring to facts, events or objects. In their play, these children were goal-directed, verifying the accuracy of their action. The particular characteristic of these children to engage in distancing tactics indicates their somewhat more advanced cognitive and linguistic skills.

These three-group profiles are a product of combined coding procedures, procedures with differing conceptual objectives. Each characterisation is informative about the child's mood, what the child did with objects and how he or she spoke. The advantage of this complex abstraction is that we have a better grasp on qualitatively nuanced description of stylistic diversity in while maintaining a holistic approach to communicative performance. Although it is interesting to describe diversity in children's communicative styles, no matter how complex the analyses, the technique still boils down to a simple process of classification in terms of similarities and differences.

In the following section, we focus our attention on behavioural adjustments mothers make to the communicative styles of their children. Rather than asking the traditional question how maternal use of communicative strategies facilitates children's speech, in the following analysis we describe maternal sensitivity to children's styles. First, we determine if mothers also use the constructs identified in children's behaviour. Certainly, mothers produce a more elaborate communicative repertoire than two-and-a-half-year-old. However, knowing if and how they use these communicative modes which are typical of children may contribute to our understanding of facilitative strategies which until now have been addressed from the perspective of

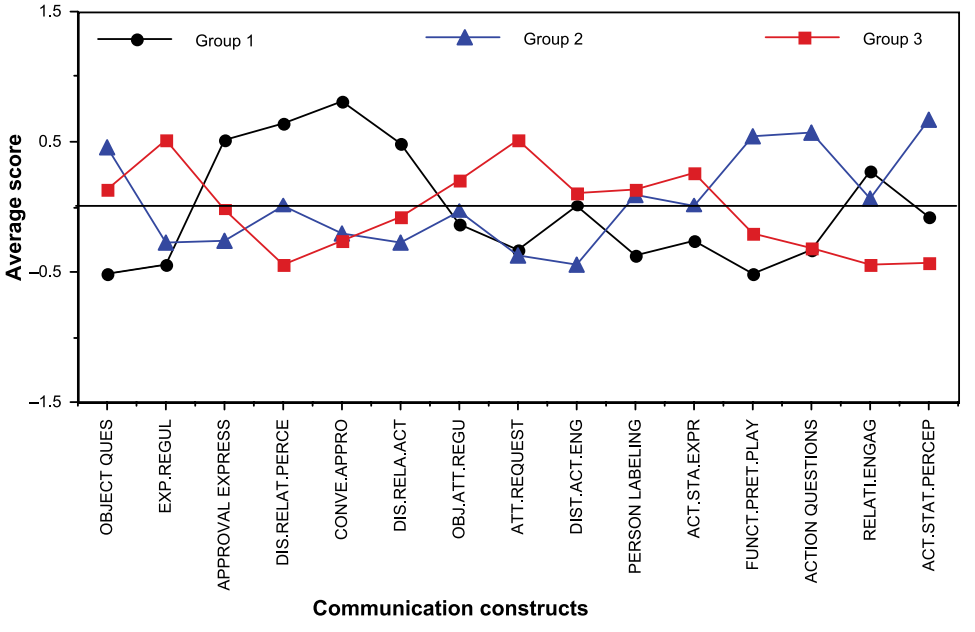

Figure 1. Children's communicative profiles.
Note: The *Y* axis should read 'standardised score'.

the adult. Secondly, we inquire if mothers use these constructs in a way that is coherent with their child's communicative style. If such synchrony can be identified, then we can conclude that the communicative styles are not just an arte fact of a complex sorting procedure, but rather they are salient behavioural profiles contributing to the construction of a shared reality. Finally, understanding the mother's part in the interaction might further clarify children's communicative styles.

Mother associations

Maternal data were merged following identical procedures described for the child. Given their adult communicative competence, mothers used more combinations than their children (50 compared to 31 for the child). Within the set of 50, all 31 child constructs were found. In other words, mothers used 19 constructs that were not observed among children, while children only used constructs that the mothers had in their repertoire. Since the focus of this paper is on children's communication styles, in the following analyses we will consider those constructs which are used by both partners.

Mothers were regrouped on the basis of their children's cluster membership. In order to address the question of maternal adjustment to children's communicative style, one-way analyses of variance were conducted for maternal use of the 15 constructs using child cluster membership as a grouping variable. Four scales distinguished significantly the three groups. Mother of children in Cluster 1 used significantly more conventional approval ($F(2, 49) = 3.35$; $p < 0.05$) and disagreement relational action ($F(2, 49) = 5.11$; $p < 0.01$). Mothers of Cluster 1 children expressed emotions less freely. Although, they verbally approved of child activity, their overall affect was low indicating disagreement or boredom. In their speech, they often referred to their child's behaviour, feelings or beliefs.

Mothers of Cluster 2 children used relational distancing ($F(2, 49) = 5.9$; $p < 0.01$) and approval demanding expressive ($F(2, 49) = 3.72$; $p < 0.05$) more often than other mothers. They were actively and enthusiastically involved in the play activity. Their speech was socially centred; they remarked and asked questions about their child's actions and feelings, checking results and predicting outcomes of object manipulation, making favourable comments on the child's behaviour.

Finally, mothers of Cluster 3 children used more expressive action statements and significantly less conventional approval than other mothers ($F(2, 49) = 3.35$; $p < 0.05$). Analyses of variance on total hourly rate of communicative behaviour revealed that mothers of Cluster 3 children spoke and intervened in the play activity more often than other mothers ($F(2, 49) = 3.85$; $p < .05$). In their communication, these mothers were playful, offered solutions and directed the child's action. They described objects and commented about events frequently.

Discussion

A major goal in this study was to go beyond a purely linguistic definition of communication by focusing on multiple components of this complex process. Our objective was to develop and validate empirical scales for a multidimensional vision of communication. The merging of the three taxonomies showed the existence of 15 different communicative constructs. The derivation of these internally coherent scales provides a new and potentially interesting set of standards for describing children's modes of communication.

The second objective of this study involved using multivariate clustering techniques from numerical ecology (Legendre & Legendre, 1984) to examine qualitatively distinct styles of child communication. Three different communicative styles were found. Children in the first cluster appeared tense, possibly compensating for the disagreeable tone of the home visit by exuberant behaviour. Children in the second cluster concentrated on the object play without paying particular attention to psychological aspects of the interaction; they appeared satisfied. Finally, children in the third cluster were controlling the social interaction, explicitly directing maternal attention and commenting their own actions. When we compare the maternal and child profiles, coherent associations emerge. The same constructs differentiated children in the first cluster and their mothers from other dyads indicating greater synchrony in joint communicative styles. Both children and mothers were evaluated as being ill at ease or nervous during the visit. Their overall affect was low, which indicates disagreement or boredom. In their speech, they both often referred to their partner's behaviour, feelings or beliefs. Mothers more often controlled play activity of Cluster 2 children, who responded to comments and instructions by focusing on objects and object-related actions. The maternal greater use of didactic speech was socially centred; they remarked and asked questions about their child's actions and feelings approving the child's behaviour. Finally, children in Cluster 3 controlled ongoing play activity. They insisted on maternal participation through playful and cheerful expression and by frequently referring to facts, events or objects. They used more advanced cognitive and linguistic tactics than other children. Their mothers were more active than other groups using subgoals and object descriptions more often. The present analyses focused exclusively on communicated behaviour. Psychological characteristics of the partners, contextual and socio-economic variables and history of relationships and individual experience, which all contribute

more or less indirectly to mother–child interaction, have not been considered. These issues will be examined elsewhere.

However, the fact that only 4 out of 15 constructs differentiate maternal behaviour indicates that other factors must be contributing to the diversity in maternal communicative styles. In response to questions about mother- or child-driven models, our results suggest that particular dyads adopt specific regulatory strategies where either the mother or the child directs the interaction. No single unifying strategy can be assumed. Although children in the first cluster synchronise their affective expression with mothers, the negative tone of these interactions renders object exploration more difficult. In these dyads neither child nor mother seems to be directing the interaction. Greater synchrony of positive affect in Clusters 2 and 3 is associated with more object play and joint use of goal-directed strategies.

The complexity of the interactive process has led some theorists to argue that communication goes beyond any purely linguistic enterprise and must be reformulated as a multidimensional system. We still know very little about this process and need a metric by which quantity and distribution of behaviours can be examined. Given methodological developments in ethology and behavioural biology, such an approach to mother–child communication involves a new paradigm where considered data from different channels of communication explain individual differences in early learning and social adaptation.

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