

Private and social speech in children's dyadic communication in a naturalistic context*

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El análisis simultáneo del habla privada y social (mediante subcategorías) en un contexto diádico infantil ha sido escasamente investigado hasta la fecha. El estudio del habla privada desde un enfoque observacional se ha centrado principalmente en el periodo de edad comprendido entre 4 y 8 años, omitiéndose frecuentemente la distinción entre las dimensiones de las categorías (función, forma y/o contenido). Otro déficit es la ausencia de la categoría silencio. El presente estudio aplica un nuevo sistema de categorías centrado en las dimensiones forma y contenido, incluyendo la categoría silencio y categorías de lenguaje social, a 64 sujetos de 3º y 5º curso apareados en diadas mientras juegan con el «Lego». Los resultados revelaron que: (a) la interiorización del habla privada (inaudible para el compañero) aumentó significativamente de los 8 a los 10 años; (b) la frecuencia de habla social pertinente a la tarea también se incrementó significativamente de los 8 a los 10 años; y (c) la frecuencia de habla social no pertinente a la tarea disminuyó significativamente de los 8 a los 10 años. La frecuencia de silencios no varió significativamente a dichas edades, tal como se esperaba.

Few analyses of subcategories of private and social speech in a dyadic situation involving children in a naturalistic context have been reported to date. As a result, the analysis of children's social speech has frequently been ignored. Observational studies of private speech have focused mainly on the age range between 4 and 8 years, and the distinction between category dimensions (function, form and/or content) has very of-

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ten been ignored. Another deficit in this type of work is the neglect of silence as a category. In the present study, a category system that focuses on form and content dimensions, including silence and social speech categories, was applied to the communication of 64 3rd and 5th grade children paired in dyads while playing with a Lego-set. The main results revealed that, between the ages of 8 and 10: (a) the internalization of private speech (inaudible to the partner, due to the very low tone of the voice) increased significantly; (b) the frequency of task-relevant social speech also increased significantly; and (c) the frequency of task-irrelevant social speech decreased significantly. As expected, the frequency of silences did not vary significantly at these ages.

Though private speech has been studied for a long time, many complex questions remain unanswered. More attention needs to be paid to theoretical and methodological issues, which too often seem to have been neglected in specific aspects such as conceptual and operational definitions. In the present study, *private speech* is defined as a production which is neither addressed nor adapted to the partner, unlike *social speech*, which is addressed to the interlocutor (Flavell, 1964/1966; Piaget, 1923/1968).

It is generally accepted that speech has two important functions: communicative – in social interaction – and intellectual – in thinking – (Vygotsky, 1934/1987). Obviously, «the initial and the primary function of speech is communicative» (Vygotsky, 1934/1987, p. 48). Indeed, Vygotsky regretted the fact that psychology left the relationship between these two functions and the nature of their development entirely unexplored. According to him, the process of internalizing speech has 3 stages: external speech, egocentric speech, and inner speech. This sequence is somehow different from the one suggested by Watson (1919/1983): overt language, whispered language, and implicit language (or silent talking). In an attempt to integrate the theories of both authors it could be hypothesized that speech develops sequentially through 4 stages: social speech, audible private speech, inaudible private speech (or whispering) and silent private speech (or inner speech).

Despite the obvious importance of both the communicative and intellectual functions of speech, it seems surprising that hardly any reports of private speech have analyzed social speech, and that nearly all have used a non-interactive context. Broadening our knowledge of the nature of the development of social speech could help us to understand better the future development of private speech, and to improve possible predictions or interventions on it. It would also help us to shed light on the discussion of the development of speech between Piaget (1923/1968), who considered it as going from the individual to the social level, and Vygotsky (1934/1987) for whom speech is first social, then egocentric and finally internalized. One of the rare studies that analyzes private speech in dyadic peer-play did not establish a subcategory for social speech (Rubin, 1979).

In addition, the nature of the development of private speech could be more deeply analyzed. Specifically, studies about private speech do not in-

clude the *silence* category in their observational coding systems, so it seems that inner speech has never been operationally defined nor statistically analyzed. This omission calls into question the exhaustiveness of these classification systems. The empirical study of inner speech – silent private speech – could start to be analyzed through the observed frequency of silences. This might lead to a better understanding of the nature of private speech and its process of internalization.

Another important category in the literature on the development of private speech is *whispering*, which has been analyzed by many researchers (see Díaz & Berk, 1992, and Fuson, 1979, for a review). However, it has been wrongly attributed to Vygotsky's theory by numerous authors (e.g., Berk & Landau, 1993; Frauenglass & Díaz, 1985; Kohlberg, Yaeger, & Hjertholm, 1968; Meichenbaum & Goodman, 1979). In fact, it was Watson (1919/1983) who considered whispering as the intermediate link between externalized speech (aloud) and inner speech (silent). Though Vygotsky (1934/1987) valued and used the idea of the existence of a transitory stage, he actually ruled out this option of whispering. (See Girbau, 1996, for a critical theoretical discussion).

Kronk (1994) concluded that inaudible muttering was the most frequent category of private speech (although silence was not analyzed) in a sample of adolescents with a mean age of 17 years working *individually* within a social context. Complementarily, another study did not find significant differences in a similar category between grades 3 (mean age of 9.0 years) and 5 (mean age of 11.0 years) in a *non-interactive* academic context, but for both of these grades it was significantly lower than for grade 4 (10 yrs) (Berk & Landau, 1993). Other research, in a *non-peer* context, has found a statistically significant increase for it from grade 1 to 3 (Berk, 1986) or from mean ages of 5 through 8 to 10 years in low-income Appalachian children (Berk & Garvin, 1984). An increase from 6 through 8 to 9 years in children working *individually* within a social context has also been observed (Kohlberg *et al.*, 1968). However, none of the papers mentioned analyzed private speech in an *interactive peer* context.

Another aspect of private speech which has been analyzed by researchers is its task-relevance, which can indicate its cognitive complexity. According to some previous studies from a Vygotskian approach (e.g., Klein, 1964; cf. Kohlberg *et al.*, 1968), private speech develops significantly from task-irrelevant to task-relevant from age 3 to 7. However, other studies have found, for example, that task-relevant private speech decreased gradually from kindergarten to fourth grade (Manning & White, 1990), or that task-irrelevant audible private speech did not vary significantly from grade 3 (9 years) to 4 (10 years) (Berk & Landau, 1993). So, in general, it could also be predicted that social speech develops from task-irrelevant to task-relevant. A study from a different approach that focused only on social speech found evidence of superficial co-ordination processes in the youngest conversant group (7-8 year olds), as opposed to two older groups (9-10 and 11-12 years) with deep co-ordination processes (Garrod & Clark, 1993). Moreover, direct collaboration between speaker and addressee is an important factor in accurate communication, even for adults (Schober & Clark, 1989).

A final question found in the literature about the evolution of private speech concerns the testing of developmental theories of two classic authors: Piaget and Vygotsky. Despite their known divergences they agreed on the age at which this phenomenon disappears; for Piaget (1923/1968), egocentric speech tends to fall off notably after the age of 7, whereas for Vygotsky (1934/1987, p. 258) it is internalized at school age. Unfortunately, there are few studies beyond 8 years of age; most studies focus on the age range from 4 to 8 years (Díaz & Berk, 1992; Fuson, 1979). Nevertheless, some authors have emphasized the importance of private speech among adults (John-Steiner, 1992; Looft, 1972).

Elsewhere, there is disagreement as to the overall frequency of external private speech. In some studies it is zero in many children (Díaz & Berk, 1992; Fuson, 1979) or several children (Feigenbaum, 1989), but it is very high in other studies (Berk & Landau, 1993; Bivens & Berk, 1990; Kronk, 1994). Another variable studied in this field is sex, which seems not to have any important influence on private speech (Díaz & Berk, 1992; Fuson, 1979).

Methodologically, a large-scale problem emerges when one tries to develop an operational definition of private speech through a category system. Research studies are ambiguous on this point, due to two basic deficiencies: (a) the frequent lack of explicit dimensional criteria (which determine the selection of categories), and (b) the poorly described operational definitions that indicate what each category includes. For these reasons it is difficult to compare studies in any detail. In fact, at most three dimensions of children's private speech utterances could be analyzed: (a) function, or the utterance's actual effect on the child's ongoing behavior; (b) form, or structural (syntax) and prosodic (intonation, contour, loudness and/or level of subvocalization) features; and (c) semantic content, or what the utterance is about; (Díaz 1986 & 1992; Meichenbaum & Goodman, 1979). But this distinction is most often neglected in category systems, including the one constructed by the first of these authors (Frauenglass & Díaz, 1985), as he himself admits. So it does not appear to be an easy task.

The aim of the present study is to analyze the use and quality of private and social speech of primary school children – over the age of seven – in dyadic communication in a naturalistic context. In order to understand better the nature of the cognitive development of private and social speech, this research will focus on the analysis of three processes: (a) the internalization of private speech through the form dimension – volume of voice –; (b) its cognitive development through the semantic content dimension – relation to the task; and (c) the development of cognitive complexity of social speech through the semantic content dimension – relation to the task. First, it is hypothesized that the frequency of inaudible private speech will increase from 8 to 10 years of age, and, if so, that the frequency of silent private speech will be similar at both ages. The second hypothesis focuses on the rise of cognitive complexity of private speech (more task-related) with age. Thirdly, it is predicted that social speech will become cognitively more complex (more task-related) from 8 to 10 years of age. Finally, it will be interesting to know the relative distribution of the speech categories.

Method

Subjects

A total of 64 children from a middle-class school in the City of Barcelona, 32 from third grade and 32 from fifth grade, participated in the study. Mean ages were 8;8 (ranging from 8;2 to 9;2) and 10;8 (from 10;2 to 11;2) respectively. The author administered a collective intelligence test (Cattell & Cattell, 1973/1986) to each of 4 class groups, that is, to a total of 97 pupils – 49 from third grade and 48 from fifth grade. Subjects with extreme scores in that test were excluded. The sample had an average IQ of 108 (ranging from 92 to 122), and was formed by 32 girls (14 from third grade and 18 from fifth) and 32 boys. Dyads were formed by pairing two children from the sample, and by matching them as closely as possible according to the following variables: (a) grade (16 third grade dyads and 16 fifth grade); (b) age; (c) intelligence (the difference in IQ between two members of a dyad was for third graders $M = 3.94$ and $SD = 2.69$, and for fifth ones $M = 2.75$ and $SD = 2.27$); (d) sex (15 male, 15 female and 2 mixed); and (e) class group (30 of the same, and 2 from different classes but friends).

Task

A *Lego-set* was displayed inside an open transparent container on a table, in front of which both children were seated. *Lego* is a construction material based on small pieces of plastic that can be assembled to build houses, etc.

Procedure

Subjects were called, two at a time, to a room inside the school with a videocamera (connected to a microphone) and a tape recorder, both hidden to maximize naturalness, (Figure 1). The observer instructed subjects as follows: «Now you can play for a while and when I come back I want you to tell me if you have enjoyed the game, and what you have built». The observer then left the room. This moment signalled the start of the transcription, which lasted 8 minutes per dyad. The first child to speak after the door was closed was called *interlocutor A*, and the second one *interlocutor B*. The transcription was done according to the unit of categorization concept as defined in the category system described. So it includes the sum of: (a) externalized verbal productions through words or sounds; (b) clearly communicative gestures, which substitute a verbalization that would be appropriate; and (c) silences. All children built something and seemed to have enjoyed the game.

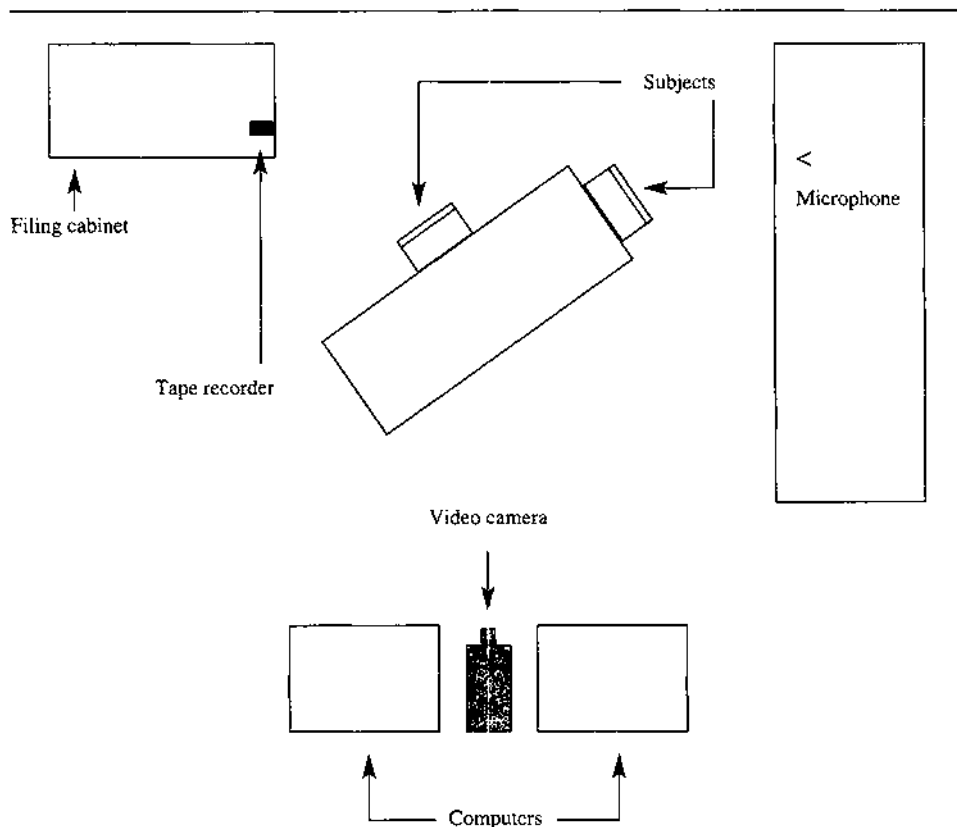


Figure 1. Room arrangement to observe children's communication.

Category System

A category system (Girbau, 1993/1995, 1999) was applied to the transcript, (Table 1). Because the literature on private speech does not provide any one universally agreed-upon set of criteria for the segmentation of the stream of utterances and the categorization of units, various viewpoints were integrated (Beaudichon & Melot, 1972; Berk & Garvin, 1984; Berk & Landau, 1993; Berk & Spuhl, 1995; Bivens & Berk, 1990; Copeland, Reiner, & Jirkovsky, 1984; Frauenglass & Díaz, 1985; Furrow, 1992; Fuson, 1979; Garvey, 1977; Klein, 1964 [cf. Kohlberg *et al.*, 1968]; Krauss, 1987; Manning & Payne, 1989; Manning & White, 1990; Manning, White, & Daugherty, 1994; Morran, 1986; Piaget, 1923/1968; Roberts, 1979; Rubin, 1979). Several of the previous category systems analyzed inaudible, task-irrelevant and task-relevant private speech. So the main contributions of the new category system are: (a) the detailed operational definitions of the unit of categorization – in particular, by including nonver-

TABLE 1 CATEGORY SYSTEM

	<i>Form</i>	<i>Content</i>
Social speech	Audible	Task-irrelevant [IrAuSo]
		Task-relevant [ReAuSo]
Private speech	Audible	Task-irrelevant [IrAuPr]
		Task-relevant [ReAuPr]
	Inaudible [InauPr]	
	Silent [SilPr]	
Untranscribable [Unt]		

bal and inner communication features – and of categories; (b) the analysis of social speech through the category system; (c) the inclusion of silent private speech as a category to be analyzed; and (d) the untranscribable category.

Unit of Categorization

A unit of categorization had to fulfill one of these requirements:

(1) An externalized verbal production through words or sounds (including shouting, audible non-overlapping laughter, feigned crying, whistling and sighing).

(2) A clearly communicative gesture in substitution of a verbalization that would be appropriate. It was only considered as a unit when the gesture responded to a request for information or action. It was transcribed as a unit at the moment the gesture started.

(3) A silence, that is, a pause equal to or longer than 2 seconds, during which neither of the 2 previous conditions apply.

As for the criteria of segmentation in units, at least one of the following conditions had to be fulfilled:

(1) *Change of turn.* – The change of interlocutor always implies a new unit.

(2) *Change of category.* – When within the same turn 2 or more categories are recognized (according to the next section's operational definitions), each of them is coded. If there is a silence at the end of interlocutor's turn (equal or larger than 2 seconds), it is also coded and separated from the previous and posterior utterances.

Operational Definition of the Categories

As can be observed, specific features are detailed for some categories, but no weightings were applied to them – in common with standard practice in private speech studies.

1. *Social speech*. Unit of categorization addressed to the play-partner (interlocutor). E.g., «If you find one like this, give it to me.» [ReAuSo]. *At least one* of these conditions had to be fulfilled:

– Eye contact simultaneously or immediately before/after a piece of information is given to the partner.

– The verb is in second person singular or first personal plural, and it addresses the partner.

– Interlocutor requests information or action (e.g., «look») from the partner.

– Interlocutor initiates a communication exchange with the partner (e.g., giving him/her information).

– Interlocutor repeats or reformulates a message addressed to the partner immediately or very soon after it.

– Interlocutor requests the partner's attention through vocatives (e.g., «eh!»), or through physical contact. It must be accompanied by at least one of the remaining conditions, except when the interlocutor also shows an object to the partner, and the partner looks at it.

– Interlocutor answers the partner's request for information or action.

– Interlocutor completes a sentence initiated previously by the partner.

– One unit of categorization directly related to the information (private or social) given by the partner in a immediately adjacent unit, or very shortly before, by the partner. It is usually a contribution to the conversation (although it may be a simple yes/no or a laugh). It includes linguistic exchanges such as interlocutory ritual (repetition of verbalizations by both speakers that maintain a foreseeable regular rhythm) or interlocutory singing (where partners alternately produce parts of the same song).

1.1. *Audible*. The volume of the production (high, normal or low) makes it intelligible to a very close listener, and it can be transcribed.

1.1.1. *Task-irrelevant*. The content of speech is neither directly related nor refers to the construction game. It includes allusions to:

– Aspects of the environment (e.g., camera, weather) or of the observer not related to the task.

– Personal physical and/or psychological states that are not a direct consequence of the task (e.g., hunger, need to go to the toilet).

– Personal experiences (e.g., academic, family) not related to the task.

– Productions that are not a direct effect of the task, even if they are preceded by a task-relevant category.

1.1.2. *Task-relevant*. The content of speech refers to the given task. It includes:

– Mentioning, describing or evaluating materials or characteristics of the task (e.g., difficult, funny/boring).

– Productions on problems, objectives, plans, procedures and results about the task. For example, justifying actions, describing the activity, looking for solutions, evaluating the action positively or negatively, analyzing or attributing mistakes/successes, counting pieces.

– Allusion to: previous personal experiences related to the task, the observer with respect to the task (e.g., execution time, goal of the task).

– Task-relevant fantasy (e.g., imagining that a Lego-piece is a particular object).

– Productions that are a direct effect of the task (e.g., «bravo!», «ouch!», «mm»). Sometimes they are a rhythmic accompaniment to the task's actions.

2. *Private speech*. Unit of categorization neither addressed nor adapted to the play-partner (interlocutor), but to the speaker him/herself. Sometimes it is displayed as the reduction of the voice volume; if it is very low, it is subcoded in the inaudible form. At other times it is accompanied by great attention to the task. E.g., «La la, la la la la.» [IrAuPr]. It includes:

– Speech addressed to an object, to a phenomenon of nature, or to an absent person which can be acquainted or imaginary. The interlocutor addresses it as if it were a human interlocutor (with verb in second person), ignoring the play-partner. So there is no eye contact with the partner either simultaneously or immediately before or after the production.

– The answer to a request for information formulated by him/herself, in such a way that neither the request nor the answer initiates a new communicative interchange. Between the two utterances there can only be one other category at most, or two if one of them is a silence. Both request and answer are coded as private. Thus, if one of the utterances initiates a new communicative interchange (social speech) and the other does not (private), they will be two different categories.

2.1. *Audible*. Already defined.

2.1.1. *Task-irrelevant*. Already defined.

2.1.2. *Task-relevant*. Already defined.

2.2. *Inaudible*. Production in a very low voice, almost inaudible, and made evident by the lip movements. It follows the voice volume criterion: the voice is not loud enough to attribute a semantic content to the verbalization, which is unintelligible to a very close listener.

2.3. *Silent*. Pause of 2 seconds or more during which neither of the other categories appear. So there is no external verbal production or clearly communicative gesture (as defined in the «unit of categorization» section).

3. *Untranscribable*. Unintelligible production due to conditions of recording, defective vocalization, or whispering into the partner's ear. If immediately before or after this untranscribable production there is a unit – usually very short – that is intelligible but not categorizable due to ignorance of the content of the untranscribable production, it is included in this category.

Reliability

Transcriptions of 4 sessions had been given to 2 judges, after all silences had been left out. Each judge worked alone with the transcriptions, the video tapes and the category system, marking the segmentation points with slashes and classifying every resulting unit in just one of the 7 categories. The agreement index between 2 judges for segmentation in units (Pearson r coefficient) was $r(494) = .91, p < .001$, based on 4 dyads (496 turns). The concordance index or

Cohen's kappa (Cohen, 1960) between 2 judges on categorization of 1586 units from the latter 4 dyads was $k = .80$, $p < .01$, which was higher than .75, the usual excellent standard (Fleiss, 1981). The number of dyads selected represents 12.5% of pairs of a total of 32, a reasonable subsample according to the criteria of Bakeman & Gottman (1986) who considered 10% to 15% to be adequate.

Results

The experimental unit for statistical analyses was the dyad, where aggregate measurements were taken on each of the 32 cases or pairs of children.

Percentages and Variability

A total of 7170 categorized units was obtained, from which the percentage distribution of the 7 categories was calculated (Figure 2). Due to the very low incidence of untranscribable productions (1.55% in the whole sample), and to the lack of theoretical interest in them, this category was excluded from the remaining analyses: variability of frequencies (Table 2) and comparative analyses of 3 variables.

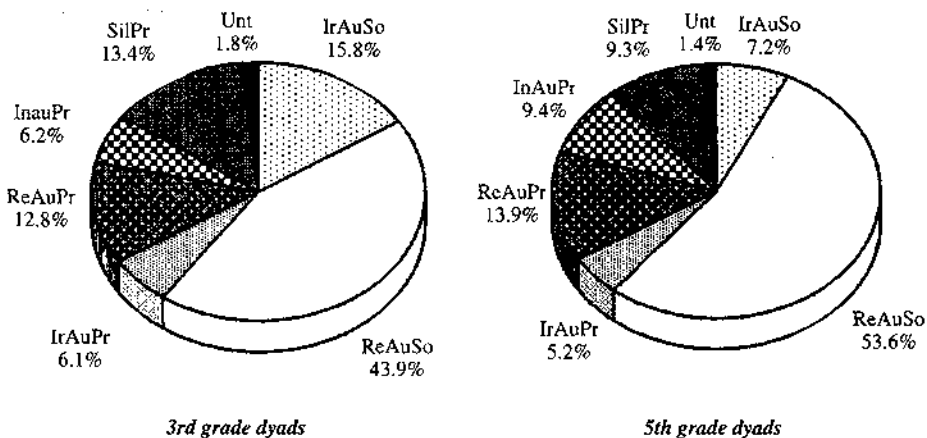


Figure 2. Percentages for Categories by Dyadic Grade.

TABLE 2. MEANS AND STANDARD DEVIATIONS FOR CATEGORIES BY DYADIC GRADE

Grade	<i>IrAuSo</i>	<i>ReAuSo</i>	<i>IrAuPr</i>	<i>ReAuPr</i>	<i>InauPr</i>	<i>SilPr</i>
3						
<i>M</i>	32.38	89.81	12.50	26.06	12.63	27.44
<i>SD</i>	29.21	31.03	11.42	12.89	8.00	9.54
5						
<i>M</i>	17.50	130.69	12.75	33.75	22.94	22.75
<i>SD</i>	24.99	38.49	13.36	14.85	9.10	13.01

Note. Labels for category abbreviations are as follows: *IrAuSo* = task-irrelevant audible social, *ReAuSo* = task-relevant audible social, *IrAuPr* = task-irrelevant audible private, *ReAuPr* = task-relevant audible private, *InauPr* = inaudible private, *SilPr* = silent private.

Comparative Analyses of 3 Variables

The frequency of the units classified was analyzed within each of the following 3 variables: categories (a total of 6), grade (third/fifth) and sex (male/female/mixed). Nonparametric statistics were applied to data because frequency of units is a discontinuous variable (although parametric tests were also applied and showed similar significant differences). Since sex had a nonsignificant influence on the frequency of each category, this variable was removed from subsequent analyses.

In order to test the 3 main hypotheses, the frequencies on each of the 6 categories were compared between grades, by means of Mann-Whitney *U* tests (Table 3). As can be seen, significant differences were found between the two grades in both categories of social speech and in inaudible private speech. Specifically, task-irrelevant social speech was significantly less frequent in fifth graders than in third graders. In contrast, task-relevant social speech had a significantly higher incidence in fifth grade than in third grade. Finally, inaudible private speech was significantly more frequent at 10 than at 8 years of age.

Since the age variable had a significant effect, the 6 categories were compared within each grade, by obtaining 15 Wilcoxon matched-pairs signed-ranks tests (approached to *Z* scores) for each grade (Table 4). Significant differences

TABLE 3. SIGNIFICANT RESULTS FOR GRADE

Categories ^a	<i>U</i> ^b
<i>IrAuSo</i>	73.50*
<i>ReAuSo</i>	54.50**
<i>InauPr</i>	53.00***

a. Labels for category abbreviations are as follows: *IrAuSo* = task-irrelevant audible social; *ReAuSo* = task-relevant audible social; *InauPr* = inaudible private. *b*_n = 16 dyads.

p* < .05. *p* < .01. ****p* < .005.

TABLE 4. SIGNIFICANT RESULTS FOR CATEGORIES X GRADE

Categories ^a	3 ^b	5 ^b
ReAuSo / IrAuPr	-3.46****	-3.52*****
ReAuSo / ReAuPr	-3.46****	-3.52*****
ReAuSo / InauPr	-3.46****	-3.52*****
ReAuSo / SilPr	-3.46****	-3.52*****
ReAuSo / IrAuSo	-3.05***	-3.46****
IrAuSo / IrAuPr	-2.53*	-
IrAuSo / InauPr	-2.04*	-
IrAuSo / ReAuPr	-	-3.52*****
ReAuPr / IrAuPr	-2.43*	2.66**
ReAuPr / InauPr	-3.52*****	2.81***
SilPr / IrAuPr	-2.61**	-
SilPr / InauPr	-3.05***	-

Note. A dash indicates a nonsignificant result.

a. Labels for category abbreviations are as follows: IrAuSo = task-irrelevant audible social, ReAuSo = task-relevant audible social, IrAuPr = task-irrelevant audible private, ReAuPr = task-relevant audible private, InauPr = inaudible private, SilPr = silent private. $b_n = 16$ dyads.

* $p < .05$. ** $p < .01$. *** $p < .005$. **** $p < .001$. ***** $p < .0005$.

were found, simultaneously, within each of the 2 grades with respect to certain comparisons of categories: (a) the frequency of task-relevant social speech was always higher than that of the 5 other categories; (b) and task-relevant private speech frequency was higher than task-irrelevant private speech and above inaudible private speech. Second, in the third grade but not in the fifth grade, both silence and task-irrelevant social speech were significantly more prevalent than task-irrelevant private speech and also significantly more prevalent than inaudible speech. Third, in fifth grade but not in third, task-relevant private speech was significantly more prevalent than task-irrelevant social speech.

Discussion

The results of the present study indicate that *age* had a significant effect on the frequency of 3 categories [ReAuSo, IrAuSo, and InauPr], in children's dyadic communication. The first and third hypotheses are therefore supported. As regards the first one, inaudible private speech was significantly more frequent at 10 than at 8 years of age. Thus, the present study supports the progressive internalization of private speech with age proposed by Watson (1919/1983). This result also agrees with the significant increase found in inaudible muttering from mean age of 8 to 10 years, in low-income Appalachian children in a non-peers context (Berk & Garvin, 1984). The present research is based on a *dyadic peer interactive* context, which has not been used in previous empirical studies, and the children were from a middle-class school.

Another novel feature of the present research is the analysis of inner spe-

ech through silences. As hypothesized, the frequency of this category did not vary significantly with age. Therefore, from 8 to 10 years of age, there is no notable step towards silent private speech, but rather towards inaudible private speech. In fact at a later age, as was pointed out, inaudible muttering was the most frequent category of private speech (55.66% of utterances) in adolescents working *individually* within a social context (Kronk, 1994), but unfortunately that study did not analyse silent private speech.

The second hypothesis was not supported, since the cognitive complexity of private speech did not rise significantly with age. It is possible that this gradual increase is only significant until age 7 (e.g., Klein, 1964; cf. Kohlberg *et al.*, 1968), since for both grades the frequency of task-relevant private speech is already significantly higher than the frequency of task-irrelevant private speech, which is rather low (a mean of 12 units). More research is needed on the development of these two categories of private speech in different contexts, especially after age 7, in order to address some of the contradictions on this point referred to above (e.g., Berk & Landau, 1993; Manning & White, 1990).

However, cognitive complexity does increase in social speech. Indeed, the third hypothesis was supported. From 8 to 10 years, social communication within naturalistic dyadic context becomes more centered on the task itself. The older children showed clearly a greater ability to simultaneously focus their attention on the task in hand (therefore fulfilling the observer's request) and on their interlocutor. With age, social speech became cognitively more complex and adaptive to the context demands. Interestingly, it appears that from 8 to 10 years of age there is a notable shift from task-irrelevant social speech – which diminishes significantly – to task-relevant social speech – which increases significantly. The lack of previous research on this point makes it difficult to compare this study with previous reports. Using a different approach, Garrod and Clark (1993) showed, however, that important changes occur in the quality of social speech at similar ages, moving from superficial to deep co-ordination processes.

As far as the distribution of the categories is concerned, it is noteworthy that task-relevant audible social speech is the most prevalent at both ages. This shows an acceptable level of socialization and adaptation at 8 years of age, despite the higher incidence of task-irrelevant social speech (in comparison with age 10). On the other hand, task-relevant speech in the private category rose significantly above irrelevant and above inaudible types, in each grade. Thus, a large part of the external private speech was related to (and to a large extent caused by) the task in question, regardless of age. In the present study, the percentages of private speech for grades 3 and 5 were 38.46% and 37.83% respectively. These results differ from those reported by Rubin (1979): he found 20% of non-social speech in third grade (mean age of 8;10 years), and 17% in fifth grade ($M = 10;9$). However, his category system did not include the silence and untranscribable categories.

Each of the 64 subjects used external private speech and also inner private speech. This agrees with some recent papers – though mostly from an academic context – which have reported that the overall incidence of external private speech is very high (Berk & Landau, 1993; Bivens & Berk, 1990; Kronk, 1994). But

it disagrees with some studies in which, surprisingly, this external private category is absent in several (Feigenbaum, 1989) or many children, (see Díaz & Berk, 1992, and Fuson, 1979, for a review). There may be various explanations for this absence: (a) an excessively short observation time according to the setting; (b) a non-exhaustive and largely undetailed category system; and/or (c) the characteristics of the task and context. With respect to the context, Goudena (1987) found more private speech in preschoolers during problem solving in the presence of a collaborative adult than with a non-collaborative one. Similarly, our results also support the Vygotskian idea that the social context increases the frequency of private speech (Vygotsky, 1934/1987).

Moreover, in the present research the standard deviations of private speech categories hardly ever exceeded the corresponding means and never exceeded them in magnitude, unlike several previous studies (see Díaz & Berk, 1992, for a review). So this could call into question the frequently mentioned extreme variability in the use of private speech, which could be caused in part by the absence of control of certain variables and by the inaccuracy of some categorical analyses. The *sex* variable did not have a significant effect on the frequency of the 6 categories, in agreement with previous studies on private speech (Díaz & Berk, 1992; Fuson, 1979).

It is to be hoped that future research will broaden our understanding of the development of private speech, which, as this study shows, persists beyond the age of seven; the age at which several authors have claimed that it disappears. More research is also needed to shed light on the characteristics (content, form and function) of private and social speech in children's dyadic contexts, especially including the complex analysis of silent private speech. More efforts should be dedicated to the study of silence (shared/not shared by partners) and the verbal processes that may be involved.

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