Private Speech Coding Manual

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Please cite this work as:


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Private speech is defined as speech that is not explicitly addressed to another person and thus serves no apparent interpersonal communicative function (Flavell, Beach, & Chinsky, 1966). The phenomenon has theoretical significance within both Piaget’s (1926) and Vygotsky’s (1934/1987) writings. A review of the research findings on private speech can be found in Berk (1992). A review of the post-1992 work on private speech and annotated bibliography can be found at http://classweb.gmu.edu/awinsler/Resources.html. In addition, a number of important papers on private speech are collected in Lloyd and Fernyhough (1999).

This working document, or living manual, has been prepared to assist researchers in various aspects of the coding of private speech, typically from videotapes, although the procedures can also be modified for live coding. For additional discussion of coding from live observations, see Winsler et al. (2003). This manual attempts to compile a wide variety of different issues, details, resources, and options related to the coding of private speech and to provide them all in one accessible location for all interested researchers. We are sure that it is incomplete and ask that you please provide suggestions for additions and revision to this document.

Distinguishing Between Social and Private Speech

Child and adult speech utterances are typically classified as either social speech or private speech. Social speech is speech addressed to another person as indicated by either a pronoun reference, a gaze to another person, or other signals of social intent, such as physical contact, argumentation, or conversational turn-taking (Diaz, 1992; Winsler, 1998). Private, or self-directed, speech refers to the audible or visible talk children use to communicate with themselves as they go about their daily activities (Berk, 1992). While social speech provides a means for
communicating with others, private speech provides a tool for thinking, for communicating with the self, and for the self-regulation of behavior (Berk, 1992; Diaz, 1992). A typical approach to drawing the social–private distinction is to classify utterances as social according to the following characteristics (Fernyhough & Russell, 1997; adapted from Diaz, 1992; Furrow, 1992; & Goudena, 1992):

**Eye contact:** The child shows sustained eye contact with another person (including the experimenter) during or within 2 seconds of an utterance.

**Behavioral:** The child’s behavior involves another person (through physical contact, gaze direction, etc.), or another person’s behavior involves the child, within 2 seconds of the utterance.

**Content markers:** The utterance has the same topic as another person’s preceding utterance, or is a question directed to another person, or contains a vocative or another person’s name.

**Temporal contiguity:** The utterance occurs less than 2 seconds after any other social utterance.

Any utterance that does not meet any of these criteria for social speech is classified as private speech. In terms of temporal contiguity, it might be worth noting that some studies have used a 3 second interval as opposed to 2 seconds. There are no data as to which criterion is “better” although requiring 3 seconds to pass before an utterance is considered private will obviously reduce the total number of utterances that are considered private.

Winsler, Carlton, and Barry (2000) distinguished between social and private speech in a similar manner. A total of four variables were coded on a live observational checklist instrument. Children's speech during each 10 s observation was coded as either containing social speech, private speech, both, or no speech. Each category was defined as follows:
Social speech: Any verbalization intended for communication to another individual as indicated by the presence of either:
   a. a name or pronoun reference,
   b. a gaze at another person during or within one second of the utterance,
   c. an intentional physical touch of another person, or
   d. a conversation or verbal turn-taking episode.

Private speech: Any verbalization by the child, which did not contain one of these social markers, including inaudible muttering and silent verbal lip movements, was taken as evidence of private speech.

Sometimes during intense, joint collaborative problem-solving with an adult, it becomes more difficult to distinguish the child’s social from private speech. In Winsler (1998), child speech utterances in the context of the dyad session were classified into one of the following three categories which represent increasing amounts of the child's active, self-directed participation: (1) social speech, (2) independent verbalizations, and (3) private speech. Social speech included any speech which was explicitly directed toward another person as evidenced by either a pronoun reference, a gaze to the other person, an answer to a parental question, argumentation, or one of several other signals of social intent, such as physical contact (Feigenbaum, 1992). Independent verbalizations included any full-volume, task relevant speech that did not fit the criteria above to be clearly classified as social. Private speech in this context was defined as any independent verbalization which was explicitly directed toward the self as evidenced by either (1) a lower, nonsocial volume or change of tone, (2) whispers or inaudible lip movements, (3) task-irrelevant wordplay or noises, or (4) regular speech emitted by the child after the parent had withdrawn from the interaction for some time.
In general, the principle with such coding schemes is that an utterance is considered private until proven otherwise. That is, objective behavioral or linguistic criteria must be met for an utterance to be counted as social, and any other utterances are assumed to be private.

In Winsler, Diaz, McCarthy, Atencio, and Chabay (1999), child speech during the dyad session was classified into one of the following five, mutually-exclusive categories:

1. **Imitations/repetitions of adult speech**
2. **Responses/answers to adult questions**
3. **Questions to adult**
4. **Independent verbalizations**: child-initiated speech, unrelated to the adult's previous utterance, and social in nature; included social speech that did not fit into one of the above categories.
5. **Private speech**: Included independent verbalizations that did not fit the criteria above to be classified as social:
   a. speech that had a lower nonsocial volume or change of tone,
   b. whispers or inaudible lip movements,
   c. task-irrelevant wordplay or noises, or
   d. regular task-directed speech by the child after the adult had withdrawn from the verbal interaction for some time

Although the above procedures distinguishing between social and private speech are typically carried out for convenience and clarity in the content of data analyses, it can be argued that distinguishing between social and private speech is often unhelpful. Among the reasons for taking such a position are the fact that all speech, including social speech, has self-regulatory functions (Furrow, 1984), and that children’s private speech is always pseudosocial (or ‘parasocial’; Kohlberg, Yaeger, & Hjertholm, 1968) because of its social origins and its sharing of linguistic features and structural properties with communicative social discourse (Wertsch, 1979).
Defining an “Utterance”

In most private speech research, the unit of analysis is the utterance, which is defined as a complete sentence, a sentence fragment, a clause with intentional markers of termination, a conversational turn, or any string of speech which is temporally separated from another by at least 2s (Diaz, Winsler, Atencio, & Harbers, 1992; Feigenbaum, 1992). An utterance contains no temporal or semantic discontinuities. A temporal discontinuity is defined as a pause of at least 2s. A semantic discontinuity includes any significant change of content, whether or not preceded by a pause. For example, imagine a child placing several pieces of a jigsaw in relatively quick succession, and accompanying her actions with, “This goes here. That goes there. That goes there.” In this case her speech would count as three separate utterances, even if they were not separated by a pause of 2s because they are complete free-standing sentences and because they refer to three different actions.

While researchers agree on the utterance as the unit of analysis, they have created many different private speech category systems in order to emphasize different characteristics of private speech such as its content, function, form, and degree of internalization (Diaz, 1992).

Metric Used for Analysis

When measuring private speech, there are several metrics available as seen below. One method of measuring private speech is the raw number of utterances during the task. Another method is to measure the number of utterances per minute. Researchers can also measure private speech as the proportion of all speech that is private. Finally, proportional measures denoting the proportion of child private speech that is made up of a particular category can be used. Winsler et al. (2003) includes a discussion of the reliability and stability of many of these metrics.
• Raw number of utterances
• Utterances per minute (when time on task varies across participants)
• Proportion of all speech that is private (coefficient of egocentricity)
• Proportion of private speech belonging to a particular category (i.e. % partially internalized)
• Number of words per utterance (a measure of internalization and fragmentation)

Because overall frequency of utterances is not always conceptually the desired focus, because overall frequency of utterances does not tell us much about the moment-to-moment relations between private speech and immediate behavior and task performance, and because global correlations between number of utterances and global task performance are both confounded with task difficulty (i.e., kids talk more when the task is tough and when the task is tough they are more likely to fail) and conceptually awkward (i.e., is lots of speech really required to show that speech helps performance?) (Winsler, Diaz & Montero, 1997), researchers are now often coding task items for the presence of different types of speech, rather than counting utterances. The following metrics can be used either at the child level (calculating a number for each child and then calculating a mean for the sample) or across the entire sample (averaging across kids to get, say, the proportion of all items that had speech). Obviously, to do these item-based metrics, one has to use a task that has multiple items or trials. The following are some examples of item-level metrics:

Item Level Metrics (Can be done within-child or overall across entire sample)

• Number of Items w/ PS
• Number of Items Correct w/ PS
• Number of Items Wrong w/ PS
• Proportion of Items w/ PS
• Number of Items Wrong w/ PS

• Probability of getting item correct given that PS was used = P (p | s) (When kid is talking, are they getting it right/wrong?) Can be done for both:
  • Concurrent item
  • Prior/Subsequent item

• Probability of speaking given that they got it right/wrong = P (s | p) (When kid is getting it right/wrong, are they talking?) Can be done for both:
  • Concurrent item
  • Prior/Subsequent item
Change over time. Finally, for all of the above metrics, if microgenetic change over time is of interest, investigators can chop up the session into equal intervals based on time (i.e., first half vs. second half of the child’s time working on the task, or into thirds, or into smaller units of time such as trials), and then calculate speech aggregates that occurred during each time period and see whether private speech changes over time as participants progress with the task.

Private Speech Coding Schemes

Content of Private Speech

Current categorization systems for private speech utterances get at the content, function, and/or form of private speech. Sometimes these different aspects of speech are kept separate and sometimes they are merged together or undifferentiated (Diaz, 1986; Diaz, 1992). Content refers to the “referential aspects of the utterance, that is, what the child is talking about” (Diaz, 1992, p. 67). Coding systems that focus on the content of private speech may include categories such as Describing own activity (e.g., “I am putting the red one here”), or Labeling and describing task materials (e.g., “Two black ones”). The meaning, or content, of the first utterance is the task at hand, while the content of the second refers to the materials being used.

Copeland (1979) coded children’s private speech content/form according to nine categories:

1. Exclamations: words indicating excitement, usually single words, e.g., “Oh!” “Drats!” “Wow!”
2. Nonwords: singing or humming, whistling, vocal sounds accompanying motions, e.g., “hm-m-m,” while pretending to make an airplane fly.
3. Descriptions of self: descriptions of boy’s own behavior, e.g., “I’m listening,” “I’m playing.”
4. **Descriptions of environment**: descriptions of surroundings, including games, room, mirror, e.g., “There’s some neat stuff here,” “There’s a new game.”

5. **Self-reinforcement**: self-praising statements with quality of positive feedback, not just an exclamation, e.g., “That’s terrific,” “Good!”

6. **Planning**: statements of intention or commands if they precede action by greater than 2 seconds, e.g., “I’m gonna play that next,” “I’ll try and flip it in.”

7. **Commands**: instructions to self or planning statements that accompany action, e.g., “Try to get it in,” “Find where it went.”

8. **Questions**: questions apparently addressed to self, e.g., “What are those?,” “What should I do?”

9. **Inaudible**: vocal sounds accompanied by lip movements that are either too low in volume or intelligibility to be coded.

Rubin and Dyck (1980) coded each private speech utterance into one of seven content categories:

1. **Analytic statements**: Involves the child reasoning out what is required in order to carry out the task.

2. **Comments about materials**: Includes speech that labels or describes objects.

3. **Comments about activity**: Utterances that describe what the child is doing or is about to do.

4. **Directions to self**: Tells child what to do or not do during or before an action.

5. **Feedback**: Evaluation of an action.

6. **Questions/Conditional Statements**

7. **Other**: Any private speech utterance that did not fit into one of the six categories.

Winsler (1998), Winsler, De León, Wallace, Carlton, and Willson-Quayle (2002), and Diaz et al. (1992) used a coding system, adapted from Copeland (1979) and Diaz et al. (1992), which places each private speech utterance by the child into one of the following 10 mutually exclusive and exhaustive categories, based on speech content:
1. **Exclamations:** Typically one-word expressions of affect or expletives (e.g., "Oh!" "Oops!").

2. **Nonwords:** Sound effects, wordplay, humming, (e.g., "Hmmm" "Vroom" – explosion noises).

3. **Descriptions of the self:** Statements about the child's state or behavior (e.g., "I'm looking for blue" "I found a fish" "I'm hungry").

4. **Descriptions of the environment/task:** Statements about the child's surroundings or the task. (e.g., "They're the same color," "A blue one," "It's hot in here").

5. **Evaluative or motivational statements:** Statements about the child's ability, performance, or motivation; self-reinforcement or deprecation; evaluation of the task (e.g., "I did it!" "I'm good at this," "Good," "This is easy").

6. **Plans/hypothetical reasoning:** Planning or future-oriented statements; if-then constructions (e.g., "I need a purple one," "I'll do this first," "If I put this here...").

7. **Commands to the self:** Explicit instructions to the self with imperative verb (e.g., "Pick them up!" "Don't put that one!" "Get one more").

8. **Questions/answers:** Questions addressed to the self or clear answers to one's own questions (e.g., "Which one should I put next?" "This one." "Where's the blue?" "Is that right?" "Yes.").

9. **Transitional statements:** Reflective utterances which had to do with ending one activity and starting another; (e.g., "So," "Then," "Next," "OK").

10. **Other:** Any utterance that could not be placed in one of the above categories.

Kraft and Berk (1998) coded private speech using the following 6 categories:

1. **Affect expression:** Emotional expressions not directed to a particular person. (e.g., “Wow! Cool!”).

2. **Word play and repetition:** Repeating words or sounds (e.g., “Put the napkin on your head; put the napkin in your pocket; put the napkin on the table.”).

3. **Fantasy play speech:** Role play.

4. **Describing one’s own activity and self guidance:** Utterances about the child’s own actions including descriptions, thinking out loud, and planning.

5. **Inaudible mutterings:** Speech too quiet to make out, or silent, obviously verbal lip movements.
6. **Other.** Self-directed speech that did not fit into one of the above categories

**Function of Private Speech**

The function of private speech refers to the possible consequences of the utterance for the individual’s ongoing behavior (Diaz, 1992). For example, the sentence, “I am putting the red one here,” could fall under the functional category *Directing own activity or Self-guiding*, if it occurs along with the child’s behavior (Diaz, 1992). Alternatively, if the sentence is uttered just before the action, it could be categorized as *Planning*. Another example is the sentence, “Two black ones,” which could be categorized as *Focusing attention*, suggesting that the child is using private speech to focus on one particular color of object (Diaz, 1992).

Furrow (1984) emphasized this aspect of private speech when he coded speech of young toddlers into 12 functional categories including:

1. **Instrumental:** An utterance that indicates desire or is in the form of a whine; (e.g., “I want it.”).
2. **Regulatory:** Referring to an imminent future event. The utterance is directing another person’s actions; (e.g., “Go there.”).
3. **Self-regulatory:** Referring to an imminent future event. The child is directing his/her own actions; (“I put that there.”).
4. **Attentional:** Referring to an ongoing sensory event or a sensory event that is eminent; (e.g., “Look”).
5. **Interactional:** Talking to some one else or offering a greeting; (e.g., “Hi.”).
6. **Expressive:** Describing an internal state or affect, offering an opinion, or expressing a feeling; (e.g., “I love you.”).
7. **Referential:** Talking about an object in the immediate surroundings or referring to an event occurring in the present; (e.g., “That.”).
8. **Description of one’s own activity:** The utterance refers to an event that is ongoing or an event that occurred right before the utterance. The event is one in which the child took part; (e.g., “Putting it.”).
9. **Questions:** The syntax of the utterance is in the form of a question or the child’s inflection indicates a question; (e.g., “What that?”).

10. **Imaginary:** The utterance is sung, a word play or the child labels/describes an object using pretend words; (e.g., “That hat.” – referring to a block the child placed on his/her head).

11. **Informative:** Referring to an object or event not in immediate surroundings; (e.g., “Daddy at work.”).

12. **Incomprehensible:** Utterances that were inaudible or not decipherable.

Furrow (1992) also focused on the functional classification of private speech emitted by children during two mother-child play sessions, which were videotaped in the child’s home. Furrow (1992) used an abbreviated version of the system defined by Furrow (1984). The 1984 study used a 12-category system; however, three of the categories had relatively low frequencies of private speech occurrences. Consequently, nine exhaustive categories of functions were defined as follows (Furrow, 1992, p. 148):

1. **Engaging/regulatory:** Includes a combination of the regulatory, attentional and interactional categories defined by Furrow (1984). These utterances refer to:
   a. an event that might be immediately carried out where another person is the specified agent or there is no agent specified in the utterance and the child does not perform the action him or herself (regulatory--e.g., the child says “put the box down” and does no do it him or herself),
   b. a sensory event that is ongoing or might be immediately carried out (attentional--e.g., “See the man”), or
   c. a conventional greeting (interactional--e.g., “Hello”).

2. **Self-regulatory:** These utterances refer to an event that might be immediately carried out. For example, the child says “put the box down” and then does it.

3. **Expressive:** This type of private speech contains an evaluative opinion, an expression of an internal state, or a stock phrase that expresses feeling. For example, a child may say, “I love you.” The utterances previously included in the instrumental category (Furrow, 1984) that refer to a child’s wants (e.g., “I want the red one) are also included here.

4. **Referential:** Refers to a present object of a present event that does no involve the child (e.g., “That.”).

5. **Describing own activity:** Refers to an ongoing or just completed event in which the child was involved (e.g., “Putting it.”).
6. **Seeks information:** In the Furrow (1984) coding scheme, this function was called *Question*. This category also includes utterances with a question intonation and/or question-like syntactic form.

7. **Imaginary:** Refers to utterances that are sung, are word play, or represent a transformation of real objects or events (e.g., “That hat” said of block on head).

8. **Informative:** Includes utterances that refer to a nonpresent object or event (e.g., “Daddy at work.”)

9. **Incomprehensible:** Includes inaudible utterances and speech that cannot be understood

Feigenbaum (1992) explored the function of children’s private speech as they built train tracks. The coding system was applied to every utterance, regardless of its status as private or social speech. Speech was first classified as either planful or nonplanful based on its content and its role in the activity. Feigenbaum then subdivided each of those function categories. Most of the planning categories were adapted from Pea’s (1982) summary of the literature on the development of planning skills. Feigenbaum’s nonplanning categories were adapted from Kohlberg et al. (1968) and Fuson (1979). The coding system is as follows (p. 186):

<table>
<thead>
<tr>
<th>Planning Functions</th>
<th>Nonplanning Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining the problem – describing or clarifying those aspects of the situation that bear on the problem</td>
<td>Remarks about others – commenting on (or questioning) the actions of others (or objects) related to nonplanning activities</td>
</tr>
<tr>
<td>Defining the goal – describing the situation to be achieved</td>
<td>Description of activity – describing a speaker’s own actions (past, present, or future) related to nonplanning activities</td>
</tr>
<tr>
<td>Defining discrepancies – clarifying the differences between the problem and the goal</td>
<td>Monitoring execution – regulating nonplanning activities</td>
</tr>
<tr>
<td>Formulating a plan – proposing, simulating, evaluating, and revising courses of action that will eliminate discrepancies</td>
<td>Fantasy – pretending, or engaging in make-believe</td>
</tr>
</tbody>
</table>
Monitoring plan execution – checking each step as the plan is carried out, and noting constraints

Emotional release – expressing feelings unrelated to planning

Remembering – recalling the problem, the goal, and solutions

Word play – uttering nonsense syllables; humming or singing

Emotional release – expressing feelings about success, failure, or frustration regarding planning

Sound effects – simulating the sounds made by objects or people

Voice characterizations – imitating voices during role-play

**Form of Private Speech: Coding Syntactic Abbreviations**

Form refers to the prosodic and structural aspects of private speech such as loudness, intonation, and other relevant acoustic variations, as well as possible violations of syntax or deletions, that could have potential functional significance (Diaz, 1992). For example, if the child’s speech is uttered in a slow, aberrant manner, such as “I a-a-am pu-u-u-ting the re-e-e-ed . . . etc.,” (Diaz, 1992, p. 67), it could signal a different function for the utterance. Other important aspects of form include structural or formal deletions, which can indicate the progressive internalization or development of private speech. Whether the private speech “represents a statement, a question, a request, or a command can also be considered relevant aspects of form” (Diaz, 1992, p. 67).

In Winsler, (1998) and Winsler, De León, Wallace, Carlton, and Willson-Quayle, (2002) private speech utterances were categorized as being either complete or fragmented. An utterance was defined as complete if it were grammatically intact in that it contained both a subject (explicit or implied, as in the imperative) and a predicate. Complete utterances also included one-word questions, answers, and imperatives to the self. Examples of utterances coded as complete include "This goes here" "Where does this go?" "I need a three" "How?" and "I see."
Grammatically incorrect or incomplete utterances were coded as fragmented, such as "This one" "Over here" "Blue" "Where is the .... ? "But" "Six more" and "The red one on top of the yellow."

Abbreviated utterances, relative to complete statements, are interpreted as indicative of children's increased internalization or interiorization of speech as these utterances are more fully integrated with children's inner verbal thought. Also calculated in this connection is the mean length of each utterance (MLU) or mean number of words per utterance.

Winsler, De León, Wallace, Carlton, and Willson-Quayle, (2002) include excerpts from the transcripts of two four-year-olds, one engaged in the selective attention task and one in the Lego task: For illustrative purposes, we’ve included the below which includes examples of abbreviation.

The first child, age 4, is seated individually at the table doing the 4th item/card of the SA task:

CHILD: (Humming) (As he is putting away item #3)
CHILD: Dog and dog. (Referring to the two pictures on the card)
CHILD: Guess I have to get another dog.
CHILD: They have any more dogs… in there? (While searching the box for the correct ‘dog’ answer)
CHILD: There
CHILD: Whisper (?) (?) (?) (Three words whispered to himself too quietly to make out)

The second child, boy - age 4;5, is seated individually at the table working on the Lego robot:

CHILD: OK. (Just finished putting on a piece, thinking about next move)
CHILD: Red right… here. (While placing a red lego piece in the correct location)
CHILD: Now. (Looking at the model)
CHILD: It’s not hard at all (Smiles)
CHILD: (Mutt).
CHILD: (Mutt). (Inaudible muttering – verbal lip movements)
CHILD: Now two blacks. (Inaudible muttering – verbal lip movements)
CHILD: Mmmhm. (Reaching for black legos from the box)
CHILD: Mmmhm. (Meaning ‘yes’)
CHILD: Now where’s ....? (Inaudible muttering – verbal lip movements)
CHILD: (Mutt).
CHILD: (Mutt). (Look for a piece)
Coding Task Relevance and Degree of Internalization

The degree of internalization of private speech includes the distinction between task relevance and irrelevance of the utterance. Most of the coding systems that incorporate this distinction do so through an analysis of the semantic content and/or affective tone of the speech (Diaz, 1992). Consequently, many coding systems that emphasize task relevance/irrelevance focus on the content of private speech either directly or indirectly. Goudena (1987) defines irrelevant speech as all speech where “the content of the utterance does not deal with the task the child is engaged in” (p. 196).

Coding the degree of internalization originally included a judgment of the relative maturity or immaturity of the private speech. This distinction is based on the idea that private speech can be categorized “according to a developmental hierarchy from lower (or immature) to higher (or mature) levels or speech types” (Diaz, 1992, p. 69). Research by Kohlberg et al. (1968) demonstrated that the onset and decline of private speech follows Vygotsky’s prediction of a curvilinear relationship between private speech and age. Specifically, Kohlberg et al. (1968) revealed that private speech utterances are related to children's level of cognitive maturity, with overt private speech peaking and declining earlier for more cognitively advanced children. Another idea from Kohlberg et al. (1968) is that private speech follows a developmental hierarchy and involves the emergence and disappearance of different private speech with age (Diaz, 1992), although this idea is no longer typically pursued in modern private speech research.

Kohlberg et al. (1968) proposed a category system that follows “a developmental progression from presocial self-stimulating language (Level I), to outward-directed private speech (level II), to inward-directed private speech (Level III), to external manifestations of private speech (Level IV), and finally to silent inner speech (Level V)” (Diaz, 1992, p. 69).
Taking a Piagetian, cognitive developmental perspective, Kohlberg and his colleagues coded private speech utterances according to the following categories of increasing cognitive maturity (Diaz, 1992, p. 69):

- **Level I:** Word play and repetition
- **Level II:** Remarks addressed to nonhuman objects
- **Level II:** Describing own activity
- **Level III:** Questions answered by the self
- **Level III:** Self-guiding comments
- **Level IV:** Inaudible mutterings

Although Kohlberg et al. (1968) provided evidence for these levels of private speech, there has not been support from later replications that children progress systematically from type of speech content to the next.

Berk’s (1986) system for categorizing the relevance and degree of internalization of private speech is probably the most widely used system for coding speech (Berk & Spuhl, 1995; Winsler, 1998; Winsler et al., 1999, 2000). Building on the coding system used in Kohlberg et al. (1968), Berk (1986) proposed a 3-level private speech coding scheme to account for both distinctions with the concept of internalization: task relevance/irrelevance and relative maturity/immaturity. The three levels in this scheme correspond to the developmental stages of private speech internalization. In this coding system, children’s utterances are first divided into social and private utterances. Private utterances are then further divided into three categories:

1. **Task-irrelevant private speech.** Can be further categorized into:
   a. Word-play/repetition.
   b. Task-irrelevant affect expression (e.g., “I love chocolate ice cream!”).
   c. Comments to others not present.
2. **Overt, regular volume, task-relevant** private speech is sub-divided into:
   a. Descriptions or labels, which occur in conjunction with the action.
   b. Explanation of behavior or goals, which are emitted prior to the action.
   c. Questions to self (e.g., “What should I do next?”).
   d. Task-relevant affect expression (e.g., “I did it!” or “This is hard.”).

3. **Inaudible muttering** includes whispers or silent lip movements.

   Berk’s (1986) categories are intended to be exclusive and exhaustive. In other words, any particular utterance should fit into one and only one category. In reality, however, distinctions are often not so straightforward. Winsler (1995) added a fourth category to Berk’s (1986) 3-level scheme, “Level 0”, in an effort to capture the frequent occurrences of speech utterances that were unintelligible or incomplete; and for which a clear decision on task-relevance could not be made. Although this additional may at times be useful, Winsler found that Level 0 speech behaved in a very similar manner to Level I speech and for that reason, Level 0 and I speech are often merged anyway for analyses.

   A study by Azmitia (1992) also incorporated similar private speech distinctions in assessing the degree of internalization. Children’s private speech was classified as either “task-related (speech describing steps in the problem, plans, or evaluations) or task irrelevant (singing, noises, verbalizations emitted during fantasy play with the Lego blocks—e.g., pretending the blocks were dolls or cars)” (Azmitia, 1992, p. 106). The utterances were also categorized according to whether they were audible or inaudible (i.e., whispers) and whether they were complete or abbreviated (i.e., word or phrase fragments) (Azmitia, 1992).

   **Temporal Progression of Private Speech**

   Another issue regarding the developmental course of private speech is the timing of private speech. Vygotsky believed that the timing of private speech changes with respect to the child’s actions as children age or face increasingly challenging mental tasks (Berk, 1992).
Following this assumption, the idea is that private speech first occurs at the end of an action (reactions to one’s actions), then during the action (describing one’s own behavior), and finally before a child’s behavior occurs (self-guiding speech) (Berk, 1992; Berk & Winsler, 1995). Private speech occurring before a child completes a task suggests planning.

Although a few studies have providing empirical support for changes in the timing of private speech (Duncan and Pratt, 1997; Kohlberg et al., 1968) the majority of studies have not shown developmental differences in the timing of children private speech with respect to action (Berk & Spuhl, 1995; Kleiman,1974; Pellegrini, 1981; Rubin, 1979; Rubin & Dyck, 1979). The consistent problem with this literature has been in reliably defining which specific action(s) of the child to relate the speech to, and clearly determining whether when the speech occurred distinctly before, during, or after such actions when there is so much overlap. Unfortunately, investigators in this area have not given explicit descriptions of their timing and coding procedures and the experimenters themselves typically describe how difficult this is to code. Often the researchers resort to using the content of the child’s utterance (i.e., whether the utterance discusses a future action – “this one will have to go here”), rather than actually timing speech utterances with respect to specific child actions.

Kohlberg and his colleagues, for example, differentiated six types of utterances:

**Level I: Presocial Self-stimulating Language**
1. **Word play and repetition**: repeated utterances for the sake of repetition (e.g., I have a toy, toy, toy.)

**Level II: Outward-directed Private Speech**
2. **Remarks to nonhuman objects**: (e.g., Hey, you block!)
3. **Describing own activity**: speech that has no task-solving relevance or planning function; utterances during an action (e.g., The helicopter goes up, up, up!)
Level III: Inward-directed or Self-guiding Private Speech

4. Questions answered by the self: (e.g., Why did I move that? Because it didn’t go there.)

5. Self-guiding comments: (e.g., Red one here. Blue here. Yellow next.); these utterances differ from category 3 in that these are task-oriented; this speech precedes and presumably controls the child’s activity.

Level IV: External Manifestations of Inner Speech

6. Inaudible muttering: speech that is too quiet for the experimenter to hear accompanied by visible mouth movements

Kohlberg et al. (1968) explored the developmental progression of private speech in 4- to 10-year-olds engaged in making sticker designs. Although the children’s private speech was categorized according to content, it was not timed with respect to specific task-related actions.

Duncan and Pratt (1997) measured private speech in 5-year-olds involved in two tasks across three sessions: a paper-folding task (resembling origami tasks found in books on crafts for children), and a story-sequencing task (adapted from the Picture Arrangement test of the Wechsler Intelligence Scale for Children Revised). Children’s private speech was categorized as either planning or constituting speech based on the temporal relation of utterances to relatively discrete task-related actions. Private speech occurring before a task-related action was classified as planning (private speech preceding action). Similarly, private speech occurring simultaneously with or following the beginning of an action was classified as constituting speech. In effect, this coding scheme classifies all task-related utterances as either planning or constituting based on the timing of speech alone. The semantic content of the child’s speech was only used to classify utterances into a third miscellaneous category unrelated to the task at hand.

Item-Based Speech Performance

As discussed earlier, sometime the focus is on items, rather than utterances. In Winsler, Diaz, Atencio, McCarthy, & Adams Chabay (2000), and Winsler, Diaz, & Montero, (1997), performance on the items was simply coded as either success/failure. If the child independently
placed the correct card on the item, the item was coded as a success. If the child placed an
incorrect answer card and appeared to be finished, or did not complete the item, the item was
coded as a failure. Children's private speech during the period while they were working
independently on the task items (i.e., before the experimenter intervened in the case of a failure)
was coded as either item relevant or item irrelevant. Items were classified as having item
relevant private speech if, at any time while the child was working independently on the item,
the correct dimension that was shared by the two pictures (either the specific exemplar ["They're
both blue"] or the general concept ["Same color"]) was mentioned. Items were classified as
containing item-irrelevant private speech if there were speech used by the child during that item
but the correct perceptual dimension was never mentioned. If the child produced no private
speech while independently working on the item, the item was coded as silent.

Thus, six different types of speech-performance relations were possible for each item: (1)
Silence/Fail, (2) Irrelevant Private Speech/Fail, (3) Relevant Private Speech/Fail, (4)
Silence/Success, (5) Irrelevant Private Speech/Success, and (6) Relevant Private Speech/Success.
The total number of items in each of these categories was recorded, as was the total number of
correct items (regardless of speech) and the total number of items with each type of speech
(regardless of performance).

*Speech-Action Coordination.* Winsler, Diaz, Atencio, McCarthy, and Adams Chabay
(2000) coded item performance and private speech during a hammer task. The item performance
included overall motor performance (number of trials in which the child hit the color sequence
correctly) and speech-action coordination (percentage of trials in which the child's speech [if
any] and motor actions were coordinated [action matched the speech] as opposed to
dyscoordinated [child said one thing, did another].
Coding in Naturalistic Settings

Coding the Activity Context of Private Speech

In Winsler, Carlton, and Barry (2000), children's activity was coded as being either explicitly goal-directed or non-goal-directed. Goal-directed activity was defined as behavior by the child that appeared focused, organized, and had an identifiable goal or end point to the activity. The goal being pursued by the child could either be self-formulated or teacher-provided. Examples of goal-directed activity in the context of self-selected activity periods (SSA) included, for example, building a structure out of Legos® or some other assembly/construction materials, doing a puzzle, playing a game with rules, or engaging in an organized make-believe episode of 'house.' Not explicitly goal directed behavior in this context included, for example, aimless wandering around the classroom, looking on into another group's activity, repeatedly spinning a puzzle piece around one's finger for the apparent 'fun of it,' and making a transition between one activity and another.

In Winsler and Diaz, (1995), the amount of private speech emitted by the child was recorded while the child engaged in one of three general categories of behavior: Work, Play, or Other.

1. **Work:** Any behavior that was clearly oriented toward the attainment of a particular task goal. The goal-directed activities that made up the work category included mostly academic tasks like writing, making something with the help of a model, tangible problem solving, weighing objects on a balance, and completing a handout from the teacher.

2. **Play:** Operationalized as behavior that was not oriented toward a specific task outcome, but rather was an end in itself. Play behaviors included physical play (running, touching, dancing), manipulative play (spinning a toy on one's finger, repetitively pouring water from one cup to another), and fantasy play ("house" or "school").
3. **Other**: All other miscellaneous classroom behaviors like going to the bathroom, eating, standing around looking confused, or watching others from a distance.

The degree to which a child's behavior was being externally regulated was coded by having the observer note in which of the four classroom contexts (Free Play, Plan-Do-Review, Teacher-Directed with spontaneous choice, and Teacher-Directed/large group with structure), in ascending order of external control and teacher structure the observation was taking place.

Kraft and Berk (1998) coded private speech as it occurred during one of four types of activities, all during free play. The child’s activity was also coded as open-ended or closed-ended.

1. **Functional play**: Includes repetitive movements, such as pouring water from one container to another container.

2. **Constructive play**: Includes construction such as cutting shapes out of clay using a cookie cutter.

3. **Fantasy play**: Includes role playing.

4. **Unoccupied onlooker**: Includes wandering aimlessly and observing others.

**Coding Social Context**

In Winsler, Carlton, and Barry (2000), children's immediate social context was also coded. Observers noted, for each 10s interval in the classroom, whether the child was alone, with one or more peers, with a combination of one or more peers and a teacher, or one-on-one with a teacher. Children were coded as being alone if no other person doing the same general activity was within three feet of the target child and there were no social interchanges with another person during the observation. Children were coded as being with a peer if there were one or more other children present who were either doing the same activity in parallel with the target child within three feet or who were physically or verbally interacting with the target child. Children were coded as being with both peer(s) and a teacher if any adult was included as one of
the members of a group, using the same criteria as those used above for 'peer.' Children were classified as being exclusively with a teacher if they were interacting one-on-one with a teacher with no other children present within three feet of the target child.

In Winsler and Diaz (1995), whether or not the target child was alone or with others during an observation period was also recorded. If the target child was with one or more persons, the number and type (pre-kindergartner, kindergartner, 1st grader, or adult) of individual(s) were also recorded.

Kraft and Berk (1998) also coded degree of adult involvement and peer involvement in children’s classroom setting. Adult involvement fell into one of three categories: (1) direct, when the adult was interacting with the child and has some role in the activity; (2) watcher or helper, when the adult was close by and able to provide assistance if needed and (3) uninvolved, adult was not close by. Peer involvement was categorized as solitary, parallel, associative, and cooperative.

**Tasks Used to Assess Private Speech**

There are several types of tasks that have been used in studies of private speech, including selective attention tasks, categorization tasks, constructive tasks, sequencing tasks, and response inhibition tasks. Whatever task is used, it is important that the task is appropriately challenging for each age group and for each individual, in order to elicit private speech and equate task difficulty across children and ages. Berk and colleagues recommend individual pretest task calibration whereby the task is modified for each child to ensure equal task difficulty for all. Of course, sometimes, equating task difficulty across subjects is not the goal and instead either task difficulty is something being manipulated as an experimental condition or is irrelevant to the research question being asked.
**Speech Instructions to Participants**

There is some variance from study to study in the instructions given to children or adults before they start on the task about talking to themselves during the activity. Some investigators do not mention anything about talking out loud (Berk, 1986; Diaz et al., 1992; Goudena, 1987; Goudena 1992; Winsler, 1998; Winsler et al., 1999; Winsler et al., 2000). Out of concern that children might feel awkward about talking out loud, other investigators chose to say something to participants that lets them know that it is OK to talk during the task if they want to (Berk & Spuhl, 1995; Fernyhough & Fradley, in press; Frauenglass & Diaz, 1985). Something like the following is often said: “Some children like to talk to themselves while they do this game, if you want to do that, that is fine.” This is fine and doesn’t appear to negatively affect any aspect of data collection. A few researchers give more explicit instructions for their participants to talk out loud during their task and prompt them to do so when they are silent for long periods (Daugherty White, & Manning, 1994). This practice, however, is NOT recommended as it places artificial constraints on the situation and changes the cognitive processes and task activities required and distorts the natural spontaneous emergence of self-talk, which is usually the desired behavior under study (Diaz & Berk, 1995)

**Selective Attention Task**

The selective attention task, first used by Diaz et al. (1992), is frequently used in studies of private speech. In this task, the child is asked to determine which of two perceptual dimensions (color or shape) is common to two pictures. “Each item card [has] two pictures that [share] similarity either color or shape, and a remaining space for the child to place an answer card” (Diaz et al., 1992). There are 12 stimulus items: each item is a 4-inch by 8-inch card with two pictures on it and a blank space with a strip of Velcro® onto which the answer cards are
attached. The participant receives a box that contains answer cards that match the 12 stimulus cards and some distracter cards. The child must choose which card, from the container of answer cards, matches the shared dimension of the first two cards. “The answer cards had colored circles or white shapes, thereby enabling the child to match only by color or shape” (Diaz et al., 1992). The shared dimension varies randomly throughout the task.

Winsler, Diaz, and Montero (1997) used this same procedure with a larger set of 24 items. In their study, there are six practice items used to explain the task to the child. For the first two practice items, the experimenter demonstrated the task to the child while explaining his or her actions. Both of the dimensions are represented in these first two practice items. Following the demonstration, the experimenter and child complete two items in collaboration. The last two are completed by the child while the experimenter observes. The child is then instructed to complete the remaining items by him or herself.

This task requires selective attention to the perceptual dimension that is shared by the two pictures and inhibition of response to the other dimension. “For example, one item’s pictures might include a yellow house and a yellow dog [color]. The correct card to be searched for would be a card with a yellow spot” (Winsler, Diaz, & Montero, 1997; p 66). Alternatively, “a card might have a picture of a green flower and one of a red flower. Here the correct response would be for the child to select and attach the card that is the colorless flower” (Winsler et al., 2003). As noted by Winsler et al., (2003), this selective attention task provides the appropriate level of difficulty for preschool children and retains their interest. The child’s performance is based on the number of answer cards correctly matched to the item cards. This task can also be considered as tapping one dimension of executive functioning, namely, response inhibition (inhibiting the salient prepotent response of going with color).
**Categorization Tasks**

Frauenglass and Diaz (1985) instructed children to categorize cards with picture of common objects into “meaningful categories (i.e., apple, hamburger, and candy bar, house, store, barn)” (Frauenglass & Diaz, 1985). Klingler (1986) utilized categorization tasks to assess private speech utterances. In his “simple categorization task,” the child sorted 20 cards with pictures of common objects into four stacks based on the use of each pictured object. He also included “a multidimensional sorting task,” in which the child sorted 16 cards with pictures into four overlapping stacks. “These cards could be sorted according to category, function or association. There are four people dressed according to occupation, four vehicles, four animals and four shelters. A doctor, for example, could be placed with another person in the category of people, with the ambulance, as a function of occupation or with the hospital. The farmer could be placed with a cow, a barn, or a person.” (Klingler, 1986).

Sánchez, de la Mata, Alarcón, and colleagues (Azevedo, Sánchez, Alarcón, & De la Mata, 2002; Sánchez & de la Mata, 2004; Sánchez & Alarcón, 2004) use a similar categorization task in their work examining the private speech of adults with varying levels of literacy. In this task, participants sort a stack of picture cards into semantic categories with the number of examples given to the subjects determining the difficulty level of the task.

**Construction Tasks**

One type of activity that elicits good private speech requires the child to construct a picture or figure. Daugherty et al. (1994) used tangrams, which tap skills in logical thinking to investigate private speech. Participants instructed to use small plastic shapes to fill in a large shape outlined on an activity board. “The child was asked to move the geometric pieces within the larger shape until the pattern had been filled in accurately” (Daugherty et al., 1994; p 23).
A magnet board puzzle task was used by Winsler et al. (1999). The magnet board task consisted of an 8.5" by 11" metal frame, 50 pieces of different magnetic geometric shapes of different colors, and an 8.5" by 11" laminated color picture of a face of a clown that was completed with 24 of the magnetic shapes (the model).” The task is for the child to assemble the shapes on the board to match that pictured in the model.

Berk and Spuhl (1995) utilized a Legos® building activity to evaluate children’s use of private speech. In the pretest condition, a model of a house was used to evaluate the child’s familiarity with building with Legos and to individually calibrate task difficulty. Following the pretest condition, the child returned to the lab on three other occasions and was presented with three additional models (clown, car, and helicopter) to replicate. All four models contained at least 54 but no more than 57 pieces and the four Lego colors were equally represented in each model. Upon arrival for each session, the child was presented with two models, identical in shape and color, and told “the Lego pieces in both constructions were exactly the same in color size, and location” (Berk & Spuhl, 1995; p. 155). The child then chose one of the two models to take apart. After completely dismantling one of the models, the child was instructed to rebuild it using the intact model as a guide.

Winsler et al. (2003) also used a lego-construction (LC) task in which participants were asked to replicate a three-dimensional Lego structure comprised of 27 pieces. Initially, the child completed the model in collaboration with the experimenter. Subsequently, the child was instructed to construct the model again individually while the experimenter relocated to another place in the room that was separated from the child’s location.
**Sequencing Tasks**

Frauenglass and Diaz (1985) included a sequencing task in their study of private speech. Participants were asked to place randomly presented pictures in sequential order so the pictures told a time-sequenced story. Initially, the experimenter completed two examples with the child and then instructed the child to continue working on items alone while the experimenter was busy doing something else. The child was told to complete as many items as possible in the five minute time limit.

**Response Inhibition Tasks**

Luria (1961) used a response inhibition task to observe children’s private speech. In this task, the child is given a balloon and is instructed to say “press” aloud and press or squeeze a balloon when the child sees a light of a particular color. The child also had to say “don’t press” and not press a balloon when a different color light was seen. In some experiments, a hammer is used and the child is told to hit a wooden holder with multi-colored pegs (Balamore & Wozniak, 1984; Winsler et al., 2000) to get at speech-action coordination in addition to the execution and inhibition of actions.

The Tower of London (ToL) task is an executive functioning task that has proved effective in eliciting PS (Fernyhough & Fradley, in press). Although it is often presented in a computer-game version, the mechanical version of the task is used more frequently in PS studies. The task involves two identical copies of the basic ToL apparatus, each consisting of three pegs of different lengths inserted into a wooden base, and three painted wooden balls (red, green and blue). The lengths of the pegs are such that one will accommodate three balls, one will accommodate two balls, and the smallest will only accommodate one ball. A total of 12 different configurations is possible on the ToL (see Figure 1). Two can be solved in a minimum of 2
moves, two can be solved in 3 moves, four can be solved in 4 moves, and four can be solved in 5 moves.

In a typical PS study (e.g., Fernyhough & Fradley, in press), four trials are presented in ascending order of difficulty, as follows: 2-move, 3-move, 4-move and 5-move. The target configurations that are typically used are Position 2 (2-move), Position 4 (3-move), Position 6 (4-move) and Position 10 (5-move). In each trial, the experimenter (E) presents the child with one of the copies of the apparatus in the ‘standard’ configuration, and then presents the other copy of the apparatus in one of the 12 target configurations. Presentation of the test trials is preceded by two warm-up trials, where only two balls (blue and green) are used. These warm-up trials are not coded.

The procedure for the test trials is as follows. The E invites the child to sit at the table, and then shows the child the ToL apparatus, saying ‘Would you like to play this game?’ One copy of the apparatus (set up in the standard configuration) is placed in front of the child, and the other (set up in one of the target configurations) is placed on the table just out of reach of the child. The E then explains the rules of the game, as follows: ‘You have to make this (circling the apparatus nearest to the child) look like this (circling the second, target apparatus). But there are some special rules you have to remember. You can only move one ball at a time. And you can only put the balls on the sticks, not on the table.’

To ensure that children only move one ball at a time, they are encouraged to place their free hand behind their back while performing the task. The two warm-up trials are then presented. The E begins the test phase by saying: ‘I’m going to make things different now. I’m going to add this red ball.’ The first target position is then prepared, and the E says: ‘Now, can you make this (circling the standard apparatus) look like this (circling the target apparatus).’
Timing for performance measures begins as soon as the E finishes this last utterance. The same time-point serves as the starting point for subsequent videotape coding of children’s speech.

If a child becomes stuck, distracted or upset, the E intervenes, resetting the puzzle if necessary. In such (typically rare) instances, only the second attempt at the problem is coded. Further details on obtaining performance measures on the ToL are available on request.
Figure 1. Tower of London task: Standard and target positions.
Table 1. Table of private speech studies with the accompanying coding schemes.

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<th>Setting</th>
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<td>Lab Setting; Alone vs. Paired Conditions</td>
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<tr>
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<td>- complete or abbreviated</td>
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<tr>
<td></td>
<td>1. Internalization</td>
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<td>- regular volume</td>
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<td>- partially internalized</td>
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<td>- task-irrelevant vs. task-related</td>
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<tr>
<td></td>
<td>- regular volume</td>
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<td>- task-irrelevant vs. task-related</td>
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<td>Lego and selective attention task</td>
<td>Lab setting in clinic); Individual and Adult-Child Conditions</td>
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<tr>
<td>Winsler, Carlton, &amp; Barry (2000)</td>
<td>Presence of Private, Social, or No Speech</td>
<td>Naturalistic classroom activities, tasks, and games</td>
<td>Classroom Setting (Large Group, Semi-Structured, and Free Play)</td>
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<tr>
<td>Authors</td>
<td>Research Areas</td>
<td>Tasks</td>
<td>Setting</td>
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</table>
2. Internalization | Selective Attention Task; Legos | Classroom Setting and Home Setting |
| Winsler & Diaz (1995)           | Presence of Private, Social, or No Speech | Naturalistic classroom activities, tasks, and games | Classroom Setting (Large Group, Semi-Structured, and Free Play) |
2. Item-Based | Magnet Board, Selective Attention Task (Hammer Task) | Individual Lab Setting |
| Winsler, Diaz, & Montero (1997) | Item-Based (Success/Failure) | Selective Attention Task | Isolated Room in Preschool Setting |
References


Appendix A

**Detailed Overview of One Coding Procedure (Fernyhough)**

Private speech coding typically involves the following steps:

- Coding of task performance
- Full transcription of utterances
- Distinguishing between social and private utterances
- Categorization of private utterances according to Berk’s three-level scheme
- Categorization of private utterances into abbreviated and non-abbreviated forms
- Further semantic categorization

**Materials**

The standard PS coding sheet allows for coding of social speech (SS), Level 1 private speech (PS1), Level 2 private speech (PS2) and Level 3 private speech (PS3). The sheet is organized into one-minute blocks of time, further subdivided into 10s intervals. This allows for a combination of event coding (i.e., counting up the total number of utterances within a given trial) and interval coding (i.e., determining whether a given behavior occurs within a given time interval).

**Starting to Code**

Begin by filling in the key information at the top of the score sheet: name of child, tape number, date (if applicable), and start time. For start time, use the time code on the videotape. This should be sufficiently accurate for all subsequent timings (such as timing of utterances in the transcription, determining the 10s intervals for coding, and ToL time-to-solution measures). For the ToL, record the trial number (i.e., which puzzle the child is attempting) at the top of the score sheet.
Coding begins when the experimenter has finished setting out the instructions for the task (see p. 30 above). When this happens, the time-code on the videotape should be noted, and the tape counter on the VCR reset to zero. This time-point can then form the zero-point for all subsequent timings.

If a child says nothing on a trial, record ‘no speech’ on the score sheet and the transcript.

**Transcription of Speech**

This should be done on a separate sheet of paper, or directly onto a computer. It should be done before the 3-level PS coding. Record children’s speech as accurately as possible, using standard notation, e.g., [inaudible] for an inaudible portion of an utterance. Record children’s task-relevant actions as well. For example, on the ToL, record which ball is being moved while the child makes a particular utterance. Note down anything else which might be important, and use the videotape time-code for timing information.

**Notes for coding private speech on the ToL**

- Children will frequently answer ‘yes’ to the E’s final instructions, that is, where the E says ‘Can you make this one look like this one?’ In this case, the utterance fulfils the criteria for social speech, and should be coded as SS.
- If anything happens which is not obviously covered by these notes, try to record what happened as fully as possible, and give times for where the event happened so that it can be found again easily.