LACUS FORUM XXXIII

Variation

UNIVERSITY OF TORONTO

Reprint

FIRST EDITION

Published by LACUS, the Linguistic Association of Canada and the United States, in Houston, Texas, USA. Current address and contact information for LACUS can be found on the World Wide Web at *http://www.lacus.org*.

Manufactured in the United States.

ISSN 0195-377X

A MICRO-ANALYSIS OF LOOKING BEHAVIOR OF AN ENGLISH-SPEAKING AND A CHINESE-SPEAKING CHILD

Nancy Pine
Mount St. Mary's College

ALTHOUGH CONSIDERABLE VARIATION exists among individuals of the same culture, exposure to specific cultural and linguistic patterns affects behaviors. Infants discriminate phonetic contrasts of all languages in their first months, but their perception narrows to the sounds of their speech community within a year (Kuhl 2004:831–33). Deaf babies exposed to sign language from birth (Emmorey 2002:170) produce manual babbling by about 10 to 14 months, whereas hearing babies exposed only to speech do not produce these movements and, instead, map their vocal articulation to the auditory speech patterns of their environment. In a study of 150 Chinese and US children, two- and three-year-olds were found to produce prewriting that mirrors the graphical shapes of their writing communities (Pine 1993). The current study probes in detail, the visual information-seeking behavior of one two-year-old English-speaker from the United States and one two-year-old Chinese-speaker[1] from China in an effort to understand whether they exhibit behaviors that may be linked to their cultural/linguistic communities. The children were both mid-range performers in a larger study (Pine 2005, 2006) investigating visual behavior in the two countries.

1. BACKGROUND TO THE RESEARCH. Both the larger study and the current one investigate subtle nonverbal behavior patterns that may be associated with the children's linguistic communities. They build from studies exploring linguistic relativity such as those by Levinson (2003) and Lucy and Gaskins (2001, 2003) that explore the influence language may have on non-verbal cognition. Comparing languages that map particular concepts differently, they detail the variable effect linguistic coding may have on cognition across cultures. Lucy and Gaskins' studies (2003:479–81) with Yucatec speakers and American English speakers that investigate number-marking patterns show that the nonverbal cognitive responses of adults as well as 9-year-old children agree where the languages agree and differ where the languages differ. Bowerman and Choi (2003:398–411) in their work with Korean speakers and English speakers found that children as young as 18 months, who are in the early linguistic stage, adopt language-specific principles of categorization, but that infants in the prelinguistic stage are less sensitive to such categories. Although the research reported in this paper does not directly address the interplay between language-specific behavior and non-linguistic cognitive skills, it may point toward nonverbal looking behaviors that, in future research, could be mapped against particular language-specific structures or concepts.

1.1. EARLY STUDIES. Several earlier studies (Pine 1997a, 1997b, 2005) investigate whether very young Chinese-speakers and English-speakers exhibit clusters of nonverbally expressed attributes of visual information-seeking behavior that are associated with their specific cultural and linguistic community. The results suggest a clear delineation between the looking behaviors of the two language groups in some categories. For example, the Chinese-speaking children focused more on objects that were less than 15 centimeters in size, while remaining quite still in their own movements; the English-speakers focused on larger objects and moved their hands and bodies more. Another differentiation was the diameter of the area in which the child's body moved while engaged in a looking event. The Chinese children almost always stayed within a 0 to 1 meter diameter even though there was always more space available and the children were not physically constrained. The English-speaking children on the other hand chose to use a much larger area. However, two analytical puzzles stood out in these studies—the problem of children's wandering attention as they engaged in a looking activity and the problem of how to actually code movement, especially since movement patterns hinted at differences between the two groups.

A child's visual focus shifts as distractions come along. Although a child may be absorbed in threading beads onto a string, she may look up if someone walks past or another child tries to take her beads. In addition children's visual focus shifts even while they are looking at one object of focus—for instance, while playing with a toy car they may stop to turn it upside-down and examine its bottom. More confounding are the difficulties of analyzing movement. First, the perceptual concepts embedded in movement while looking are difficult to grasp. For example, when a child is running around a play-yard looking at the world through a sieve, what is he perceiving? What is his object of focus? Secondly, movement is complex to code at even the most basic level. As children move, several parts of their bodies are usually involved. Should these be coded as one or separately—each hand and foot, the trunk and head considered as separate entities? Furthermore, US children appeared to be fascinated by motion. In the play-yard they watched sand being poured from a teacher's shovel or sifted through a sieve for long blocks of time. English-speaking adults were often videotaped jiggling something to get a child to look at it or to entertain. Movement was also involved in what Chinese children looked at, but it appeared to be slower or less pronounced.

Our simplistic solution in the early studies was to code movement only for the whole body and hands, assigning each just one rating on a 4-point scale for an entire event. In addition, the video data had been recorded in a large variety of venues. While retaining the naturally-occurring settings, we needed to record in each country the same number of events from homes, preschool classrooms, and similar public places. We also required a video system[2] that would permit a fine grained, second-by-second analysis of more clearly defined categories as well as examination of the movement of different parts of children's bodies. Because of the time intensive nature of such an analysis we needed to narrow our data, and we reasoned that examining the looking behavior of one child in each linguistic group who was closest to the means of the analyzed categories might uncover subtle behavior patterns masked by the less detailed differences we had found earlier. This required a two-step process, analyzing better matched data sets and then completing a micro-analysis of the two children's events.

1.2. PRELIMINARY STUDY FOR THE MICRO-ANALYSIS. After videotaping children in each country in similar environments (preschools, homes, parks) we analyzed 26 comparable looking events from each linguistic group using the variables that, in the earlier studies, had shown clear group delineation. A looking event is defined as a time span during which a child looks at one thing in order to investigate it, observe it, or interact with it. The primary mode of interaction is visual, even though other modes are involved. Events include such activities as painting, arranging geometric shapes, watching sand as it is poured through a sieve, and so on. Acting on a suggestion from Marianne Gullberg of the Gesture Group at the Max Planck Institute of Psycholinguistics we added an on-task/off-task variable to address the problem of children's shifting focus. The following were analyzed using their specific parameters (centimeters, meters, seconds, or a point rating) and then, where necessary, converted to a 4-point scale for comparison:

- size of the object of focus
- distance of the object from the child's eyes
- speed of body movement
- space used by the child's body while looking
- speed of hand movement
- length of on-task time segments.

Object size, distance of object from the child's eyes, and diameter of the area the child used were coded in centimeters and meters and then converted to a 4-point scale, with 1 being the smallest distance or diameter, 4 the largest. Body movement and hand movement (considering both hands as one unit) were coded on a scale of 1 to 4, with 1 equaling *still, nearly stationary* (e.g. holding a block still while looking at it; feet resting on a chair rung); 2, *limited movement, wiggling* (e.g. song-related arm or foot motions; the child could be in one place, but was more active than #1); 3, *moderate movement* (e.g. shaking rattles and watching them, walking about while looking at a toy or book), and 4, *very rapid* (e.g. jumping up and down while looking through a view finder; looking at beads in a plastic tube while twirling around on a stool; moving a drawing back and forth quickly while looking at it). Example video clips at each level were used for judgment calibration. The body and hand movement variables were assigned only one rating per event. On-task time was calculated by identifying when a child was looking at the object of focus. The on-task times were then calculated as a proportion of the total length of the looking event.

Figure 1 (overleaf) shows the mean score for the 6 variables for the 26 events of each linguistic group. The error bars are the standard error of the mean, found from the variances. The analysis shows a significant difference ($p < .05$) between the two linguistic groups on four variables—object size, body movement, hand movement, and on-task time. For those variables, the difference in the means was greater than twice its uncertainty. The Chinese-speaking children in this data set focus on smaller objects for longer periods of time than their English-speaking counterparts, and their body and hand movements are slower. The more systematized data collection sharpened some of the group differences compared with

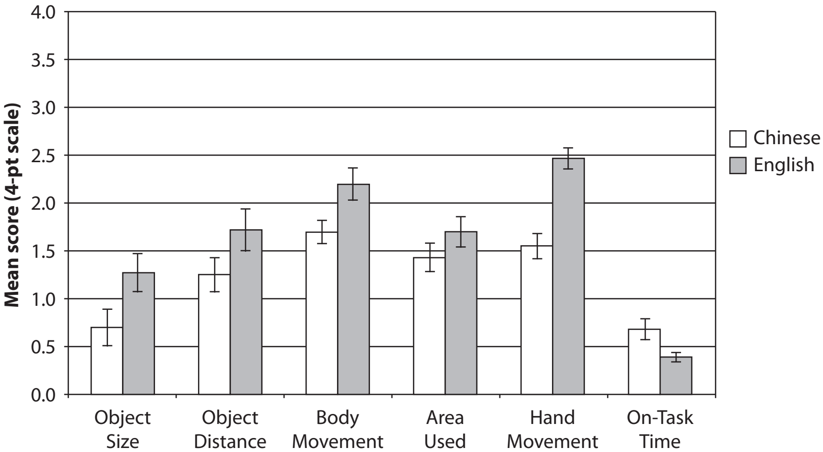

Figure 1. *Looking behavior variables for Chinese-speaking and English-speaking children, 26 events for each linguistic group. Ratings converted to a 4-point scale in which 1 is the smallest or slowest, 4 the highest or quickest.*

the more holistic earlier studies, while it diminished the differences of other variables—especially the area used by the children.

2. SELECTION OF THE TWO CHILDREN. The two children were selected for the micro-analysis by computing the mean within each category and language group for the cohort of the preliminary study and then selecting the child from each language group that ranked closest to the mean averages across all categories. Since both of the selected children had been videotaped during more than one looking event, we then selected the looking event closest to the group means for each child.

The characteristics of the two identified children and events are listed in **Table 1**. By chance the two children were male. The Chinese-speaking child is playing with water toys in a low sink in the family's apartment bathroom. His mother and a family friend (the videographer) are present, talking with each other from time to time. Occasionally the videographer asks the child a question—e.g. does he attend preschool yet. He responds to these questions, looking up as he does. Twice his mother intervenes in his play—once to suggest using a particular toy (which he does not do) and once to suggest picking up a toy that had dropped on the floor (which he does). The English-speaking child is sitting at a table in his preschool classroom where two children are painting and two waiting to paint. At the beginning of the event he is waiting at the end of the table and poking his finger into a paint tray near him; part way through the event, he moves to another chair and begins painting. The teacher is monitoring the painting and a few other activities in the room. While he is waiting she tells him to stop fiddling with the paints and wait his turn. Later she tells him it is his turn to paint and to move to another chair, which he does. At one point someone walks by and attracts his attention, and at another the teacher helps him take off his jacket. Although these two events represent those closest to the mean in each linguistic

	Chinese-speaking child (CH1)	English-speaking child (US1)
Age	2 yrs 3 mos	2 yrs 7 mos
Language	Chinese	English
Sex	male	male
Environment	home	preschool
Activity	playing with water toys in low sink	making paint prints with plastic baskets
Total of event length	163 seconds	256 seconds
Adult present	mother + videographer	teacher + videographer
Adult directions to child	minimal	minimal

Table 1. *Characteristics of the 2 identified children and the looking events closest to their group means.*

group across all categories, it must be kept in mind that the environments of the events are considerably different—the Chinese-speaking child at home with his mother, the English-speaking child in a preschool toddler center with several other children and a teacher.

3. CATEGORIES FOR MICRO-ANALYSIS. The purpose of selecting two children central to their language-group means was to uncover patterns subtler than those found in earlier studies. Therefore the categories selected for the micro-analysis are different from the variables used in the preliminary study and reflect the most challenging analytical areas confronting us. Two of these—on-task times and speed of body movement—had been used in the preliminary study but needed more detailed coding; several other variables related to movement were added, as well as head tilt. The final list of categories analyzed for the micro-analytic study were:

- on-task times
- speed of object of focus
- speed of body movement
- speed of right hand movement
- speed of left hand movement.

All movement variables were rated on a 4-point scale for each episode—1 being *still; nearly stationary*; 4 being *very rapid*. Head tilt and foot movement speed, though coded, were omitted from the final analysis because they did not appear relevant to the particular events being examined.[3]

Three types of time categories—*event*, *segment*, and *episode*—allowed us to identify and compare different elements of the children's movements and looking behaviors. An *event* ranges from 1 to 5 minutes and is the time span during which a child looks predominately at one thing (e.g. a car, a doll, a book) or an associated set of things (e.g. a few water toys,

On-task Segment #	CHINESE-SPEAKING		ENGLISH-SPEAKING	
	Duration	Fractional	Duration	Fractional
1	5.09	0.04	26.00	0.14
2	19.94	0.16	6.98	0.04
3	12.00	0.09	1.99	0.01
4	6.00	0.05	2.34	0.01
5	4.99	0.04	8.00	0.04
6	13.02	0.10	4.99	0.03
7	4.30	0.03	4.99	0.03
8	22.99	0.18	0.99	0.01
9	26.99	0.21	21.00	0.11
10	11.00	0.09	45.99	0.25
11	—	—	23.00	0.12
12	—	—	40.99	0.22
Total (secs)	**126.32**		**187.26**	
Proportion of total time	**0.78**		**0.73**	
Mean	**12.63**		**15.61**	

Table 2. *On-task segments for the Chinese-speaking and English-speaking children. Reported in real time (seconds) and fractional time.*

a painting and the brush being used, a set of blocks). It ends when the child changes to a different activity, is out of view of the camera, or when the video has followed the child for 5 minutes. Any event less than a minute was eliminated. An event is separated into *on-task time segments* and *off-task time segments*. In one event, for example, a child looks at and manipulates a set of pattern blocks for 4 minutes and 34 seconds; it ends when the teacher tells her to clean up. During that event she looks at and uses the blocks most of the time (on-task segments), but she looks away from them 3 times (off-task segments)—once when the teacher passes by, once when another child wants to take two red blocks, and once when she sneezes. These are coded as:

on-task: 1 minute 23 seconds
off-task: 0 minutes 8 seconds (teacher walks by)
on-task: 0 minutes 36 seconds
off-task: 0 minutes 16 seconds (other child wants blocks)
on-task: 1 minute 18 seconds
off-task: 0 minutes 6 seconds (sneezes)
on-task: 0 minutes 47 seconds.

The final analysis looked only at on-task segments. For a given event, the total of the time segments is the same as the total event time. The same time segments apply to all the movement variables (hands, feet, etc.) of an event.

Episodes are sub-units within on-task segments, often only a few seconds long. They usually denote a slight focus shift (e.g. looking at a different part of a car) or movement speed level change. Each episode has a speed-level rating. Different variables had their own episode structure—e.g., the left-hand-movement episode structure for a given child could be quite different from the child's right-hand-movement episode structure. (A sample list of episodes for each child is given in 4.2 below.)

My primary collaborator in China, Yu Zhenyou, and I spent many hours refining rating judgments until we were aligned. Many areas of rating were remarkably clear with little need for adjustment, including when on-task and off-task segments as well as episodes began and ended. This accuracy was facilitated by the ELAN software (see note 2) that enables analysis at varied speeds and coordination of multiple categories.[4] Others—e.g. the difference between levels 3 and 4 for hand movements—took considerable practice and refining. In the final study I did all coding for the two children, with Yu doing periodic checks.[5]

4. RESULTS. Because each child's event was characterized by several on-task segments that were significantly longer than others, we investigated the difference in performance between the long and short segments. With no differences found for these varied time segments, we looked at variables across all segments—again finding striking similarities between the two children even though adults viewing the videos commented on differences. It was only when we separated out the highest speed levels, that we found what appear to be interesting differences worth further investigation.

4.1. ON-TASK TIME SEGMENTS. The on-task time segment comparisons (**Table 2**) were essentially equal. Although the total length of the children's on-task segments was quite different (126 seconds for CH1, 187 for US1) the proportion of on-task times to the total event times is similar. The mean length of the time segments for the two children was also comparable. The occurrence and position of several significantly long segments is of mild interest, but still rather similar for the two children—occurring at the beginning and end of each event with rapid changes from on-task to off-task in the middle.

4.2. SPEED LEVELS OF MOVEMENT VARIABLES. The four movement variables—object of focus, body, right hand, and left hand—were rated for levels of speed on the 4-point scale from *still* to *very rapid*. Each episode for each variable was rated by level, and then weighted by duration (in seconds) to arrive at a weighted speed level (**Table 3**, overleaf). The levels for the 2 children showed no significant patterns of difference. The mean-weighted rates are startlingly similar, with the Chinese-speaking child rated slightly faster than the English speaker in body and right-hand movement.

Nevertheless, when adults view the videotapes of the other culture's children during looking events they almost always comment on differences. The US adults often describe the Chinese children as *calm, still*, and *very focused*, whereas Chinese adults tend to

Movement variable	CHINESE-SPEAKING	ENGLISH-SPEAKING
Object of focus	1.82	1.86
Body	1.73	1.52
Hand right	1.73	1.57
Hand left	1.68	1.73

Table 3. *Mean-weighted level of speed for each movement variable, all on-task episodes, for the Chinese-speaking and English-speaking children.*

Movement Variables/ Speed Levels		CHINESE-SPEAKING				ENGLISH-SPEAKING			
		Tt	Ft	Ml	Freq	Tt	Ft	Ml	Freq
Object of Focus	Level 3	5.20	0.05	1.73	3	29.67	0.19	1.98	15
	Level 4	0.00	0.00	0.00	0	1.57	0.01	1.57	1
Body	Level 3	6.71	0.05	3.36	2	19.85	0.11	2.21	9
	Level 4	0.00	0.00	0.00	0	0.00	0.00	0.00	0
Hand Right	Level 3	8.72	0.07	2.18	4	23.25	0.13	1.45	16
	Level 4	0.00	0.00	0.00	0	2.31	0.01	1.16	2
Hand Left	Level 3	5.23	0.04	2.62	2	29.77	0.16	1.98	15
	Level 4	0.00	0.00	0.00	0	1.66	0.01	0.83	2

Table 4. *Total length of time expended at levels 3 and 4 by each child for the 4 movement variables.* ***Tt*** *= total time (seconds),* ***Ft*** *= fractional time,* ***Ml*** *= mean length (seconds),* ***Freq*** *= frequency.*

describe US children as *very active, busy*, and doing something *risky* or even sometimes *dangerous*. Also, during the coding process it was apparent that there were differences, with different patterns of speed levels appearing. For example, the English-speaking child had a sprinkling of level 3 and 4 episodes throughout each of the movement variables whereas the Chinese child did not. These patterns along with the adult descriptions of the other culture's videotapes kept raising the question of what we were missing in the analysis.

Isolating the most rapid movements (**Table 4**) reveals how much more the English-speaking child (US1) used these levels than the Chinese-speaking child (CH1). US1 used significantly more time, proportionally, at these levels and at more frequent intervals. US1 used brief spurts of level 3 and level 4 motions, while CH1 seldom raised his to level 3, and never to level 4. In previous analyses the English-speaking child's long periods of time spent at level 1 masked the affects of his levels 3 and 4 movement.

Furthermore, examination of where levels 3 and 4 occur in relation to levels 1 and 2 reveals different level sequencing patterns between the Chinese-speaking and English-speaking child. Two US1 sequence patterns are apparent for levels 3 and 4. He often moves abruptly from a level 1 speed to 3 and back to 1. Two of his level 4 occurrences explode

Speed Level	Movement Description for CH1
1	Hand near waist
2	Reaches down into water
2	Lifts red water wheel
2	Fiddles with red water wheel
2	Moves hand to sink edge
1	Rests hand on sink edge
2	Fishes for and picks up blue toy
2	Pokes at red toy with blue toy
2	Picks up funnel with both hands

Table 5. *Movement rates for Chinese child.*

Speed Level	Movement Description for US1
1	Inspects lower arm (for paint?)
3	Reaches for basket; moves it to paint tray
2	Puts basket in paint, moving it up and down
1	Presses down on basket
3	Picks it up & moves it over paper
1	Holds basket above paper
3	Moves basket to right; puts it down on paper
1	Pushes it down on paper w/both hands
3	Lifts basket w/both hands; moves it to paint tray

Table 6. *Movement rates for US child.*

directly from and/or return immediately to level 1—sequences 1,4,1 and 1,2,4,1 respectively. The Chinese child, on the other hand, on those few occasions when he does increase the speed of his movement to level 3, embeds it in a progression—e.g. 1321 or 132221. In addition, twice during each event variable US1 moves from level 1 (*still*) to 2 then to 3 and maintains his movement at level 3 across two episodes before slowing—e.g., 12331.

Another pattern involves the variety of sequence in the use of speed levels. The Chinese child maintains movement at the same speed level across many episodes of movement shifts. For instance, a 20-second example of his right-hand episodes shows that although his hand is moving from one toy to another and moving the toys around, his rate of speed remains steady (**Table 5**).

In contrast, the US child shows much more variety in the sequencing of changing speeds. A typical right-hand motion sequence for him progresses as shown in **Table 6**. The English-speaking child exhibits continuous speed level change at every small movement shift, while the Chinese-speaking child holds his speed level relatively steady even though he is moving his hands and often his body. These longer periods at a given level lend a steadiness to his looking. One can conjecture that both the continuous variety of speed levels of US1 compared with the maintenance of one level during several movement and focus shifts by CH1 would cause a video viewer to describe the US child as more active and the Chinese child as more focused and still. The fact that the level 3 and 4 occurrences of the object, body, left hand and right hand are somewhat synchronized may also make them more noticeable.

5. DISCUSSION. Investigating the question of whether such movement patterns are associated with English and Chinese language structures and concepts lies well in the future. For the present, evidence is accruing (cf. Lucy & Gaskins 2003; Emmorey 2002) that the language one uses can enhance specific cognitive processes. These language-specific processes do not alter the across-the-board nature of cognitive processing. Emmorey (2002:270) reports, for instance, that several visuospatial cognitive domains, such as motion analysis and spatial memory, have shown an effect from sign language use, but other visuospatial areas that seem connected (e.g. memory of visual images) have in fact remained unaffected. Habitual use appears to make individuals more adept at coding certain types of information while not affecting them in other seemingly related areas.

5.1. LANGUAGE AND GESTURE. A few distinct differences between the processing structures of Chinese and English have been uncovered, but great caution must be exercised before connecting one finding to another. McNeill & Duncan (2000:148–54), comparing the relation of gesture to the language structure of English and Chinese speakers, have shown that Mandarin speakers differ from English speakers in how they time gestures within phrases. While English speakers perform an action-related gesture in close association with the lexical verb being used, Mandarin speakers, in contrast, are likely to place an action-depicting gesture at the head of the phrase even though, in words, only the topic and not its action has been stated. It appears that the Mandarin structure affects gesture placement and that particular discourse structure elements may influence where a gesture phrase is placed in time. Although the current study looks at movement that is generally not associated with speech and has been coded from a nonverbal perspective, it would be productive to probe whether the differences of speed found here at levels 3 and 4 are precursors of some gesture patterns.

5.2. PATTERN VARIATION BETWEEN CHINESE-SPEAKING AND ENGLISH-SPEAKING CHILDREN. The emphasis of variation in the English-speaking child and the more steady movement levels of the Chinese-speaking child are echoed in two other studies—in the prewriting of two- and three-year-olds (Pine 1993) and in how Chinese and US adults hold young children (Pine 2005). In both cases the US participants exhibit a penchant for variety. The size of the US children's prewriting configurations (the marks preliterate children often make when pretending to write) varied widely at all ages, whereas the size of the Chinese children's configurations became steadily smaller with age and had more size consistency at all ages. In a study of adult interactions with young children, Chinese adults were found to hold babies and toddlers in an almost identical position with the child's head at eye level with the adult's eyes, whereas US adults were observed holding children in 10 distinct positions, varying from high on the hip with the child looking in a number of directions to flat against their bodies with their heads covered (Pine 1997:9). Although we cannot assume that these reveal perceptual development patterns that differentiate the two linguistic groups, it is worth noting that in these two studies plus the current one, the US samples exhibit a wide variation of behaviors, the Chinese samples a smaller variation.

5.3. THE IMPORTANCE OF DETAILS. We have found that the devil is indeed in the details. Our detailed coding and analyses, though critical for providing foundation information, yielded nothing of interest until we stepped back and listened to the remarks of the adults viewing video data of the other culture's looking events. Their spontaneous observations that the child from the other culture exhibited different behaviors were hard to ignore. It was this qualitative data, supplemented by our own coding-related hunches that the looking behavior of children from the two groups seemed somewhat different, that led us to look in detail at level 3 and 4 movement data. Only then did we find the marked differences between the English-speaking and Chinese-speaking child. Whether these different movement speeds and sequences are associated with specific language use is unknown.

Levinson (2003:43) has pointed out that the details of the world in which children interact will inform discerning toddlers again and again until they learn the detailed behaviors that are distributed throughout the language learning environment. From this perspective the nonverbal habits and incremental movements exhibited in the differentiated patterns of the two children in this study may help us to understand the interplay of movement, gestures, and speech.

---

1 Chinese refers to Putonghua, the 'common language'; data were collected in the People's Republic of China.

2 We selected ELAN (EUDICO Linguistic Annotator) software developed for the analysis of language, sign language, and gesture by the Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. Analyses of each part of the body within an event can be viewed simultaneously and the speed slowed to allow detailed movement analysis. Versions 2.3 and 2.4 for OS X were used. Last downloaded July 2006, *http://www.mpi.nl/tools*

3 Head tilt was controlled by the placement of materials—the Chinese-speaking child looking down at the sink while standing beside it; the English-speaking child looking down at his painting and hands from a sitting position. The feet of the 2 children were seldom visible in the videos.

4 Accuracy was also facilitated by discussions with researchers in the gesture group at the Max Planck Institute of Psycholinguistics and learning how they identify the on-set and trajectory of gestures. A special thanks is due Nick Enfield for organizing my many meetings there.

5 Yu Zhenyou has been central to this research. His early childhood expertise, careful collection of video data, and hours of discussion about coding parameters have been invaluable. Thanks also go to my Chinese colleagues who contributed to earlier looking-behavior studies, especially to Qiu Wei and her family and Zhang Yafei.

REFERENCES

Bowerman, Melissa & Soonja Choi. 2003. Space under construction: Language-specific spatial categorization in first language acquisition. In Gentner & Goldin-Meadow 2003, 387–417.

Emmorey, Karen. 2002. *Language, cognition, and the brain: Insights from sign language research*. Mahwah NJ: Lawrence Erlbaum.

Gentner, Deidre & Susan Goldin-Meadow (eds.) 2003. *Language in mind: Advances in the study of language and thought*. Cambridge MA: MIT Press.

Kuhl, Patricia K. 2004. Early language acquisition: Cracking the speech code. *Nature reviews neuroscience* 5:831–43.

Levinson, Stephen C. 2003. Language and mind: Let's get the issues straight! In Gentner & Goldin-Meadow 2003, 25–46.

Lucy, John A., & Suzanne Gaskins. 2001. Grammatical categories and the development of classification preferences: A comparative approach. In *Language acquisition and conceptual development*, ed. by Melissa Bowerman & Stephen C. Levinson, 257–83. Cambridge: Cambridge University Press.

———. 2003. Interaction of language type and referent type in the development of nonverbal classification preferences. In Gentner & Goldin-Meadow 2003, 465–92.

McNeill, David, & Duncan, Susan D. 2000. Growth points in thinking-for-speaking. In *Language and gesture*, ed. by David McNeill, 141–61. Cambridge: Cambridge University Press.

Pine, Nancy. 1993. A comparison of two cultures' complex graphical knowledge prerequisite to literacy. PhD diss., Claremont Graduate University, Claremont, California.

———. 1997a. Looking and noticing as culturally specific behavior. *LACUS forum* 23:509–20.

———. 1997b. Visual information seeking behavior in two cultures. Paper presented at the Pacific and Asian Communication Association Conference, Honolulu.

———. 2005. Visual information-seeking behavior of Chinese- and English-speaking children. In *LACUS forum* 31:289–300.

———. 2006. The visual path to literacy for Chinese and US children. Paper presented at the Faculty & Graduate Student Research Seminar, Nanjing University, Nanjing, People's Republic of China.