The Development of Gesture, Speech, and Action as Communicative Strategies

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0. Introduction

This paper examines relations between young children's gestures, utterances, and related actions, and the corresponding responses of adult caregivers. Previous research has shown that gesture and speech become integrated during the one-word period (Goldin-Meadow 1993). Prior to this integration, children make use of gestures or single words as a communicative strategy (Bates 1979, Butcher and Goldin-Meadow 2000). Integrating strategies allows a gesture to be used to direct a recipient's gaze toward a particular person, place, or thing, while words can be used to identify specific objects (Goldin-Meadow, Wein, and Chang 1992, Greenfield and Smith 1976). In this paper, I suggest that children employ *action* as a communicative strategy, together with speech and gesture. I show that when a child uses two, or three combined strategies (combinations of gesture, speech, action) they receive a higher percentage of responses from a recipient (i.e. acknowledgements of a communication) than when a single strategy is used.

1. Background

Research in language acquisition revolves primarily around the question of how young children learn to both produce and comprehend spoken utterances. Prior to the onset of speech, much of the language development research focuses on the ways that preverbal behaviors are related to the development of speech. In language development, gestural communication has an important role from the beginning. Gesture is seen as a precursor to verbal language development (Dore 1975, Acredolo and Goodwyn 1988). For example, babbles of Japanese babies have been found to be more syllable-like and canonical when they wave their arms and open and close their hands (Masataka 2000), and early motor activities such as reaching and grasping have been linked to gestural babbling (Carter 1979, Pettito and Marentette 1991). Further activities, such as an infant's ability to follow another person's gaze (Churcher and Scaife 1982) or a pointing gesture (Butterworth and Grover 1990) have also been seen as crucial in the infant's path

of development toward more structured gestural actions and toward verbal development (Sachs 1993).

In single-word speech, young children systematically combine early utterances with non-verbal acts. These often express associations between two different elements about which a child wants to communicate with relation to a single event. As children's spoken language skills develop, they rely less heavily on the use of gesture in communication than they do on spoken language skills (Carpenter, Naigle, and Tomasello 1998). However, gesture has been found to lighten the cognitive load in interaction (Goldin-Meadow this volume), and the communication skills children use when they employ gesture as a means of communication are an important basis for their later verbal development, particularly beyond the one-word stage.

Several researchers have examined response types that may occur when a child produces a point (Jones 2000, Wootton 1997). First, there could be a non-response, where the caregiver does not acknowledge the child's communicative gesture. This may cause the child to attempt to reinitiate the sequence. A second possibility is that the caregiver might clarify what the point is doing. Finally, a caregiver may make a guess about what the point is doing. In this paper, I am interested in each of these categories at a somewhat broader level. I am interested in non-responses versus responses, regardless of whether those responses are clarification or attempted guess responses. This paper asks the following questions: What types of strategies typically elicit a caregiver's response as opposed to non-response? Do combinations of strategies elicit more responses than use of single strategies? If so, which combinations of strategies elicit the most response?

1.1. Method

1.1.1. Subjects

Data for this study are from an audiovisual corpus collected one hour weekly over an 18 month period in a day care center in Santa Barbara. The study focuses on four children taped from around age 12-16 months together with their caregivers.

1.1.2. Data coding

The data were coded for several communicative strategies. A communicative strategy is the means by which a child initiates a communication. For each strategy coded, this typically involves the child looking at the caregiver and then moving their gaze toward a target object while using the strategy. The data were coded for three distinct communicative strategies. These are:

- *Vocalizations*, which may be words or proto-words (these are children's idiosyncratic but consistent attempts at producing adult words; for example, one child in the corpus uses [m★] to indicate that she wants a drink).
- *Gestures*, which are gestures directed at another individual. Two gesture types were coded according to coding laid out in Goldin-Meadow and Mylander (1984), including:

Point: a movement of the index finger or outstretched hand toward an object.
Gimme: holding out an open palm as if to receive an object; the palm may be turned upwards or sideward.

- *Actions*, which are movements toward or away from an object of attention in an effort to either grasp it or avoid it. Actions that are considered communicative are those where the child indicates an intention of an initiation to communicate. This is typically established through an engaged eye gaze to the caregiver. Not all actions are communicative; the additional cue of eye gaze must also be present for an action to be coded as communicative.

2. Results and discussion

Results indicate that across the four children single strategies were used most frequently, with 78 instances of a single strategy use, followed by 76 instances of a combination of two strategies, and 23 instances of use of three combined strategies. Data was coded by myself and a second coder. Cohen's kappa was significant at $p < .001$, $k = .868$, indicating high inter-coder reliability.

Table 1 below presents the results relating to the first question regarding which types of strategies typically elicit a caregiver's response as opposed to non-response. The figures indicate that speech and gesture strategies elicit the most responses.

QU 1: WHAT TYPES OF STRATEGIES TYPICALLY ELICIT A CAREGIVER'S RESPONSE?

strategies	***speech***		***gesture***		***action***		**Total**	
	n	*%*	n	*%*	n	*%*	n	*%*
response	16	*42*	12	*33*	0	*0*	28	*100*
non-response	22	*58*	24	*67*	4	*100*	50	*100*
Total	38	*100*	36	*100*	4	*100*	78	*100*

Table 1. Single communicative strategies across caregiver response

The highest percentage of caregiver responses to single strategies occurred when the child used a speech strategy. 42% of single utterances received a caregiver response. This was followed by 33% of single gestures receiving a response. No single actions garnered caregiver responses.

The small percentage of single action strategies and the lack of response to this strategy suggests that when it is the sole communicative strategy action does not have the same communicative value as gesture and speech. It is neither used by the child nor adhered to by the caregiver in the same way that the alternative strategies are. However, it must be noted that the use of action is not always an available option for children. Young children are often involved in activities that do not give them the freedom to move toward or away from an object they wish to

initiate a communication about. For example, one such incident involved a low-flying airplane near the day care center. Several children pointed and vocalized about this distant object, which they were not able to move toward. Another common instance of restricted movement is when a child is seated at a table and their chair is pulled close to the table edge, thus restricting their ability to move toward an object they are gesturing and or vocalizing about.

QU 2: DO COMBINATIONS OF STRATEGIES ELICIT MORE RESPONSES THAN USE OF SINGLE STRATEGIES?

Moving on to the second question of the paper, an investigation of whether combinations of strategies elicit a higher percentage of responses than use of single strategies, data indicates that the use of three combined strategies resulted in the highest percentage of caregiver responses, as seen in Table 2 below:

# of strategies	***one***		***two***		***three***	
	n	*%*	n	*%*	n	*%*
response	28	*38*	60	*79*	22	*96*
non-response	50	*62*	16	*21*	1	*4*
Total	78	*100*	76	*100*	23	*100*

Table 2. Caregiver responses across combinations of categories

Table 2 indicates that 96% of three combined strategies were responded to by the caregiver. The use of two combined strategies resulted in a response 79% of the time, while use of a single strategy was responded to 38% of the time. The figures indicate a higher response rate for combinations of strategies than for single strategies. The frequency of response is highest for the combination of all three strategies, indicating that combinations of strategies elicit more responses than use of single strategies.

The use of different communicative strategies by the children is illustrated in the transcript in (1) below. This transcript shows single strategies and combinations of strategies in an interaction between a caregiver and two children. In the scene presented here, Chera (aged 1;3) is sitting eating lunch and the caregiver is sitting near her. Beside the table Chera is eating at, there is a smaller table with her lunch containers and bottle. The transcript begins when Brailey (aged 1;0) moves toward the table and vocalizes. The number of strategies in this short interaction is not indicative of the frequency of strategies as a whole across the database. Meal times tend to be particularly fruitful places for finding both pointing and gimme gestures. This is largely due to the fact that for many children other children's food is usually more interesting and sought after than their own.

In the transcript below, the numbers in the left hand column represent strategy sequence numbers and relate to the adjacent strategy labels in the column beside them. These in turn relate to the information in the columns headed Brailey and

Caregiver. The numbers in the # column refer to the total number of strategies for each sequence. I have placed the category of *gaze* in the 'strategy' column, although, as mentioned in 2.2, gaze is not a strategy. A gaze is used by the child to mark the intention of an initiation to communicate, which is the first step in coding each of the communicative strategies.

In sequence 1 in the following transcript, Brailey uses a single communicative strategy; an utterance "de" and receives no response from the caregiver. In 2, he uses two strategies, an utterance "yeya" which combines with a gesture (a point toward food containers on the table). Here he receives the response "That's Chera's lunch". In 3, Brailey points to the container again and combines this with an utterance "da" and the caregiver responds with "That's Chera's". In 4, Brailey then moves his focus to the smaller table the containers are on, and points to that, combining this gesture with the utterance "da". This receives a minimal response of "Ahem" from the caregiver, who then turns to focus on Chera (who, incidentally, is pointing or reaching toward her food throughout this interaction, but is not responded to until she verbalizes). Brailey then moves away from the table and is out of camera range for 11 seconds. He moves back into range and as can be seen in 5 he points to and touches a food container while saying "da". This combined strategy receives no response from the caregiver; however, in 6, when Brailey adds the action of attempting to pick up the container, the caregiver shifts her attention from Chera, who still has her hand out in a reaching gesture, and turns around to face Brailey. She then responds by physically intervening between him and the containers while saying "That's Chera's, I don't want you to pick it up". In 7, when Brailey continues to combine three communicative strategies, the caregiver again physically intervenes while asserting the fact that "That's Chera's too". In 8, Brailey returns to combining just two strategies, utterance and action, because his action involves drawing the container to him with both hands. The object that has been the referent of his gestures all along is now in his grasp and he therefore has no need for the pointing gesture he has been using. This combined action-plus-utterance strategy leads to the fullest spoken response thus far when the caregiver says "Brailey, I don't want you to play in Chera's food". She then takes the final action of the sequence, which is to move Brailey away from the table where the lunch containers are.

(1)

Time		Strategy	Brailey (12 months)	Caregiver	#
	1	**gaze**	on lunch containers		1
35:02		**utterance**	de	*No response*	
	2	**gaze**	on one lunch container		2
35:05		**utterance**	yeya [Chera]	That's Chera's lunch	
35:05		**gesture**	points to container	(focuses on other child)	
	3	**gaze**	still on lunch container		2
35:08		**utterance**	de	That's Chera's	
35:10		**gesture**	points to container (finger touches it)		
	4	**gaze**	moves to table		2
35:13		**utterance**	da	uh-hm	
35:13		**gesture**	points to table	(focus moves to other child)	
			[moves out of view]		
	5	**gaze**	on food containers		2
35:31		**utterance**	da	*No response*	
35:31		**gesture**	points to and touches container	(focus is on other child)	
	6	**gaze**	on one container	*physical intervention*	3
35:33		**gesture**	pointing	That's Chera's; I don't want you to pick it up.	
35:34		**utterance**	da		
35:35		**action**	touching then picking up		
	7	**gaze**	on different container	*physical intervention*	3
35:42		**utterance**	da .. da … da	That's Chera's too	
35:42		**gesture**	points to new container	mhm	
35:42		**action**	attempting to pick up container		
	8	**gaze**	on food container	*physical intervention*	2
35:46		**action**	draws container to him with both hands	(moves child away)	
35:47		**utterance**	da	Brailey I don't want you to play in Chera's food	

These interaction sequences nicely illustrate children's use of single and multiple strategies and the types of responses these strategies receive from caregivers. They show how the use of different strategies and combinations of strategies can result in different caregiver responses. The interaction between Brailey and the caregiver throughout the time that Chera is gesturing toward her food indicates a circumstance where a child using just one single strategy forfeits the attention of the caregiver, whose focus moves to the child who is using combined strategies.

It is possible to see this interaction as an escalation of strategies due to Brailey's persistence in trying to get to the containers, and this persistence as being the motivation for the caregiver's response, not the use of multiple strategies. Table 3 below presents a partialling out of interaction strategies on the basis of whether the caregiver is attempting to monitor or moderate a child's behavior. Restricted strategies are those where the caregiver responds to the child with a direct comment on their behavior, as in (1) above when the caregiver says "Brailey I don't want you to play in Chera's food".

# of strategies	***one***		***two***		***three***		**Total**	
	n	*%*	n	*%*	n	*%*	n	*%*
restricted	1	*25*	2	*7*	1	*5*	4	*8*
non-restricted	3	*75*	26	*81*	22	*95*	51	*92*
Total	4	*100*	28	*100*	23	*100*	55	*100*

Table 3. Restricted versus non-restricted action strategies

The distinction highlighted in Table 3 is between those interactions when a caregiver is explicitly attempting to monitor a child's actions in some way and those when the child's actions are not an issue. Results in Table 3 indicate that of the 55 action strategies, 4 (7%) were coded as being responded to with a behavior monitoring comment. The transcript in (2) below illustrates use of multiple strategies and caregiver response when the response is not for behavior monitoring purposes.

In the following transcript, Chera (aged 1;3) is sitting eating lunch with some other children and the caregiver is sitting across the table from her. In sequence 1, Chera sees some snacks on the table and points toward them while looking at the caregiver who is facing her, but gives no response. In 2, she then sees a bag of pretzels near the caregiver and reaches toward it. She receives no response from the caregiver and moves her attention to a container of pasta. In sequence 3, she points to the container saying "baba". Chera has escalated her use of strategies in this sequence, using both gaze and gesture, and she receives a response from the caregiver, who encourages her to try some pasta. In 4, Chera then holds her gaze on the pasta and there is a 7 second pause between the caregiver's suggestion to try some and Chera's response with "ba", which she says as she attempts to stand up and simultaneously reach toward the pasta.

(2)

Time		Strategy	Chera (15 months)	Caregiver	#
	1	**gaze**	on caregiver		
06:58		**gesture**	points to snacks on table	*No response*	1
	2	**gaze**	on bag of pretzels		
07:02		**gesture**	reaches for bag	*No response*	1
	3	**gaze**	moves to pasta container		
07:06		**utterance**	baba		
07:06		**gesture**	points to container of pasta	Do you know what this is? This is pasta. Do you want to try a bite?	2
	4	**gaze**	on pasta in front of her		
07:13		**utterance**	ba		3
07:13		**gesture**	points to pasta	No?	
07:14		**action**	attempts to stand up and reach for pasta		

In this interaction we can see an increase in the number of strategies used by the child, although the caregiver responses are very different from those illustrated in (1) above. The strategy used in this transcript reflects the findings presented in Table 2 above with relation to caregiver responses across communicative strategies. The number of strategies used by Chera increased with each sequence; however, there was no corresponding behavior-monitoring by the caregiver, such as the monitoring of Brailey's behavior in (1) above. Caregiver response is clearly not just triggered by persistent behavior such as Brailey's in (1), as, when we look at (2), we can see that Chera's multi-strategy use did not trigger a behavior-based comment and yet she still received responses when she used more than one strategy. The caregiver responded to the children's use of communicative strategies regardless of their behavior.

QU 3: WHICH COMBINATIONS OF STRATEGIES ELICIT THE MOST RESPONSE?

A tally of the most frequent strategy combinations in the transcripts in (1) and (2) suggests that the most frequent combination of strategies is utterance and gesture. This is not, however, reflective of the overall results of the study, as we can see when we look at results for the third question regarding which combinations of strategies gain the most response. Table 4 below indicates that the combination most frequently responded to was speech and action, with 87% of speech and action strategies receiving a caregiver response, followed by action and gesture with 83% and speech and gesture with 75%.

strategies	***speech/gesture***		***speech/action***		***gesture/action***	
	n	*%*	n	*%*	n	*%*
response	36	*75*	14	*87*	10	*83*
non-response	12	*25*	2	*13*	2	*17*
Total	48	*100*	16	*100*	12	*100*

Table 4. Combined communicative strategies across caregiver response

The results in Table 4 indicate that there were minimal differences in response frequency between the combined strategy pairs, and these are not statistically significant (χ^2 (df=2, n=76) = 3.78 p <.05).[1] Regardless, there are several ways of combining these pairs, all of which are more effective than single strategy uses.

This finding indicates the importance of children's use of action alongside speech and gesture as a means of eliciting recipient responses to communicative strategies. The two primary combined strategies included action, which we noted with relation to question one, is not an important communicative strategy on its own. It is, however, important as a strategy in combination with either speech or gesture and more so with them both. Although action is not always an available choice for young children, when it is used, it is a valuable resource in initiating communication.

3. Conclusion

Overall, results from this study indicate that the use of an integrated system results in a higher percentage of responses from a caregiver than the use of single communicative strategies. Children received a higher percentage of responses from a recipient when they used two or three combined communicative strategies than when they used a single strategy. In their use of two combined strategies, children received the highest response using a speech and action strategy; however, response differences across strategy pairs were not significant.

Results presented in this study indicate that caregiver response differs across different types and frequencies of communicative strategies. This finding provides insight into a motivating factor of children's development from using independently functioning gesture and speech systems to use of an integrated gesture/speech/action modality.

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[1] Expected frequency was < 5 in two cells.

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