When Gestures and Words Speak Differently

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Consider a 6-year-old child attempting to justify her belief that the amount of water changed when it was poured from a tall, skinny glass into a short, wide dish. The child says, "It's different because this one's tall and that one's short," thus making it clear that she has focused on the heights of the containers. However, in the very same utterance, the child indicates with her hand shaped like a C first the diameter of the glass and then, with a wider C, the larger diameter of the dish. The child speaks about the containers' heights but has also noticed—not necessarily consciously—that the containers differ in width as well.

This child has produced a gesture-speech mismatch—a communicative act in which the information conveyed in gesture is different from the information conveyed in the speech the gesture accompanies. In a mismatch, the child conveys two distinct ideas about the very same problem. If given instruction in the task, children who produce mismatches are likely to profit from that instruction—more likely than children who do not produce mismatches. Gesture-speech mismatches are not unique to 6-year-olds, however. They are produced by toddlers, preschoolers, school-aged children, adolescents, and even adults. Nor are mismatches restricted to water puzzles; they can be found in spontaneous talk, narratives, reasoning about math and physics problems, moral dilemmas, and many other contexts.

What might cause speakers to produce gesture-speech mismatches in particular, and gestures in general? What functions, if any, do the gestures that accompany speech serve? In this review, I summarize a line of research suggesting that gesture plays a role as a unique index of learners' thoughts, and perhaps as a mechanism for change as well.

Recommended Reading

Emmorey, K., & Reilly, J. (Eds.). (1995). *Language, gesture, and space.* Hillsdale, NJ: Erlbaum.

Goldin-Meadow, S., McNeill, D., & Singleton, J. (1996). Silence is liberating: Removing the handcuffs on grammatical expression in the manual modality. *Psychological Review, 103,* 34–55.

Iverson, J.M., & Goldin-Meadow, S. (Eds.). (in press). *The nature and functions of gesture in children's communication* (New Directions for Child Development, No. 80). San Francisco: Jossey-Bass.

Krauss, R.M., Chen, Y., & Chawla, P. (1996). Nonverbal behavior and nonverbal communication: What do conversational hand gestures tell us? In M.P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 389–450). San Diego: Academic Press.

McNeill, D. (1992). (See References)

GESTURE AS A WINDOW TO THE MIND

Gestures have attracted attention for at least two millennia. Initially, the focus was the hand's role in rhetorical oratory. Speakers of the day were advised how to display their hands to underscore points in their presentations, a practice that continues today in the lessons politicians receive in how to appear convincing, forthright, firm, or sympathetic.

Although gesture has always been considered relevant to talk, it has usually been viewed as a stream separate from speech, one that may reflect the attitudes and feelings of speakers but is not centrally involved in language. It was not until the publication in 1992 of David McNeill's ground-breaking book *Hand and Mind* that gesture became a "legitimate" interest of language researchers. According to McNeill, gesture forms a wholly integrated system with speech and, as such, can reveal much about the way thoughts are transformed into communication.

Speech conveys meaning by rule-governed combinations of discrete units, codified according to the norms of that language. In contrast, gesture conveys meaning mimetically and idiosyncratically through continuously varying forms (McNeill, 1992).[2] For example, the gestures accompanying a description of the east coast of the United States may convey aspects of the coastline that would be difficult, if not impossible, to convey in speech. Because gesture rests on different representational devices than speech and is not dictated by standards of form as is speech, it offers another view into the mind of the speaker, displaying thoughts that are not always conveyed in the speech it accompanies.

GESTURE-SPEECH MISMATCH AND LEARNING

My focus here is not on the conventional gestures that have acknowledged meanings within a culture (e.g., thumbs up). Such gestures, called *emblems* (Ekman & Friesen, 1969), are interpretable even without speech. Rather, I focus on the nonconventional gestures that are spontaneously produced along with speech and, to a certain extent, depend on the frame created by speech for their interpretation.

To code the spontaneous gestures produced on a given task, my co-workers and I first develop a gestural lexicon for that task. We assign meaning to each gesture on the basis of the shape of the hand and form of the motion in relation to the speech it accompanies. For example, a flat palm held horizontally without movement at the water level of a container is the gesture that typically accompanies height explanations in speech on a conservation task[3] ("it's tall"); we therefore assign the meaning "height" to this gesture form. We then use the form-meaning pairings that result from this process to code gestures produced by other children whose performance on this same task has been videotaped. One experimenter codes gesture without listening to the accompanying speech (i.e., with the sound turned off), and another codes speech without watching gesture (i.e., with the picture turned off). A response is considered a mismatch if the meaning assigned to gesture is different from the meaning assigned to speech. If, for example, gesture is assigned the meaning "height" by one coder and speech is assigned the meaning "width" by another, the response as a whole is considered a mismatch.

Utterances in which gesture and speech convey different information are not exclusive to a particular age or task, nor are they a characteristic of individuals. The same child who produces many mismatches on one task can produce none on another (Perry, Church, & Goldin-Meadow, 1988). Gesture-speech mismatch does, however, appear to be a characteristic of children who are in transition with respect to a given task. Two types of evidence, obtained from children asked to explain their solutions on a task, support this claim:

- Children who produce a relatively large proportion of gesture-speech mismatches when explaining their (incorrect) solutions to a task are particularly likely to benefit from instruction on that task, reliably more than children who produce few mismatches. Mismatch has been found to be an index of readiness to learn in conservation tasks (Church & Goldin-Meadow, 1986) and mathematical equivalence tasks (e.g., 5 + 4 + 3 = _ + 3; Perry et al., 1988). Mismatch marks a learner as being open to instruction and, in this sense, in transition.

- In acquiring the concept of mathematical equivalence, children progress from a stable state in which they produce gesture-speech matches conveying incorrect procedures, through an unstable state in which they produce many gesture-speech mismatches, to another stable state in which they again produce gesture-speech matches, now conveying correct procedures (see Table 1; Alibali & Goldin-Meadow, 1993). During the unstable state, children's speech may convey procedures that lead to incorrect solutions, and gesture may convey procedures that lead to correct solutions (as shown in the middle column of Table 1). But speech may also convey correct procedures while gesture conveys incorrect procedures, or gesture and speech may both convey incorrect procedures. The few children who skip the mismatching state and go directly from an incorrect matching state to a correct matching state do reliably less well when tested later than do those who pass through the mismatching state, suggesting that the skippers have not truly

Table 1. *Examples of explanations children use as they progress toward mastery of mathematical equivalence*

	Responses generated for the problem 5 + 4 + 3 = _ + 3		
Modality	Matching explanations (incorrect)	Mismatching explanations[a]	Matching explanations (correct)
Speech	"I added the 5, the 4, and the 3" (add to equal sign)	"I added the 5, the 4, and the 3" (add to equal sign)	"I added 5 and 4 and got 9" (grouping)
Gesture	Points at the 5, the 4, and the 3 (add to equal sign)	Makes a V shape with the hands under the 5 and 4 (grouping)	Makes a V shape with the hands under the 5 and 4 (grouping)

[a]Children also produce mismatching explanations in which speech conveys a correct procedure and gesture conveys an incorrect procedure (e.g., "grouping" in speech accompanied by "add to equal sign" in gesture), and explanations in which speech and gesture both convey incorrect, but different, procedures (e.g., "add to equal sign" in speech accompanied by a point at each of the four numbers in the problem, i.e., "add all numbers," in gesture).

mastered the concept. The mismatching state is thus sandwiched between two matching states and, in this sense, is a transitional period.

When a child produces a gesture-speech mismatch, the child is expressing two distinct ideas, one in speech and one in gesture (see Table 1). Do such children activate two ideas when solving problems on-line as well as when explaining them after the fact? My colleagues and I assumed that activating two ideas while working on a single problem would take effort, and we determined how much effort a child expended on a math problem by asking the child to simultaneously remember a list of words. We reasoned that the more ideas a child activated when working on a problem, the more effort the child would expend on that problem, leaving less memory available for recalling the word list.

We chose math problems that none of the children solved correctly. Some, but not all, of the children produced many gesture-speech mismatches when explaining their incorrect solutions. We expected these children, when later asked to solve the same types of problems without explaining them, to expend more cognitive effort to arrive at their incorrect solutions than children who did not produce gesture-speech mismatches. The mismatchers did indeed remember reliably fewer items from the word list than the matchers, suggesting that they had in fact worked harder on the math problems (Goldin-Meadow, Nusbaum, Garber, & Church, 1993). These findings are consistent with the idea that mismatchers activate more than one idea when solving a single problem—and that the cognitive state that underlies mismatch involves having, and using, two ideas on one task.

GESTURE PROVIDES A UNIQUE VIEW INTO WHAT THE LEARNER IS THINKING

By definition, the information conveyed in gesture in a mismatch is different from the information conveyed in the speech that accompanies the gesture. However, it often turns out that the information conveyed in gesture in a child's mismatch cannot be found anywhere in that child's speech repertoire—that is, the information is unique to gesture (Goldin-Meadow, Alibali, & Church, 1993). Thus, for example, the child who produced the mismatching explanation shown in Table 1 expressed the "grouping" idea only in gesture; he did not express this idea in speech in any of the explanations he gave. Moreover, children who produce many mismatches tend to have more procedures overall for solving problems than do children who produce few, and all of the "extra" procedures are unique to gesture.

What happens to the size of children's repertoires when they are given instruction in a task? When children progress from an incorrect matching state to a mismatching state in mathematical equivalence, the number of procedures they have in their repertoires increases, and when they progress from a mismatching state to a correct matching state, the number of procedures in their repertoires decreases (Alibali & Goldin-Meadow, 1993).

What about children who make no progress after instruction? Predictably, children who make no progress remain either matchers or mismatchers and continue to produce the same small (for the matchers) or large (for the mismatchers) number of different procedures in their explanations. To maintain the same number of procedures in their repertoires over time, children can, of course, retain their old procedures and do little else. This, in fact, is the strategy that children who remain matchers follow. However, children who remain mismatchersfollow a different strategy after instruction. Although they maintain some of their old procedures, they also generate many new procedures, abandoning old ones to keep the number of procedures in their repertoires constant (Alibali, 1994; Goldin-Meadow & Alibali, 1995).

Interestingly, almost all of the new procedures that the children generate are conveyed uniquely in gesture. The variability in procedures that many theorists consider essential to developmental progress (e.g., Siegler, 1994; Thelen, 1989) is indeed present in these children—in their gestures. The newly generated thoughts that the children are experiencing can be detected, but only by looking at their hands, not by listening to their words.

INFORMATION CONVEYED IN GESTURE IS NOT TIED TO THE HANDS

Much of the information conveyed by gesture in a child's mismatch cannot be found anywhere in that child's speech. Why, then, do we think children's gestures convey substantive information? Although we experimenters can reliably interpret the gestures children produce, what evidence do we have that these interpretations are valid for the children?

To answer this question and, at the same time, determine whether children themselves have access to the information that we hypothesize they convey in gesture, my colleagues and I presented them with solutions derived from the procedures they produced uniquely in gesture, and asked whether they judged those solutions to be acceptable answers to the problems. For example, a child who produced "add to equal sign" (see Table 1) uniquely in gesture would later be asked whether 12, the solution generated by this procedure, was an acceptable response to the problem 5 + 4 + 3 = _ + 3. Children reliably rated procedures that they produced uniquely in gesture as more acceptable than procedures they did not produce in either gesture or speech (Garber, Alibali, & Goldin-Meadow, in press). These findings suggest not only that we were correct in attributing procedural meanings to the children's gestures, but also that the children themselves have access (albeit not necessarily explicit access) to the knowledge displayed uniquely in their gestures.

DO GESTURES COMMUNICATE?

Gesture conveys information that could be useful to listeners. For example, a teacher might wish to be aware of the budding ideas children express uniquely in gesture as they grapple with a problem. Is there evidence that the information displayed in gesture is accessible to ordinary listeners not trained in laboratory settings?

This question remains unsettled. Kendon (1994) concluded that listeners do attend to gesture and alter their understandings of utterances accordingly. Other investigators argue that the gestures accompanying speech have little communicative value (e.g., Krauss, Morrel-Samuels, & Colasante, 1991). On the one hand, studies supporting the idea that gestures have communicative value do not always control the type of speech that accompanies gesture. On the other hand, studies that fail to find a communicative role for gesture often narrow the field too much and explore only gestures that are redundant with the speech they accompany (gesture-speech matches). Neither type of study has systematically explored whether gesture that conveys different information from speech communicates substantive information to the listener. Indeed, one might expect that it is precisely in situations of gesture-speech mismatch that gesture can play its largest role in communication.

A number of recent studies have found that ordinary listeners can reliably read gesture when it conveys different information from speech (Alibali, Flevares, & Goldin-Meadow, 1997; Goldin-Meadow, Wein, & Chang, 1992; McNeill, Cassell, & McCullough, 1994; Thompson & Massaro, 1994), even when gesture is unedited and fleeting, as it is in natural communication (Goldin-Meadow & Sandhofer, 1997). For example, consider a child who saw two rows of equal numbers of checkers and then watched one row being spread out so that it took up more space. He said (incorrectly), "They're different because you moved them," but with his hands, he matched the checkers in the two rows in a one-to-one fashion. When asked to assess this child's understanding of the task, an adult attributed to the child reasoning based on one-to-one correspondence (which appeared only in the child's gesture), as well as reasoning based on the fact that the checkers had been moved (which appeared in the child's speech). Thus, listeners can take advantage of the unique insight gesture offers into the thoughts speakers have but do not express in words.

Given that a listener can extract substantive information from gesture, it is perhaps not surprising that speech can be affected by the gestural company it keeps. Interestingly, however, gesture seems to hinder recognition of speech but not help it. That is, gesture decreases recognition of a message produced in speech if it conveys a different message (Goldin-Meadow & Sandhofer, 1997; Kelly & Church, in press), but does little to improve recognition of a spoken message if it conveys the same message (Krauss et al., 1991). Indeed, in current analyses of one-on-one instruction, we are finding that children are less likely to repeat the mathematical procedure a teacher gives in speech if that speech is accompanied by a mismatching gesture than if it is accompanied by a matching gesture or no gesture at all.

Thus, gesture can convey information, not only to well-trained gesture coders who have the advantage of time and instant replay on their side, but also to naive listeners who frequently give little conscious attention to gesture but interpret it nonetheless. In this way, gesture can play an indirect role in effecting cognitive change. Gesture can signal to people in the child's learning environment that a particular notion is in the child's repertoire (albeit implicitly). Listeners may then alter their behavior accordingly, perhaps giving explicit instruction in that notion, if it is correct, or providing input that encourages the child to abandon the notion, if it is not on the right track. If gesture can play this type of role in spontaneous interaction, children may be able to shape their own learning environments just by moving their hands.

THE COGNITIVE FUNCTIONS OF GESTURE

The fact that gesture can communicate information to a listener does not mean that speakers intentionally fashion their gestures for this purpose. There is some evidence that speakers gesture more when a listener can see their gestures than when the listener cannot (Cohen & Harrison, 1973). However, increased gesture production in such a situation could easily be a natural outgrowth of the speech production process, which itself is likely to be affected by the presence of a listener. Moreover, speakers do gesture on the telephone and when listeners cannot see them. Indeed, even blind speakers gesture, though they themselves have never seen gesture (Iverson & Goldin-Meadow, 1997).

In addition, the fact that gesture can communicate information to a listener does not at all preclude the possibility that gesture has other, noncommunicative functions. Gesture could, for example, have a cognitive function. Rauscher, Krauss, and Chen (1996) have made a convincing case that gesture plays a role in the retrieval of words from memory. Also, children participating in science lessons frequently use gesture to foreshadow the ideas they themselves eventually express in speech (Crowder, 1996), perhaps needing to express those ideas in a manual medium before articulating them in words.

A great deal of development involves redistributing strategies already in the learner's repertoire—that is, learning when it is appropriate to activate one strategy and not another (Kuhn, Garcia-Mila, Zohar, & Andersen, 1995). One very important component of this developmental process is the generation of new knowledge to add to the mix. Gesture offers a process by which learners can bring new information into their repertoires without disrupting the current system. Because gesture is uncodified and not susceptible to cultural approbation (speakers are rarely criticized for their spontaneous gestures), it is an ideal modality within which to work out and even consider for the first time notions that are wild, untamed, and inchoate. Moreover, because the representational formats underlying gesture are mimetic and analog rather than discrete, gesture may permit the learner to represent ideas that lend themselves to these formats and that are not yet developed enough to be encoded in speech.

For example, a child who says that she "added the 5, the 4, the 3, and the 3 and got 15" for the problem in Table 1 displays, in her speech, no awareness that the equation has two sides divided by an equal sign. However, she may move her hand under the left side of the equation, then break the motion and perform precisely the same movement under the right side of the equation. Such a gesture reflects a budding awareness that the two sides are in some way alike, although the child does not have an explicit understanding of the significance of the equal sign.

Once having entered the child's repertoire, these ill-formed ideas can begin to change the system. If, for example, this learner notices her own gestures, she may be confronted in a gentle way with the disparity between her explicitly acknowledged system (the unbroken string of numbers articulated in speech) and her newly emerging ideas (the two parts to the equation displayed in gesture), and thus may be encouraged to change the system. It may even be sufficient for the learner to produce an idea in the manual modality without ever taking it in visually, a hypothesis that can be tested using blind speakers who never see their own gestures.

By offering an alternative route in which developing ideas can be tried out and expressed, gesture may itself facilitate the process of change. Gesture may thus contribute to the learning process not only by providing a unique view of the learner's thoughts, useful to experimenters and communication partners alike, but perhaps by stimulating those thoughts as well.

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Notes

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2. It is worth noting that gesture can take on other forms and other roles in communication. If necessary, the manual modality can assume the linear, segmented forms characteristic of speech, as in, for example, conventional sign languages of the deaf (Klima & Bellugi, 1979) or the nonconventional gesture systems invented by deaf children not exposed to sign language (Goldin-Meadow, 1997). Gesture's flexibility allows it to assume an analog and mimetic form when it accompanies speech and a discrete form when it must fulfill the functions of language on its own. Indeed, it may be this flexibility that has made language the province of speech: Although gesture can fulfill either role (the analog or the discrete), speech is better suited to one (the discrete), and thus, by default, the other (the analog) falls to gesture (Goldin-Meadow & McNeill, in press).

3. Conservation tasks were developed by Piaget (1941/1952) to explore children's understanding of concepts such as liquid quantity, length, and number. In the liquid-quantity task, the experimenter pours water from a tall, skinny glass into a short, wide dish. The child is asked first to judge whether the dish contains the same or a different amount of water as the glass, and then to explain that judgment.

References

Alibali, M.W. (1994). *Processes of cognitive change revealed in gesture and speech.* Unpublished doctoral dissertation, University of Chicago, Chicago, IL.

Alibali, M.W., Flevares, L., & Goldin-Meadow, S.

(1997). Assessing knowledge conveyed in gesture: Do teachers have the upper hand? *Journal of Educational Psychology, 89,* 183–193.
Alibali, M.W., & Goldin-Meadow, S. (1993). Gesture-speech mismatch and mechanisms of learning: What the hands reveal about a child's state of mind. *Cognitive Psychology, 25,* 468–523.
Church, R.B., & Goldin-Meadow, S. (1986). The mismatch between gesture and speech as an index of transitional knowledge. *Cognition, 23,* 43–71.
Cohen, A.A., & Harrison, R.P. (1973). Intentionality in the use of hand illustrators in face-to-face communication situations. *Journal of Personality and Social Psychology, 28,* 276–279.
Crowder, E.M. (1996). Gestures at work in sense-making science talk. *Journal of the Learning Sciences, 5,* 173–208.
Ekman, P., & Friesen, W.V. (1969). The repertoire of non-verbal behavior: Categories, origins, usage and coding. *Semiotica, 1,* 49–98.
Garber, P., Alibali, M.W., & Goldin-Meadow, S. (in press). Knowledge conveyed in gesture is not tied to the hands. *Child Development.*
Goldin-Meadow, S. (1997). The resilience of language in humans. In C.T. Snowdon & M. Hausberger (Eds.), *Social influences on vocal development* (pp. 293–311). New York: Cambridge University Press.
Goldin-Meadow, S., & Alibali, M.W. (1995). Mechanisms of transition: Learning with a helping hand. In D. Medin (Ed.), *The psychology of learning and motivation* (Vol. 33, pp. 115–157). New York: Academic Press.
Goldin-Meadow, S., Alibali, M.W., & Church, R.B. (1993). Transitions in concept acquisition: Using the hand to read the mind. *Psychological Review, 100,* 279–297.
Goldin-Meadow, S., & McNeill, D. (in press). The role of gesture and mimetic representation in making language the province of speech. In M.C. Corballis & S. Lea (Eds.), *Evolution of the hominid mind.* Oxford, England: Oxford University Press.
Goldin-Meadow, S., Nusbaum, H., Garber, P., & Church, R.B. (1993). Transitions in learning: Evidence for simultaneously activated strategies. *Journal of Experimental Psychology: Human Perception and Performance, 19,* 92–107.
Goldin-Meadow, S., & Sandhofer, C.M. (1997). *Gesture conveys substantive information about a child's thoughts to ordinary listeners.* Manuscript submitted for publication.
Goldin-Meadow, S., Wein, D., & Chang, C. (1992). Assessing knowledge through gesture: Using children's hands to read their minds. *Cognition and Instruction, 9,* 201–219.
Iverson, J.M., & Goldin-Meadow, S. (1997). What's communication got to do with it? Gesture in children blind from birth. *Developmental Psychology, 33,* 453–467.
Kelly, S., & Church, R.B. (in press). A comparison between children's and adults' ability to detect conceptual information conveyed through nonverbal behaviors. *Child Development.*
Kendon, A. (1994). Do gestures communicate?: A review. *Research on Language and Social Interaction, 27,* 175–200.
Klima, E., & Bellugi, U. (1979). *The signs of language.* Cambridge, MA: Harvard University Press.
Krauss, R.M., Morrel-Samuels, P., & Colasante, C. (1991). Do conversational hand gestures communicate? *Journal of Personality and Social Psychology, 61,* 743–754.
Kuhn, D., Garcia-Mila, M., Zohar, A., & Andersen, C. (1995). Strategies of knowledge acquisition. *Monographs of the Society for Research in Child Development, 60*(4, Serial No. 245).
McNeill, D. (1992). *Hand and mind.* Chicago: University of Chicago Press.
McNeill, D., Cassell, J., & McCullough, K.-E. (1994). Communicative effects of speech-mismatched gestures. *Research on Language and Social Interaction, 27,* 223–237.
Perry, M., Church, R.B., & Goldin-Meadow, S. (1988). Transitional knowledge in the acquisition of concepts. *Cognitive Development, 3,* 359–400.
Piaget, J. (1952). *The child's conception of number* (C. Gattegno & F.M. Hodgson, Trans.). London: Routledge & Kegan Paul. (Original work published 1941)
Rauscher, F.H., Krauss, R.M., & Chen, Y. (1996). Gesture, speech, and lexical access: The role of lexical movements in speech production. *Psychological Science, 7,* 226–231.
Siegler, R.S. (1994). Cognitive variability: A key to understanding cognitive development. *Current Directions in Psychological Science, 3,* 1–5.
Thelen, E. (1989). Self-organization in developmental processes: Can systems approaches work? In M. Gunnar & E. Thelen (Eds.), *Systems and development: The Minnesota Symposium on Child Psychology* (pp. 77–117). Hillsdale, NJ: Erlbaum.
Thompson, L.A., & Massaro, D.W. (1994). Children's integration of speech and pointing gestures. *Journal of Experimental Child Psychology, 57,* 327–354.

Why Child Care Has Little Impact on Most Children's Development

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Today, more American children are cared for by paid providers than by full-time parents. In 1995, there were nearly 21 million children under the age of 5 years who were not yet enrolled in school. Of these, about 40% were cared for regularly by parents, 21% were cared for by other relatives, 31% were enrolled in child-care centers, 14% received care in family day-care homes, and 4% were cared for by sitters in the child's home.[2] From 1970 to 1994, mothers of children under 6 years more than doubled their labor force participation, to 62% from 30% (Hofferth, 1996). The prevalence of care by nonrelatives in the past two decades has alarmed parents, government agencies, and the research community. Parents and relatives presumably have emotional investments in the child's well-being that nonrelatives may not have. Thus, attention has been focused on the possibly damaging effects on children of purchased child care.

Recommended Reading

Clarke-Stewart, K.A. (1989). (See References)
Lamb, M. (in press). (See References)
Scarr, S. (in press). (See References)
Scarr, S., & Eisenberg, M. (1993). (See References)

FROM WORKING MOTHERS TO CHILD-CARE ECOLOGY

Three waves of child-care research demonstrate the changing zeitgeist surrounding nonmaternal care (Belsky, 1984; McCartney & Marshall, 1989). In the 1970s, the first wave compared maternal care with any kind of nonmaternal care, without assessing the quality of either setting. The implicit research question was, How much damage is done to infants and young children by the fact that their mothers are working?

The second wave examined the quality and variety of child-care