

Search on a Five Choice Invisible Displacement Hiding Task: A Rejoinder to Schuberth and Gratch*

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Several aspects of Schuberth and Gratch's (1981) reply to Cummings and Bjork (1981) require comment. First, while we appreciate Schuberth and Gratch's desire to examine the replicability of our findings, a sample of eight infants is too small to allow for an adequate test. The use of small samples must always be viewed with caution, and it is a particular concern in object permanence research because of the considerable individual variation in task performance, even among infants who are the same age.

Second, Schuberth and Gratch overstate the differences between the findings of the two studies. After presenting their results, Schuberth and Gratch assert that their findings are "grossly different" from ours. However, an examination of the data reveals that the findings of the two studies are similar on every trial but one. In fact, Schuberth and Gratch make this point themselves during the course of presenting their results. Therefore, their description of the results of the two studies as "grossly different" is misleading.

Third, our position with regard to the frequency of the \overline{AB} error seems to have been misunderstood. It is not our contention that searches at the A location during B hiding trials can *only* be produced as an artifact of a two-choice procedure. Instead, our claim is that the A location does not have a unique hold on

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infant cognition simply because it was the first place where the infant found the object. According to our memory hypothesis, whether infant search is directed at the A location during B-hiding trials should largely depend upon the information processing demands of the task. Thus, if the A location were the closest hole to the correct location (or were very similar to it in some other way) one should expect a high frequency of searches at the A location even on a five-choice task. Or, one might expect to increase the frequency of searches at the A location during B-hiding trials by diverting the infant's attention to the A location at or just before the time the infant needs to retrieve information concerning the correct location (for instance, Harris, 1973). Infants may also err at the A location because they are inattentive, or because they are so overwhelmed by the information processing demands of the task that they search at random. Therefore, even when the A location is the furthest hole from the correct location, one could expect some search at the A location, particularly on the more difficult B-hiding trials, i.e., the first and second B trials.

In order to challenge our position regarding the \overline{AB} error in the current task context, it is necessary to show that the \overline{AB} error occurs with a high frequency even when the A location is the furthest hole from the correct location. Schubert and Gratch's results fail to demonstrate this point. Their infants erred at the A location on only 18% of B-hiding trials. In addition, according to X^2 analyses which we performed on their data, there was no hiding trial in which search at or near the A location was significantly more likely than search at or near the correct location.

The results obtained by Schubert and Gratch in their second study also do not pose a challenge to our position regarding the \overline{AB} error. Using a procedure which we introduced in earlier visible displacement research (Bjork & Cummings, 1979; Cummings & Bjork, 1979), Schubert and Gratch tested seven of their infants on a two-choice task after they were tested on the five-choice task. Schubert and Gratch argue from their findings employing this procedure that the frequency of \overline{AB} errors is similar using either a two-choice or a five-choice task. We would argue, however, that their results are inconclusive because (a) the order of task presentation was not counterbalanced, and (b) their conclusion is based upon an acceptance of the null hypothesis. While we consider Schubert and Gratch's results using this procedure to be inconclusive, we nonetheless feel it is important to point out the value of a procedure that tests the same infants in both a two-choice and a five-choice situation. Namely, this procedure allows one to address the critical question of whether the same infants who make the \overline{AB} error on a two-choice task also make the \overline{AB} error on a five-choice task. Unfortunately, Schubert and Gratch do not present their results in such a way as to address this critical question. However, in Bjork and Cummings (1979) we found that only one of the ten infants who made the \overline{AB} error on a two-choice task also made the \overline{AB} error on a five-choice task.

Fourth, although Schubert and Gratch do not explicitly interpret their

findings with respect to Piaget's (1954) account of infant search behavior, the implication is that they consider their findings to support Piaget. Therefore, it is important to point out that this is not the case. While it may be the case that a greater proportion of Schubert and Gratch's than of our infants made the \overline{AB} error on the first B-hiding trial, this comparison does not speak at the issue at hand. The relevant question is whether, in an unconstrained search situation, the \overline{AB} error occurs significantly more often than other types of search errors. If one asks this question of Schubert and Gratch's data, the answer is "No." Of the eight search errors made on the first B-hiding trial, five were \overline{AB} errors and three were searches at locations in which the object had never been hidden, binomial test, $p = .36$.

Fifth, Schubert and Gratch blur the substantial differences between the approaches of Piaget and Cummings and Bjork when they state that they agree with both of us that infant search can best be described as reflecting "difficulties at the encoding, storage and/or retrieval phases of the problem solving process (p. 64)." Whereas Piaget argues that infants do not understand fundamental concepts regarding objects and space, we contend that infants do comprehend the nature of objects and space, but are less effective information processors than older individuals. The hypotheses advanced by Piaget and Cummings and Bjork regarding infant search behavior differ sharply, both at the conceptual level and in terms of the predictions they make.

Finally, we would like to draw attention to the fact that a demonstration that the \overline{AB} error is primarily a methodological artifact of the two-choice hiding procedure does not diminish the significance of infant search errors as indicators of early cognitive processes. Instead, we feel that the methodology and approach introduced in the present research will broaden the framework for future investigation in this area, and lead to a better understanding of infant cognition by providing infants with a greater opportunity to reveal what they know about objects and space.

REFERENCES

- Bjork, E. L., & Cummings, E. M. *The 'A, not B' search error in Piaget's theory of object permanence: Fact or artifact?* Paper presented at the meeting of the Psychonomic Society, Phoenix, November, 1979.
- Cummings, E. M., & Bjork, E. L. *The 'A, not B' search error in Piaget's theory of object permanence development: Fact or artifact?* Unpublished manuscript, 1979.
- Cummings, E. M., & Bjork, E. L. The search behavior of 12 to 14 month-old infants on a five-choice invisible displacement hiding task. *Infant Behavior and Development*, 1981, 4, 47-60.
- Harris, P. L. Perseverative errors in search by young infants. *Child Development*, 1973, 44, 28-33.
- Piaget, J. *The construction of reality in the child*. New York: Basic Books, 1954.
- Schubert, R. E., & Gratch, G. Search on a five-choice invisible displacement hiding task: A reply to Cummings and Bjork. *Infant Behavior and Development*, 1981, 4, 61-64.