DOCUMENT RESUME

ED 145 935 PS 009 604

AUTHOR Lewis, Michael; Hurowitz, Laurie
TITLE Intermodal Person Schema in Infancy: Perception Within a Common Auditory-Visual Space.
PUB DATE Apr 77
GRANT BRSG-G-5-S07-RR-05729-01
NOTE 12p.; Paper presented at the Annual Meeting of the Eastern Psychological Association (Boston, Massachusetts, April 13-16, 1977) ; Project supported in part by the National Institutes of Health, Div. of Research Resources

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Auditory Discrimination; Cognitive Development; *Concept Formation; Infant Behavior; *Infants; Mothers; *Research Methodology; *Visual Discrimination
IDENTIFIERS *Person Schema

ABSTRACT

This study was designed to test two alternate hypotheses regarding the meaning of increased lateral head movements in infants during experiments in which the mothers' voices were displaced from their faces. One interpretation is that the lateral looking responses of the infants are attributable to maturational effects on the infants' physiological capacity to orient toward the lateral sound stimulus during the displacement condition. The second interpretation is that violations of the intermodal person schema occurred when the infant was presented with displaced face-voice pairs, which resulted in increased locking, head turning, or general exploration. A sample of 7 one-month-old and 10 four-month-old full-term, home-reared Caucasian infants of both sexes were tested individually. There were four general experimental conditions: (1) normal: either mother or adult female stranger presented to the infant with her voice transmitted through the center speaker; (2) displacement: mother or stranger presented with her voice transmitted through a side speaker; (3) discrepancy: either mother or stranger presented with the voice of the other transmitted throught the center speaker and (4) control: face or voice of mother or stranger presented alone. Results were interpreted as supporting a differential pattern of responding by infants as early as the first month of life to violation of the person schema through distortion in the visual-auditory organization of that schema. (JMB)

Intermodal Person Schema in Infancy: Perception Within a Common Auditory-Visual Space[1]

Michael Lewis and Laurie Hurowitz
Educational Testing Service

The development of the very young infant's ability to process intermodal stimuli in a common spatial location has been studied in several experiments. Aronson and Rosenbloom (1971) studied integrated audio-visual processing with infants 30 to 55 days old to explore the hypothesis that infants perceive integrated intermodal stimuli. To test this hypothesis, audio-visual discrepancies emanating from a common spatial location, the infant's mother, were presented. In their procedure the mother's voice was displaced from her face. Aronson and Rosenbloom hypothesized that these discrepancies would distress, agitate, confuse or upset the infants. For the 7 infants tested, Aronson and Rosenbloom found that infants increased in tonguing or mouthing behaviors under the discrepant condition of audio-visual displacement.

In a replication study modifying several of the Aronson and Rosenbloom methodological procedures, McGurk and Lewis (1974) studied intermodal integration of the person schema developmentally with one-, four-, and seven-month-old infants. Again the mother's voice was displaced from her face. In addition to measuring the infant's affective responding to audio-visual displacement of the mother's face and voice (including infant vocalizations, smiles/laughs, frowning, fret/crying and tonguing), exploratory behaviors of head turning were recorded. McGurk and Lewis (1974) did not find a differential

---

[1] Paper presented at the Eastern Psychological Association meetings, Boston, Massachusetts, April 1977. This project was supported in part by BRSG Grant No. 5 S07 RR05729-01 awarded by the Biomedical Research Support Grant Program, Division of Research Resources, National Institutes of Health.

increase in distress responding related to the audio-visual violation, but did report an increase in lateral head movement during the audio-visual displacement conditions. The one-month olds evidenced increased lateral head turning to the direction of the mother's voice, and 4 and 7 month olds significantly increased lateral head movement to the sound of the mother's displaced voice. A similar finding was also reported by Aronson and Rosenbloom (1971).

The common finding of both studies, that of increased lateral head and general body movement raises the question of the meaning of lateral head movement during audio-visual displacement. Such lateral head orientation toward sound is consistent with observations of the localizing abilities of infants. Evidence of the developing ability of the infant to localize to sound has been empirically demonstrated as early as the first three days of life in a study by Turkewitz, Moreau, Birch and Davis (1971). Thus, one interpretation of the head turning result is that the lateral looking responses of the infants are attributable to maturational effects of the developing physiological capacity of the infant to orient toward the lateral sound stimulus during the displacement condition. However, a second interpretation of the results is that violations of the intermodal person schema occurred when the infant was presented with displaced face-voice pairs, which resulted in increased looking, head turning or general exploration.

To test these competing interpretations, the present study was designed to replicate the McGurk and Lewis (1974) study as well as include additional conditions which would violate the infant's audio-visual person schema but maintain the source of audio-visual stimuli in one common frontal location.

To achieve this we paired the mother's face with a female stranger's voice, and the female stranger's face with the mother's voice. This discrepant variation of voice-face pairings was developed to insure that the intermodal violation of the audio-visual stimuli was based on a learned association from the infant's experience. The discrepancy condition of a learned integrated person schema was achieved by exposing the infant to a familiar voice with an unfamiliar face, and a familiar face with an unfamiliar voice. Further, we included a visual control condition where female face alone was frontally presented to the infant, and a voice control condition where female voice alone was frontally presented to the infant. Head movement and positive and negative affective responding were recorded for all conditions.

Subjects:

Seven one-month-old infants (23 to 33 days old) and 10 four-month-old infants (105 to 119 days old) were studied. The sample included full-term, home-reared Caucasian infants of both sexes.

Procedure:

The laboratory arrangements were the same as those reported by McGurk and Lewis (1974). A small room, 3.5 by 4.6m was divided by a transparent Plexiglas structure which shielded the sound but provided visual contact between the two sides of the room. On the infant side of the partition, an infant seat was located on the floor facing the Plexiglas. The seat provided support in a semi-upright position. Where additional support was necessary for the younger subjects, a U-shaped foam cushion for the head and neck and a broad body-belt for the torso were engaged.

Directly in front of the infant seat, also on the floor, was a monophonic speaker. There were two additional monophonic speakers, one located 101 cm

to the left of the infant seat and one located the same distance to the right of the seat. On the adult side of the Plexiglas was a small chair facing the infant seat approximately 125 cm from the seat, and a hand microphone which was attached to all three speakers. Each section of the experimental room had a door for discrete access as well as a one-way viewing mirror.

In a second room adjoining the infant section of the experimental room, the adult participant who was not present in front of the infant could observe the infant through a one-way mirror, though the adult participant remained uninformed about the auditory input in the infant section. There was a hand microphone in this room connected to the three speakers in the infant section.

In a third room, an experimenter manipulated the control keys which determined the operative status of the adult microphones and the speakers in the infant section. In this room there was also a television monitor and a second experimenter who recorded the infants' responses from the monitor while remaining uninformed about the auditory input in the infant section. The recording camera was mounted above the small adult chair facing the partition and the infant in the experimental room.

All of the infants were tested individually. Throughout the procedure, the mother and stranger spoke continuously from their designated locations. Both mother and stranger were never aware of which voice the infant was hearing during the experimental sequences. The stimulus voice was transmitted through either the center speaker, or the speaker to the right of the infant seat. Prior to the experimental session, the mother and stranger adjusted their voice levels to equalize the sound when transmitted to the infant section.

There were four general experimental conditions. The normal condition was a presentation of an integrated person schema where the female adult (mother, female stranger) faced the infant while her voice was transmitted from the center speaker. The displacement condition was a presentation of a female adult (mother, female stranger) facing the infant with her voice transmitted from the right speaker. The discrepancy condition was a presentation of either the mother's face with the strange female voice through the center speaker or the mother's voice with the stranger's face. The fourth condition consisted of two control procedures. The visual control condition was a presentation of the female adult (mother, female stranger) facing the infant with no auditory input while the auditory control condition was the transmission of a female adult voice (mother, female stranger) through the center speaker with no adult facing the infant.

The order of presentation of these ten stimulus conditions was randomized, and 30 seconds each in duration. The interrater reliabilities on the dependent measures were .77 (look forward), .98 (look right), .70 (look down, look left), .76 (vocalize), .98 (smile/laugh), .92 (frown), .96 (fret/cry), and .82 for the composite variable of total looks (forward, right, down, left).

Results:

Similar to the findings of McGurk and Lewis (1974), both positive and negative affective responding occurred in extremely low frequency across all conditions. Vocalizations occurred in a low frequency (.48) across all conditions. Smile/laugh was not recorded for any one-month-old infant, and occurred at a low frequency for four month olds (.12). Across conditions frowning and fret/cry also occurred infrequently, .30 and .43 respectively.

A comparison of the normal maternal face-voice pairings and displaced maternal face-voice pairings showed increased lateral head movement under the displaced condition although the difference failed to reach significance. However, for mother-stranger data combined, a significantly greater number of total head turnings occurred during the displacement than in the normal condition ($p < .05$ by Wilcoxon sign test, Siegel, 1956). The failure to replicate the earlier findings of the mother alone displacement effect may have been due to the smaller number of subjects in the present sample.

Insert Figure 1 about here

The pattern of total looking behavior for one- and four-month-olds combined is illustrated in Figure 1. A Friedman's Analysis of Variance by rank (Siegel, 1956) indicated an overall significant difference across conditions ($p < .05$). There was a general increase in head turning during the violation conditions in relation to the normal condition. The greatest amount of total head movement occurred in the discrepancy, and control conditions, while the lowest frequency occurred during the normal condition.

A comparison of the discrepancy and normal conditions (Wilcoxon sign test, Siegel, 1956) of the one-month-olds for the combined mother-stranger data indicated increased looking behaviors during the discrepancy condition ($p < .06$). This was also significant for the four-month-olds and the combined age data ($p < .05$, $p < .03$, respectively).

While the control conditions were not initially conceived of as a type of violation condition, the results indicate that the face-alone, voice-alone stimuli resulted in an increase in head movement for the combined ages (Wilcoxon sign test, $p < .05$). Evidence of the infant's differential responding to

face-alone versus normal face-voice pairings have been found by other researchers (Carpenter, 1973) for infants two to seven weeks old.

Discussion:

The results of this study support the hypothesis of a differential responding pattern of infants as early as the first month of life to violation of the person schema through distortion in the visual-auditory organization of that schema. The nature of the infant's response, as measured in the present study, is not a stressful affective reaction but rather an exploratory response of increased looking behaviors to conditions which violate the infant's expectation of the person schema. Thus, no study has shown negative affect to violation, although Aronson and Rosenbloom's may have if we hold that tonguing constitutes negative affect, a somewhat less than plausible hypothesis.

The results of our discrepancy condition lead us to believe that increases in looking cannot be accounted for by auditory localization as suggested by McGurk and Lewis (1974), since the face-voice mismatch comes from the same location in space. Rather we must conclude that the increased looking behaviors reflect an exploratory response by the infant to the violations of an integrated audio-visual person schema. This may explain the infants' behavior during the control conditions, which also elicited high exploratory behaviors. While in natural settings infants observe an adult's face without hearing vocalizations, or hear an adult's voice without seeing a face, the particular experimental conditions of this study may have failed in simulating these naturally occuring situations. In the face-alone condition the adult was in close proximity to the infant, and the adult's lips were moving although the infant heard no auditory input. In the voice-alone condition, an adult voice

was transmitted from a speaker in close proximity to, and in front of the infant, although there was no accompanying adult figure. Each of the conditions may have somewhat violated the infant's person schema.

Intersensory organization has not been considered to exist at birth or soon after, but rather develops as the infant acquires higher order schema (Piaget, 1952). The present study along with others (Aronson & Rosenbloom, 1971; McGurk & Lewis, 1974) indicates that intersensory organization, at least around person schema, develops before 4 months of age and possibly as early as 1 month. Moreover, recent data on imitation, prior to the onset of circular reactions, have been demonstrated (Bower, 1976). These types of results may force us to conclude that rather than building more complex schema from simple ones, these complex schema may be part of the organism's capacity from the beginning of life.

We cannot say that all intersensory organization develops as a general case this early since there may be a decalage between the development of person schema and all other schema, e.g., person preceding object schema (Bell, 1970). Whether reflecting a general organizational skill or a specific one centering around person schema, the fact that person schema develops so early may be used to argue for the importance of social objects and caregivers for the development and organization of cognitive function, a point receiving increased attention (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1977; Hurowitz, 1977; Lewis & Cherry, 1977).

References

Aronson, E., & Rosenbloom, S. Space perception in early infancy: Perception within a common auditory-visual space. Science, 1971, 172, 1161-1163.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L., & Volterra, V. From gesture to the first word: On cognitive and social prerequisites. In M. Lewis & L. Rosenblum (Eds.), Interaction, conversation, and the development of language: The origins of behavior, Vol. V. New York: Wiley, 1977.

Bell, S. M. The development of the concept of object as related to infant-mother attachment. Child Development, 1970, 41, 291-311.

Bower, T. G. R. Repetitive processes in child development. Scientific American, 1976, 235(5), 38-47.

Carpenter, G. C. Mother-stranger discrimination in the early weeks of life. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Philadelphia, Pa., March 1973.

Hurowitz, L. The ascendance of an active, competent infant in the developmental literature: Theoretical perspectives on social cognition during the first two years of life. Paper to be presented at the Seventh Annual Conference of the Piaget Society, Philadelphia, Pa., May 1977.

Lewis, M., & Cherry, L. Social behavior and language acquisition. In M. Lewis & L. Rosenblum (Eds.), Interaction, conversation, and the development of language: The origins of behavior, Vol. V. New York: Wiley, 1977.

McGurk, H., & Lewis, M. Space perception in early infancy: Perception within a common auditory-visual space? Science, 1974, 186, 649-650.

Piaget, J. The origins of intelligence in children. New York: International Universities Press, 1952.

Siegel, S. Nonparametric statistics. New York: McGraw-Hill, 1956.

Turkewitz, G., Moreau, T., Birch, H., & Davis, L. Relationship among responses in the human newborn: The non-association and non-equivalence among different indicators of responsiveness. Psychophysiology, 1971, 7, 233-247.

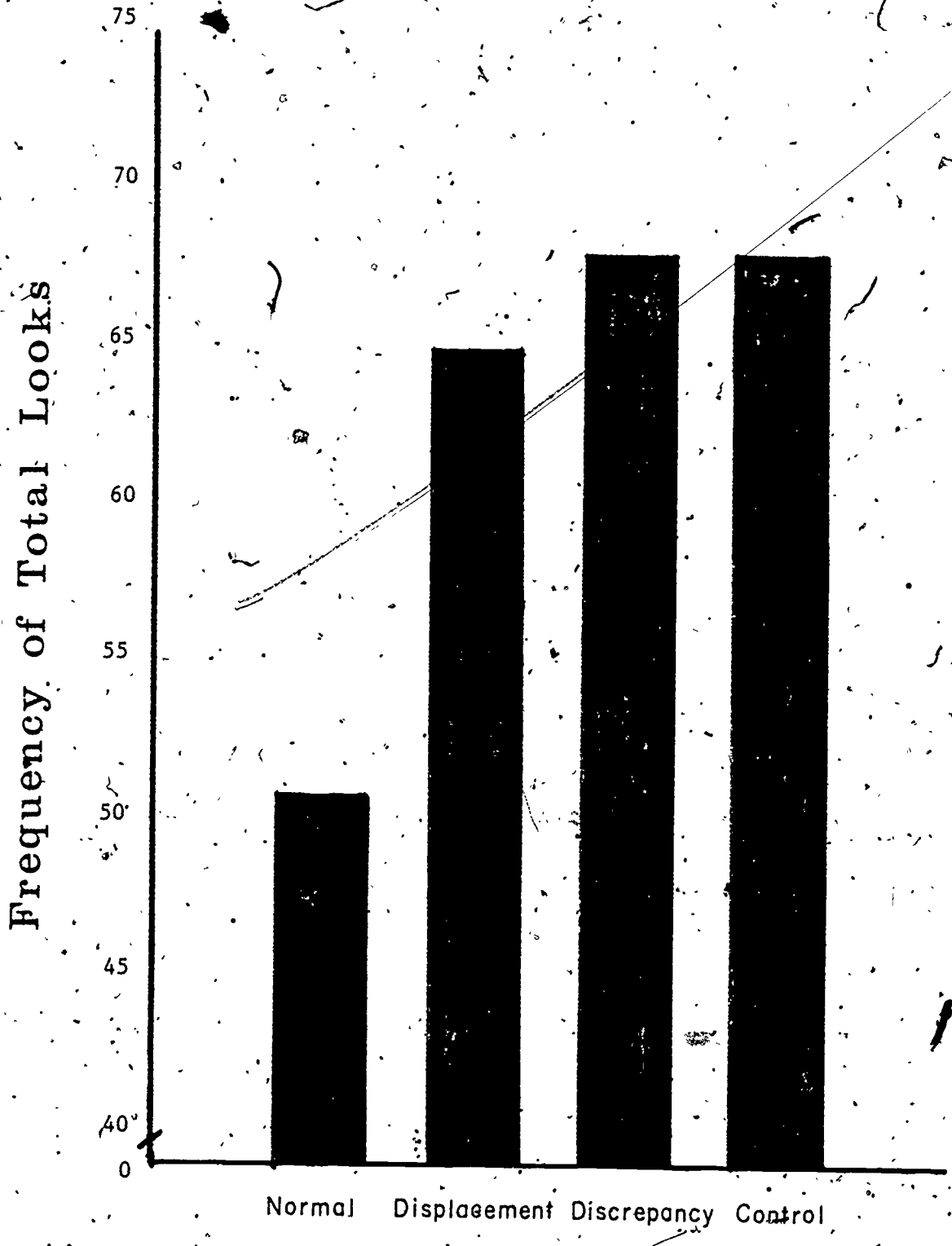

Figure 1: Total Looks for 1- and 4-Month-Old Infants.