Developments in the Expression of Affect by Later and Earlier Word Learners[1]

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ABSTRACT

The present study is a report of the developmental trends in a group of 12 infants' affect expression from 9 to 21 months, a period that coincided with certain achievements in their language development. Two sub-groups of infants, earlier and later word learners, were identified according to when they began to say words. At 9 months of age, the two groups did not differ in their frequency of emotional expression nor in the relative amount of time they spent in neutral and positive expression. All the infants increased in their expressivity. However, one group of infants increased in expression by learning to say words relatively early, while the other group increased in their frequency of emotional expression and did not learn to say words at the same time.

The research reported in this paper is part of a larger study of affect expression in the period during which infants begin to learn language. We have asked how expression with affect, which is already in place in the first year of life, is related to the emergence of language in the second year. Thus far, the data we have reported have demonstrated that differences among infants in how frequently they expressed affect and the relative time they spent in different categories of affect expression (e.g., expression with positive, negative, or neutral emotional tone) at the time of language achievements (first words and a vocabulary spurt) were correlated with the differences among them in age of language achievements. Infants who spent more time in neutral affect and expressed emotionally toned affect infrequently were younger at the time of language achievements. Infants who expressed emotionally toned affect more frequently and spent relatively less time in neutral affect were older when they reached the language achievements (Bloom & Capatides, 1987).

All the infants began to acquire language within normal age limits; however, relatively more time in neutral affect expression was correlated with earlier language learning. We have explained this finding by proposing that different cognitive activities are required for learning words and expressing emotion. Learning linguistic units (words and procedures for sentences) requires (a) attention to the acoustic signal and some aspect of the context; (b) comparison of these contents of awareness with prior experience recalled from memory; and (c) encoding. The expression of emotion entails (a) an underlying evaluative stance (e.g., Wozniak, 1986) which includes, for example, the evaluation of circumstances relative to plans and goals (Stein & Levine, 1987), along with (b) subjective feeling and (c) a neurophysiological state (e.g., Izard, 1977; Lewis & Michalson, 1985). We suggest that the experiences and processes that contribute to emotional expression may compete for the cognitive resources

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required for language learning. In contrast, neutral affect expression, which we have suggested is a continuation of the "quiet alert states" of earlier infancy, would allow the reflective, contemplative stance that is required for learning words.

However, an alternative explanation of the correlation results we reported would come from a finding that frequency of emotional expression increases over time. If emotional expression increased developmentally, then those infants who were older at the time of their language achievements would also be (coincidentally) the infants who expressed emotion more frequently. In fact, correlational analyses of individual differences across variables are only part of a developmental story because they are "potentially independent of developmental function" (McCall, 1979, 1986).

This means that even though individuals within a group may differ from one another at one time, and then keep their relative ranks to another time or variable, the group or naturally occurring subgroups may change across time. Such group changes over time would indicate a dynamic developmental process, even though the performance of an individual child, relative to the others, remained stable. Analyses of developmental trends (the average performance of groups of individuals over time) and analyses of individual differences (their rank order relative to one another) contribute different sorts of knowledge to our understanding of development. Thus, studying "both realms," individual differences and developmental function, is required (McCall, 1986).

The purpose of the study reported here was to investigate developments in affect expression over time according to chronological age in the same group of infants, in order to determine the relation between developmental trends and the individual differences already observed. The correlation results (in Bloom & Capatides, 1987) were obtained at the times of two achievements in each infant's language development: first words and a vocabulary spurt.[2] Both language achievements occurred at widely different ages for the individual children. For this study of developmental trends occurring within the same time frame, affect expression was observed at the same ages for all the infants for a period of one year, beginning before their first words at 9 months and then at four month intervals thereafter, at 13, 17, and 21 months.

In addition, we already knew that the infants differed from one another with some expressing emotion more frequently than others, and that these differences among them were stable in relation to their language development. We were concerned, therefore, that they might differ in their development of affect expression as well. If one suspects that not all children have the same developmental function, then the mean of the group as a whole is not the statistic with which to describe developmental trends. Since we wanted to look at developmental trends in the period in which these infants began to learn language, and we knew that affect expression was highly related to age of language achievement, we had to consider the possibility that different developmental functions would describe the affect expression of children who differed in age of language achievement. Thus, in addition to the relation of age of language achievement to affect expression at a given point in time, differences in age of language achievement might also predict different courses of affect development.

For these reasons, developmental functions were determined for the group of 12 infants as a whole and also for the infants divided into two groups of earlier and later word learners based upon age of the first language achievement, first words (FW). The mean age of FW was 408 days (range = 305 - 510 days); 6 infants below the mean and 6 infants above the mean formed the two groups of earlier and later word learners (EWL, LWL) respectively. Splitting the group in half this way was the most conservative test of differences in developmental function in affect expression because of the likelihood of overlap in affect expression between the two groups at

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[2]The criterion for "first words" was the first use of at least one conventional word, said at least two times in the laboratory playroom. Any conventional words were counted, including parts of routines and interjections, but imitations of mothers' speech and self repetitions were not. The criterion for the "vocabulary spurt" was the first increase of at least 12 new words (utterance types) between two monthly observations, after the child had already acquired a cumulative vocabulary of at least 20 different words (see Lifter & Bloom, 1987, for further details.) The criterion for the transition to multiword speech (MW) was mean length of utterance of 1.5 words, discounting imitations, self-repetitions, bound morphemes, *yeah* and *no*, and the articles *a* and *the*.

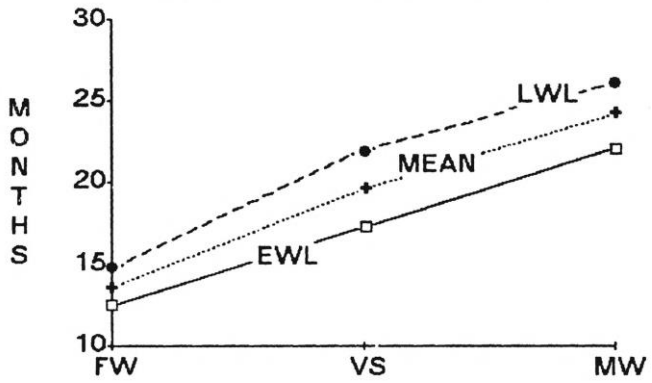
any age.[3] This was so since language achievement was correlated with affect expression and children closest to the mean could be similar in affect expression even though they fell into two different language groups. Given this potential overlap, if our two groups of language learners still differed in developmental function, we could be certain that language achievement was related to affect expression.

The coding scheme for infant affect expression that we devised for this study used gradient information from valence (positive, negative, neutral, mixed, and equivocal emotional tone) and intensity (three degrees indicating the fullness of a display). Cues from facial expression, body tension and posture, and affective vocalization (whining, crying, laughing and the like) were used to code affect expression continuously in the stream of activity as each infant and mother played with groups of toys in a playroom. The result was a continuous record of changes in expressed affect and the duration of each affect expression. Thus, this study is a report of the developments that occurred in expressed affect in one, essentially constant situation, from 9 to 21 months of age.

METHODS

Our subjects were twelve infants, 6 girls and 6 boys, of different ethnic and economic backgrounds, from homes in the New York metropolitan area.[4] All were first-born and their mothers were not employed outside the home at the time the study began. Each infant and mother visited our laboratory playroom once each month, from 8 or 9 months to about 28 months of age, and played with groups of toys that were introduced on a schedule. All the infants were presented with the same groups of toys in the same sequence. Each session lasted one hour. The children were also visited at home every month until they were 15 months old, and then every 3 months thereafter, and the mothers and investigators were in touch by phone between sessions. The research reported here was based on data from the playroom sessions. The same pair of investigators interacted with each infant and mother throughout the duration of the study, both in the playroom and at home, and were matched for ethnicity.

The present study of the infants' affect expression at 9, 13, 17, and 21 months began before they said their first words, and extended through the single-word period for all of them, and through the transition to multiword speech for some of them. The mean ages of the three language achievements (first words, FW; vocabulary spurt, VS; multiword speech, MW) are presented in Figure 1 for the group of 12 infants and for the two groups of earlier and later word learners. Later language achievement for the infants in this study did not mean language delay or disability. As can be seen in Figure 1, the ages at which the later word learners achieved FW, VS, and MW were within normal limits (Bloom & Lahey, 1978), and the two groups of infants progressed at similar rates.



[3]Fourteen subjects participated in the research project of which this study is a part. However, because data collection was begun with two of the infants later than 9 months, the comparisons at 9 months reported here were not possible for those infants. For this reason, the present study includes only those infants for whom data were available at 9 months.

[4]Although the number of subjects is obviously too small for comparisons of within group differences, we can report that of the non-white infants in our sample, 3 were above and 1 below the mean age at FW and 2 were above and 2 below the mean age at both VS and MW.

Figure 1. Age of Language Achievements

The observation playroom was furnished with a child-size table and chairs, a 3-foot plastic slide with a crawl through tunnel between the steps and the incline, and a changing table. A group of toys was on the floor when the mother and infant entered the room. One of two investigators brought in the additional groups of toys at 8-minute intervals, and a snack (cookies with juice for the baby and coffee or tea for the mother) after the first half hour. The toys were selected so as to balance possible girl-boy interest (e.g., doll, truck) and manipulative-enactment play (e.g., nesting blocks, miniature cutlery). (See the description of toys and schedule of their presentation in Lifter & Bloom, 1987.)

The observations were video recorded (SLO-383 Sony 1/2-inch stereo Beta). The camera was mounted on a 3-foot movable tripod in the playroom, and the second investigator maneuvered the camera so that the infant was in view all the time. Each infant and mother interacted with only one pair of investigators, both in the playroom and the home visits, and the investigators and infant-mother pairs were matched for ethnicity. The infants and mothers were visited at home before the data collection began, and then saw the investigators twice a month; they gave every indication that they were relaxed and comfortable in the playroom sessions.

At the time of recording, a time-code generator (FOR-A SMPTE) imposed an audio signal on the second sound track for each frame of the tape. This allowed the data to be manipulated to within 1/30th of a second (each second of video tape containing 30 frames) at the time of data processing. The videotape deck was interfaced at playback with a SMPTE time-code reader and an Apple II+ computer for data coding and transcription.

The first 30 minutes of the playroom observations at 9, 13, 17, and 21 months provided the data for the study reported here. Coders were naive both to the hypotheses to be tested and the units of analysis in the study, and the infants' affect and speech were each coded and transcribed by different persons.

Coding Affect Expression

Every change in expressed affect in the stream of an infant's activities was identified and entered into the computer with the time of onset. Because affect coding was continuous, the onset time of any change in affect expression was also the offset time of the previous affect expression. This yielded a continuous record of affect expressions and the duration of affect expressions from one shift in expression to another. An affect expression was any affective vocalizations (whining, laughing, and the like), or observable change in the infant's facial expression, body tension, or posture.

These affect expressions were coded for their valence, whether neutral, negative, positive, mixed, or equivocal tone. A neutral expression was defined by the face being in a resting or baseline position as described by Ekman and Friesen (1975), and without body tension or affective vocalization. Mixed affect expressions included elements of both positive and negative valence; equivocal expressions were neither positive, negative, nor neutral, as happened with surprise or excitement. Non-neutral affect expressions were also coded for intensity with three levels of intensity indicating the fullness of a display. Thus, the coding scheme for describing the quality of expressed affect included five qualities of valence: neutral, negative, positive, mixed, and equivocal and three levels of intensity of non-neutral expression. Photographs of examples of these affect expressions are presented in Bloom, Beckwith, Capatides, and Hafitz (1988); the coding scheme used in this study is available from the authors. See Schlosberg, 1954 and Young, 1959, for accounts of the "pleasantness-unpleasantness" and intensity dimensions of emotion; Stern, Barnett, & Speiker, 1983, for discussion of gradient and categorical information in the emotional signal; and Adamson & Bakeman, 1982; Ricciuti & Poresky, 1972; and Stechler & Carpenter, 1967, for other studies that also used gradient information rather than discrete categories of emotion for the study of affect expression.

Ambiguous episodes (the occurrence of a momentary vocalization or facial movement that could not be assigned to one of the above categories) were also coded with time of onset. These were least frequent at 17 months (M = 14.9) and most frequent at 21 months (M = 19.3); they were not included in the data analyses. In addition, the infant was sometimes moving away from the camera, or the infant's face was not visible for affect coding with no cues from body tension or affective vocalization. These intervals of "backturn" were also coded for onset so that coding affect expression in the stream of the infant's activity was not interrupted. The average amount of time

spent in backturn and ambiguous episodes at 9, 13, 17, and 21 months was 4.3, 5.7, 4.7, and 5.9 minutes respectively. All the remaining minutes of the half-hour were coded for valence and intensity of affect expression.

Three coders initially worked in rotating pairs during training, in order to increase the accuracy of coding and ensure initial confidence in their judgements. Training continued until the paired coders (the three coders each rotated with one another) achieved a predetermined level of at least 85 percent agreement with a segment of data that had been coded by the investigators responsible for training and considered as a standard. Segments were selected randomly from different children for this post-training test of reliability and each segment lasted from 2 to 5.5 minutes. Percent agreement was computed separately for the 5 categories of valence (positive, negative, neutral, mixed, and equivocal) and 3 intensity levels of positive and negative valence. The level of reliability for the coder pairs, after training and before the actual coding for the study was begun, was high: for valence, Pair 1 = 92%, Pair 2 = 90%, Pair 3 = 100%; and for intensity, Pair 1 = 89%, Pair 2 = 89%, and Pair 3 = 85%.

After continuing to code in pairs for several weeks, reliability was assessed for the individual coders working independently in the following way. Each individually coded a 3.5 minute segment that included at least 25 coding entries. The percent agreement between each member of a pair coding independently was high: Pair 1 = 100%; Pair 2 = 94%; and Pair 3 = 94% for both valence and intensity. The mean discrepancy in recording affect onset time was an average of 16 video frames, or approximately 1/2 second, for the three coder pairs. At that point the coding was begun for the data used in this study with the coders working independently.

The processed data were transferred to an IBM-XT computer for analyses. The affect expression coding was reduced using a program that (a) counted all affect expressions (which included any change in valence or intensity of expression); (b) counted the number of video frames for the length of each affect expression (the number of frames, transformed into seconds in the results below, from the onset of one expression to the onset of the next expression); and (c) calculated the mean duration and total time spent in the categories of affect expression: three degrees of positive valence; three degrees of negative valence; neutral, mixed, and equivocal valence; and in backturn and ambiguous cases.

Data Analyses

Three measures of affect expression were examined for this study of developmental functions. Two of these were the variables that were correlated with age of language achievement (in Bloom & Capatides, 1987): frequency of non-neutral expression, including positive, negative, mixed, and equivocal affect, and the percentage of total time spent in expression of neutral, positive, and negative affect. Time in neutral expression rather than frequency of neutral expressions was used in the analyses because the frequency of neutral expressions was the complement of the frequency of non-neutral expressions (i.e., the shifts to +1, -2, etc. were often shifts from neutral and followed by shifts back into neutral).

In addition, if the frequency of emotional expression increased, but the average length of the expressions (the time from the onset of one change in expressed affect to the onset of the next expression) decreased, as was reported for positive affect by Adamson and Bakeman (1985), then the relative amount of total time spent in emotional expression might not change over time. To control for this possibility, the average length of an emotional expression was included as a third variable.

The data were tested statistically with a 2 (groups EWL, LWL) x 4 (ages 9, 13, 17, 21 months) repeated measures analyses of variance, and paired comparisons *t*-tests.

RESULTS

Frequency of Emotional Expression

The two groups of infants, earlier and later word learners, differed developmentally in their frequency of emotional expression, as can be seen in Figure 2a. Those infants (EWL) who began to say words relatively earlier (M = 12.8 months) did not change in their frequency of expression over time. In contrast, the infants (LWL) who began to say words later (M = 14.7 months) increased in frequency of emotional expression instead. They then decreased in frequency of expression in the period between 17 and 21 months that encompassed their transition from FW to VS and the beginning of the transition to MW.

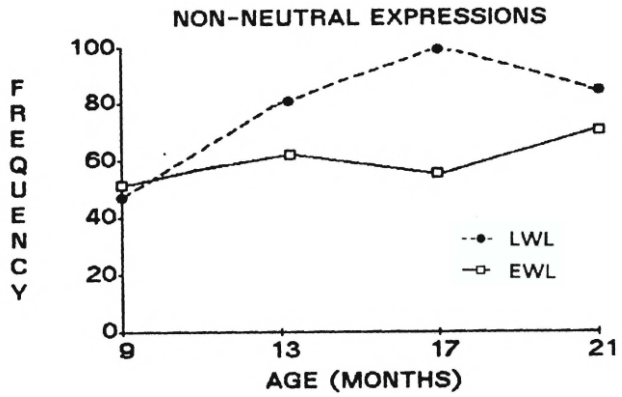


Figure 2a. Developments in non-neutral (emotional) expression by later and earlier word learners.

The frequency of emotional expression increased over time for the group of 12 infants as a whole. An analysis of variance indicated a main effect of age, $F(3,30) = 4.464$, $p = .01$, with a linear trend, $F(1, 10) = 5.518$, $p = .041$. The analysis of variance failed to meet the .05 level for the main effect of group or the group x age interaction, $F(1,10) = 3.717$, $p = .083$ and $F(3,30) = 2.409$, $p = .087$) respectively. However, the later word learners showed a significant change across age, $F(3,15) = 5.018$, $p = .013$, which could be described as quadratic, $F(1,5) = 8.897$, $p = .031$. In contrast, for the EWL, the developmental trend for frequency of expression was not significant $F(3,15) = 1.126$, $p = .37$. The two groups differed significantly at 17 months, $t(10) = 3.297$, $p = .008$. These results mean that the increase in frequency of emotional expression obtained for the group of 12 infants together was influenced by the group of later word learners.

Frequency of Positive Expressions. The valence of most emotional expressions was positive, 79% on average.[5] The developmental trends for frequency of positive expressions are presented in Figure 2b for the two groups of infants. The later word learners increased in frequency of positive expression and then decreased; earlier word learners did not change.

Figure 2b. Developments in frequency of positive emotional expression by later and earlier word learners

For the group of 12 infants as a whole, an analysis of variance indicated a main effect of age, $F(3,30) = 5.284$, $p = .005$, which could be described as quadratic, $F(1,10) = 11.072$, $p = .008$, and a group x age interaction, $F(3,30) = 3.727$, $p = .022$. Again, only the later word learners showed a main effect of age, $F(3,15) = 8.438$, $p = .002$, which could be described as quadratic, $F(1,5) = 31.404$, $p = .003$. Their frequency of positive expression increased

[5]Most positive expressions were +1 intensity; the relative frequency of positive expressions that were +1 was .66, .68, 71, and .77 at 9, 13, 17, and 21 months respectively.

between 9 and 13 months, $F(1,10) = 18.401$, $p = .002$, and between 9 and 17 months, $F(1,10) = 13.234$, $p = .005$, but decreased between 17 and 21 months, $F(1,10) = 10.881$, $p = .008$. In contrast, the earlier word learners showed no change, $F(3,15) = 0.832$, $p = .497$. The two groups of infants differed significantly at 13 months, $t(10) = 2.512$, $p = .031$, and at 17 months, $t(10) = 2.987$, $= .014$.

These results mean that the developmental trend obtained for positive expressions with the group of 12 infants together was, as with the earlier result for all emotional expressions combined, influenced by the later word learners primarily. The later word learners increased in frequency of positive expressions in the period between 9 and 17 months, and decreased between 17 and 21 months when they made their transition from FW to VS.

Frequency of Negative Expressions. Negative affect expression was relatively infrequent, due no doubt to the fact that the infants were in a relaxed playroom context.[6] However, the developmental trends for frequency of negative expressions were different for the two groups of EWL and LWL (Figure 2c).

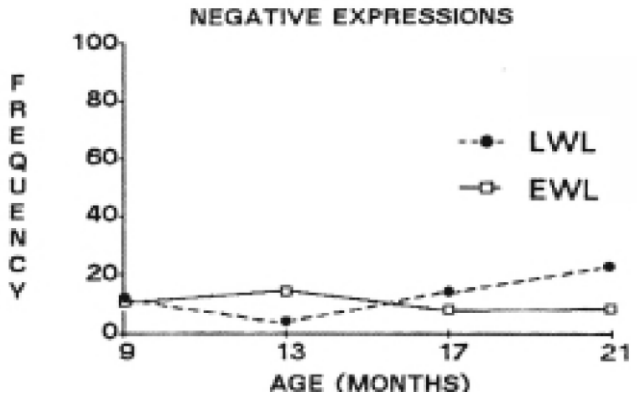


Figure 2c. Developments in frequency of negative emotional expression by later and earlier Word Learners

Analysis of variance indicated a group x age interaction, $F(3,30) = 2.965$, $p = .048$. The earlier word learners expressed negative affect more frequently at 13 months, $t(10) = 2.131$, $p = .021$, which was the age that coincided with their achievement of FW (in Figure 1). The increase in frequency of negative expressions by the later word learners between 13 and 21 months was significant, $F(1,10) = 9.273$, $p = .012$. These results suggest that certain of the language achievements were associated with an increase in frequency of negative expression: FW for the earlier word learners, and the period that encompassed the transitions to FW and VS (between 13 and 21 months) for the later word learners.

Length of Emotional Expressions

The length of an emotional (non-neutral) expression was the length of time from the onset of one expression to the onset of the next expression. Overall, for all 12 infants at all four ages, the average length of an emotional expression was 2.98 seconds. A decrease in length of expression from 3.26 seconds at 9 months to 2.59 seconds at 21 months was not significant, $F(1,10) = 1.645$, $p = .20$. Positive expressions ($M = 3.34$ seconds) were longer at all four ages than negative expressions ($M = 2.63$ seconds), but the difference missed significance, $t(11) = 2.105$, $= .059$.

The developmental trends for the mean length of positive and negative emotional expressions are presented in Figure 3 for the two groups. EWL and LWL did not differ in mean length of positive expression over time (Figure 3a). Earlier word learners' mean length of negative expressions increased between 13 and 17 months and then decreased (Figure 3b), with a main effect of age, $F(3,15) = 4.108$, $p = .026$, and suggested a quadratic trend, $F(1,5) = 5.557$, $p = .065$. The effect of age was not significant for the LWL, $F(3,15) = 1.709$, $p = .208$. An analysis of

[6]Most expressions of negative affect were -1 intensity; the percentage of time in negative expression that was -1 intensity was .73, .75, .81, and .67 at 9, 13, 17, and 21 months respectively.

variance indicated a group x age interaction $F(3,30) = 3.182$, $p = .038$, which could be described as cubic, $F(1,10) = 6.062$, $p = .034$. The two groups of infants differed at 17 months, $t(10) = 2.255$, $p = .048$.

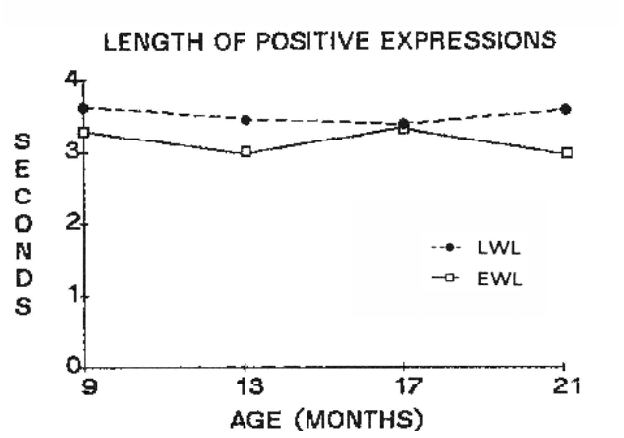


Figure 3a. Average length of positive emotional expressions by Later and Earlier Word Learners

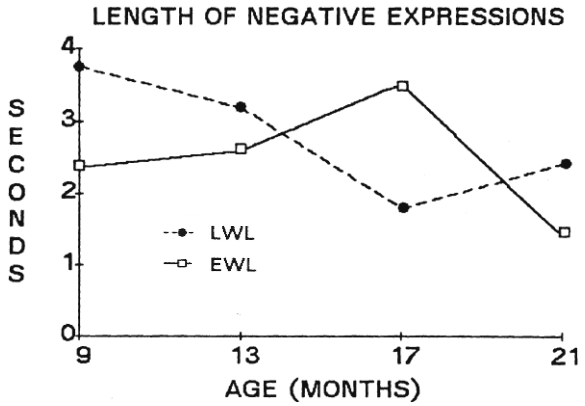


Figure 3b. Average length of negative emotional expressions by Later and Earlier Word Learners

These results complement, in part, the developmental trends reported earlier for frequency of negative expressions. The earlier word learners increased in length of negative expressions between 13 and 17 months, the period of their transition from FW to VS, while the later word learners increased in frequency of negative expressions in the period leading up to VS. Together, the two sets of developmental trends for frequency and length of an expression suggest an association between expressions of negative emotion and language change.

Time in Neutral Expressions

The developmental trends in the relative time spent in neutral and positive expression are presented for the two groups of infants in Figure 4. The children expressed neutral affect most of the time, an average of 84% of the total coded time (excluding *backturns* and ambiguous cases) in the four sessions together. An analysis of variance indicated no effect of group, $F(1,10) = 3.264$, $p = .101$. However, the earlier word learners spent more time in neutral affect expression than the later word learners at 13 months, $t(10) = 2.151$, $p = .057$, and at 17 months, $t(10) = 2.253$, $p = .048$. Thus, the infants who started to say words relatively earlier spent more time in neutral expression at the ages that encompassed their developments in language.

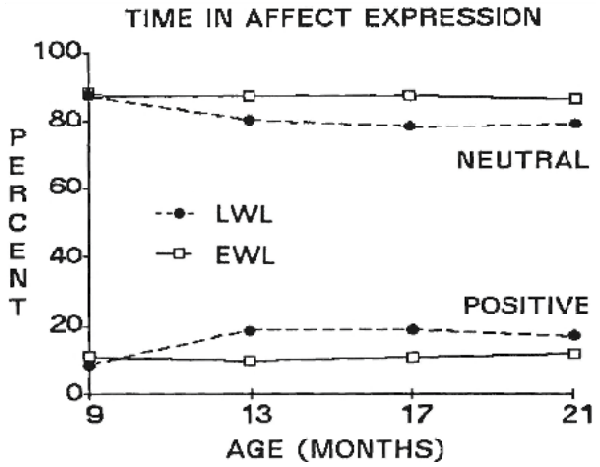


Figure 4. Time in neutral and positive affect expression by later and earlier word learners.

Time in Positive and Negative Expression.

The infants were expressing positive affect, on average, 13% of the time overall, varying from 10% at 9 months to 15% at 17 months (see Figure 4). An analysis of variance missed the required .05 level of confidence for the group x age interaction, $F(3,30) = 2.538$, $p = .075$. The EWL did not change in the percentage of time they spent in positive affect expression. However, an analysis of variance with the LWL indicated a main effect of age, $F(3,15) = 3.733$, $p = .035$, which could be described as quadratic, $F(1,5) = 19.176$, $p = .007$. The later word learners increased from 9 to 13 months, $F(1,10) = 11.103$, $p = .008$ and then decreased in the time they spent in positive expression from 17 to 21 months. The two groups differed at 13 months, $t(10) = 2.767$, $p = .02$, and at 17 months, $t(10) = 2.154$, $p = .057$.

These results were not, of course, independent of the results reported above for frequency of positive expressions; both measures indicated different developmental trends for earlier and later word learners. In addition, the increases in both frequency of positive expression and the percentage of time spent in positive expression were independent of the average length of a positive expression, which did not change over time.

The infants spent relatively little time in negative expression, from less than 1% (.007) of the time at 13 months (LWL) to 4% of the time at 21 months (LWL). Time spent in negative expression did not change with age. Earlier and later word learners differed, $t(10) = 2.229$, $p = .05$, only at 13 months, with EWL spending more time (.028) in negative expression than LWL (.007). Again, these results were not independent of the difference between the groups in frequency of negative expression.

DISCUSSION

Two groups of infants, earlier and later word learners (identified by how old they were when they began to say words), differed in their developments in affect expression from 9 to 21 months. The measures of affect expression used in this study included frequency of expression and the percentage of coded time that was spent in neutral, positive, and negative expression. At 9 months of age, the two groups did not differ on any of these measures. However, after 9 months, the developmental functions were different for the two groups. The later word learners increased from 9 to 17 months in the frequency of non-neutral expression and in the relative amount of time they spent in positive expression. In contrast, the earlier word learners showed no change in developmental function for these same measures. Thus, all the infants increased in their expressivity. However,

one group of infants increased in expression by learning to say words relatively early, while the other group increased in their frequency of emotional expression.[7]

In the results reported in Bloom and Capatides (1987), earlier word learning was correlated with a greater amount of time spent in neutral affect and less frequent emotional expression, while later word learning was correlated with more frequent emotional expression and less time in neutral expression. Those results, then, were not an artifact of trends in affect expression, with later language learning associated with emotional expression because emotional expression increased with age in general. On the contrary, only the later word learners increased in frequency and total time in emotional expression, and the earlier word learners did not change in time spent in neutral affect. Together, the results of the two studies find support in independent studies of the relation between affect expression and earlier language learning that have similarly reported earlier language developments by infants who present a more neutral pattern of affect expression (Epport, 1987; Nachman, 1986).

Developmental Trends in Affect Expression

An increase in the frequency of emotional expression in the period beginning at 9 months of age was reported by Adamson & Bakeman (1985). In the present study, however, an increase in emotional expression was associated with not learning to say words in the same period. Those infants who began to say words relatively earlier did not change in the frequency with which they expressed emotion through the single-word period and into their transition to multiword speech.

The amount of time spent in positive affect expression by the infants in the Adamson and Bakeman study apparently did not change. Using the data they reported for frequency of expression and mean length of expression per hour, we computed the average proportion of time spent in positive affect by their subjects. The results were, for one cohort, .047, .042, .05 at 9, 12, and 15 months respectively, and for the second cohort, .037, .037, .028, .032 at 9, 12, 15, and 18 months respectively.[8] Consistency in time spent in positive affect was also reported by Gaensbauer (1982) and Wasserman (1984) for a comparable age range. The same result was obtained in the present study only for the earlier word learners; the later word learners increased developmentally in the time they spent in positive expression. One can also infer from the Adamson and Bakeman results that their infants, like the infants whom we observed, spent a good deal of time in neutral affect expression.

This study was concerned only with the expression of affect (through facial movement, body posture and tension, and such vocalization as whining, laughing, and the like). We are aware of the literature (summarized in Buck, 1984) which has documented an inverse relation between such overt signs of expressivity as these and internalized autonomic responsivity. The infants with more time in neutral affect expression could have been experiencing affect that was inaccessible to the interactants (the mothers and investigators) in this study. Further exploration of the features of neutral affect expression is an issue for future research.

Affect Expression and Language Learning

The pattern of results presented here suggests an interactive, mutual influence between developments in language learning and affect expression. The first interaction was between neutral affect expression and language achievement. The infants' neutral expressions could best be described as expressions of alert attention and similar to the periods of "quiet alert states" or "alert and focused" states described in earlier infancy (e.g., Brown, 1964). Quiet alert states presumably support the cognitive activity of the first few months of life (e.g., Olson & Sherman, 1983), and measures of attention in older infants in the second half of the first year have been shown to predict later developmental outcome (Kopp & Vaughn, 1982). A major shift in infants' attentional capacities has been described towards the end of the second year by Kagan (1979). He suggested that "1-year-olds show more sustained attention because they are better able to retrieve the past and hold representations of the past and present in active memory for a longer period of time" (p. 175). Similarly, we have suggested that learning

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[7]The two groups of infants did not differ at either FW or VS in the relative frequencies of referential and expressive (Nelson, 1973) word types or tokens. However, at the time of the vocabulary spurt, a higher frequency of names of objects was correlated (Pearson $r = -.628$, $p < .05$) with younger age.

[8]The infants in their study spent less time in positive affect expression than the infants in the present study due to the fact that they had three conditions which covaried with amount of affect expression overall.

words requires the infant to attend to an acoustic signal and some aspect of the context, and compare these contents of awareness with prior experience recalled from memory. More time in neutral affect expression would enhance the infant's attention for the cognitive activity required for earlier language achievements in the second year. In addition, the neutral affect expression coded in this study included expression of the emotions category of "interest" (C. Malatesta, personal communication, February 19, 1987). Interest, as an emotion, has been considered important for processes of attention and cognition by Izard (1986) and Piaget (1954/1981).

The second interaction between developments in language learning and affect expression concerned non-neutral expressions, but positive and negative expressions did not interact in the same way with language learning. Most of these infants' affect expressions were positive, and the data suggest that both the causes and the consequences of positive expression preempted the cognitive stance required for language learning. This would explain the later language learning of those infants who increased in frequency and time spent in positive (but not negative) expression in the period from 9 to 17 months. In addition, in the period of their language learning from 17 to 21 months, these same infants decreased in both how frequently they expressed positive emotion and the time they spent in positive expression.

Negative affect expression was relatively infrequent, but the little that did occur suggested that negative expression was influenced by language achievement. An increase in the frequency and/or the length of negative expressions coincided with the ages that encompassed the language achievements. Two factors that could have contributed to this pattern of results were the relative nonautomaticity of earlier speech and the perturbations accompanying developmental change. Thus, more frequent and/or longer expressions of negative affect could be associated with difficulty in using a system of expression (language) that is relatively nonautomatic, in comparison with the system of expression (affect) that has been in place since earlier infancy. And, further, negative affect could also be the result of effort associated with times of substantial change in the system or a breakthrough in learning.

We have interpreted these results as evidence of developmental process in the interaction between language learning and affect expression, with a resulting competition for resources. However, in addition to the possible causal relation between these two factors, yet another variable such as temperament may have influenced the above results. An alternative to such process explanations as we have favored would be that differences in patterns of emotionality are differences in underlying temperament and that temperament influences developments in language. Infants who spend more time in neutral affect expression and express emotion less frequently may be infants who are predisposed to learn language earlier.

However, the evidence we have presented suggests that these infants' emotionality may have been influenced instead by their language learning. The two groups of earlier and later word learners were not different at 9 months of age on the measures of affect expression we used and differences emerged subsequently in relation to achievements in language. In another study, we have also looked at patterns of stability in affect expression over time from 9 to 21 months, and found that the earlier word learners were more stable in their profiles of emotionality than were the later word learners (Bloom & Wikstrom, 1987). For example, all the correlations (Pearson r) for time spent in positive affect expression at 9, 13, 17 to 21 months were significant ($p < .05$) for the earlier word learners, while significance was obtained for the later word learners only between 17 and 21 months. The ages 13, 17, and 21 months coincided fairly closely with the ages of language achievements for the earlier word learners, while the period from 17 to 21 months was the time of greatest language change for the later word learners. Thus, learning language may, itself, have had a stabilizing influence on expression of positive affect in this period. The implication of these results is that developments in language influenced temperament for these infants.

Several temperament researchers have suggested that context can play a major role in determining the behavioral manifestations of temperament (e.g., Super & Harkness, 1986; Thomas & Chess, 1977). Children have a hand in creating the contexts of their own development and such influences from the child are not predetermined but, rather, reflect "the probabilistic character of such 'child effects,' and of development in general" (Lerner *et al,* 1986, p. 99). The emergence of language is one aspect of development that has a profound effect on children's

ability to influence their contexts, and the patterns of affect expression we have described may reflect the influence from such development on temperament.

Finally, given the importance of context, we cannot ignore the contribution of the mothers in our study to the findings presented here. Chief among these is the effect of caregivers' socializing practices on emotional expression in earlier infancy (e.g., Malatesta & Haviland, 1982) and how such practices might contribute to individual differences in patterns of infant emotional expression (Thompson & Lamb, 1983). The mothers' responses to the expressions of affect by the infants may have been a factor that contributed to the differences among them, and this is the subject of current research in progress (Capatides, 1988). We know that mothers also differ in their latency to respond to their infants' vocalizations and in their tendency to mention the focus of the child's attention in what they say, and both factors influence subsequent vocabulary size (Roth, 1987; Tomasello & Farrar, 1986). Thus, the ways that caregivers interact with their infants can influence both aspects of development that we investigated: affect expression and language.

To conclude, the results of this study substantiate McCall's (1979, 1986) proposal that studying development requires the study of both developmental function and individual differences. Individual differences in affect expression were stable in relation to age of language achievements for the group of infants as a whole (Bloom & Capatides, 1987). However, developments in affect expression over time were different for subgroups who were identified according to when they began to say words. Thus, a relation of developments in affect expression to developments in language achievement was revealed when differences among the infants were taken into account in reporting developmental trends. The result was a more complete picture of developments in affect expression in this period.

REFERENCES

Adamson, L., & Bakeman, R. (1982). Affectivity and reference: Concepts, methods, and techniques in the study of communication development of 6-to 18-month old infants. In T. Field, & A. Fogel (Eds.), *Emotion and early interaction* (pp. 213- 236), Hillsdale, NJ: Lawrence Erlbaum.

Adamson, L., & Bakeman, R. (1985). Affect and attention: Infants observed with mothers and peers. *Child Development, 56*, 582-593.

Bloom, L., Beckwith, R., Capatides, J., & Hafitz, J. (1988). Expression through affect and words in the transition from infancy to language. In P. Baltes, D. Featherman, & R. Lerner (Eds.), *Life-span development and behavior* (Vol. 8). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bloom, L., & Capatides, J. (1987). Expression of affect and the emergence of language. *Child Development, 58,* 1513-1522.

Bloom, L., & Lahey, M. (1978). *Language development and language disorders.* New York: John Wiley & Sons.

Bloom, L., & Wikstrom, P. (1987, July). The role of temperament in language development. Paper presented at the meeting of the International Congress for the Study of Child Language, Lund, Sweden.

Brown, J. (1964). States in newborn infants. *Merrill-Palmer Quarterly, 10,* 313-327.

Buck, R. (1984). *The communication of emotion.* New York: Guilford.

Capatides, J. (1988). Mothers' socialization of their children's affect expression. Doctoral Dissertation, in progress.

Ekman, P., & Friesen, W. (1975). *Unmasking the face: A guide to recognizing emotions from facial cues.* Palo Alto, CA: Consulting Psychologists Press.

Epport, K. (1987). The relationship between facial affect expressiveness and language ability in children born preterm and "at-risk." Unpublished Doctoral Dissertation, University of California, Los Angeles.

Gaensbauer, T. (1982). Regulation of emotional expression in infants from two contrasting environments. *Journal of the American Academy of Child Psychiatry, 21,* **1**63-171.

Izard, C. (1977). *Human emotions.* New York: Plenum.

Izard, G, (1986), Approaches to developmental research on emotion-cognitive relationships. In D. Bearison, & H. Zimiles (Ed.), *Thought and emotion: Developmental perspectives* (pp. 21-37). Hillsdale, NJ: Lawrence Erlbaum Associates.

Kagan, J. (1979). Structure and process in the human infant: The ontogeny of mental representation. In M. Bornstein, & W. Kessen (Eds.), *Psychological development from infancy: Image to intention* (pp. 159-182). Hillsdale, NJ: Erlbaum.

Kopp, C., & Vaughn, B. (1982). Sustained attention during exploratory manipulation as a predictor of cognitive competence in preterm infants. *Child Development, 53,* 174-182.

Lerner, R., Lerner, J., Windle, M., Hooker, K., Lenerz, K., & East, P. (1986). Children and adolescents in their contexts: Tests of a goodness of fit model. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities and challenges* (pp. 99-114). Hillsdale, NJ: Lawrence Erlbaum.

Lifter, K., & Bloom, L. (1987). Object play and the emergence of language. Paper submitted for publication.

Lewis, M., & Michalson, L. (1985). Faces as signs and symbols. In Zivin, G. (Ed.), *The development of expressive behavior: Biology-environment interactions* (pp. 153- 180). New York: Academic.

Malatesta, C., & Haviland, J. (1982). Learning display rules: The socialization of emotion expressions in infancy. *Child Development, 53*, 991-1003.

McCall, R. (1979). Qualitative transitions in behavioral developments in the first two years of life. In M. Bornstein, & W. Kessen (Eds.), *Psychological development in infancy: Image to intention* (pp. 183-224). Hillsdale, NJ: Erlbaum.

McCall, R. (1986). Issues of stability and continuity in temperament research. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities and challenges* (pp. 13-25). Hillsdale, NJ: Lawrence Erlbaum.

Nachman, P. (1986). A comparison of toddlers cared for by mothers and substitute caregivers at the Margaret S. Mahler Research Nursery. Paper presented at the Meetings of the San Francisco Psychoanalytic Institute, San Francisco, September.

Nelson, K. (1973). Structure and strategy in learning to talk. *Monographs of the Society for Research in Child Development, 38* (1-2, Serial No. 149).

Olson, G, & Sherman, T. (1983). Attention, learning, and memory in infants. In M. Haith, & J. Campos (Eds.), P. H. Mussen (Series Ed.), *Handbook of child psychology: VoL 2. Infancy and developmental psychobiology* (pp. 1001-1080). New York: John Wiley.

Piaget, J. (1981). *Intelligence and affectivity: Their relationship during child development* (T. Brown, & C. Kaegi, Trans.). Palo Alto, CA: Annual Reviews Inc. (Original work published 1954.)

Ricciuti, H., & Poresky, R. (1972). Emotional behavior and development in the first year of life: An analysis of arousal, approach-withdrawal, and affective responses. In A. Pick (Ed.), *Minnesota symposium on child psychology* (Vol. 6, pp. 69-96). Minneapolis, MN: University of Minnesota Press.

Roth, P. (1987, April). Longitudinal study of maternal verbal interaction styles. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Baltimore, MD.

Schlosberg, H. (1954). Three dimensions of emotion. *Psychological Review, 61,* 81-88.

Stechler, G. & Carpenter, G. (1967). A viewpoint on early affective development. In J. Hellmuth (Ed.), *Exceptional infant: The normal infant* (Vol. 1, pp. 164-189). Seattle, WA: Special Child Publications.

Stein, N., & Levine, L. (1987). Thinking about feelings: The development and origins of emotional knowledge. In R. Snow & M. Farr (Eds.), *Aptitude, learning, and instruction*: Vol. 3. *Cognition, cognition, and affect* (pp. 165-197). Hillsdale, NJ: Erlbaum.

Stern, D., Barnett, R., & Spieker, S. (1983). Early transmission of affect: Some research issues. In J. Call, F. Galenson, & R. Tyson (Eds.), *Frontiers of infant psychiatry* (pp. 74-84). New York: Basic Books.

Super, C., & Harkness, S. (1986). Temperament, development, and culture. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities and challenges* (pp. 131-149). Hillsdale, NJ: Lawrence Erlbaum.

Thomas, A., & Chess, S. (1977). *Temperament and development.* New York: Brunner/Mazel.

Thompson, R., & Lamb, M. (1983). Individual differences in dimensions of socioemotional development in infancy. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience. Vol 2, Emotions in early development* (pp. 87-114). New York: Academic Press.

Tomasello, M., & Farrar, J. (1986). Joint attention and early language. *Child Development, 57,* 1454-1463.

Wasserman, G. (1984, April). Affective expression in normal and physically handicapped toddlers: Situational and development effects. Paper presented to the International Conference on Infant Studies, New York.

Wozniak, R. (1986). Notes toward a co-constructive theory of the emotion-cognition relationship. In D. Bearison & H. Zimiles Eds.), *Thought and emotion: Developmental perspectives.* Hillsdale, NJ: Erlbaum.

Young, P. (1959). The role of affective processes in learning and motivation. *Psychological Review, 66,* 104-125.