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This study examined the developmental acquisition, defined both cross-sectionally and longitudinally, of females' superiority in decoding nonverbal cues. Three age groups (250 pre-high school students, 109 high school students, and 81 college students) were examined cross-sectionally, and 48 children 11-14 years old were examined longitudinally. Decoding of four types of nonverbal cues (face, body, tone, discrepancies) arranged from the most controllable channel to the least controllable (most "leaky") channel, was examined. The analysis of variance and the appropriate contrast (the Linear Trend in Age × Linear Trend in Channel) showed that as age increased, females lost more and more of their advantage for the more leaky or more covert channels but that they gained more and more of their advantage for the less leaky channels ($p = .0022$). The results of the longitudinal 1-year study supported those of the cross-sectional study—During the year, women lost more and more of their advantage in more leaky channels, $r(2) = .96$, $p = .02$, one-tailed. These results are consistent with a socialization interpretation that as females grow older, they may learn to be more nonverbally courteous or accommodating.

Recently, the finding that females are superior to males in understanding nonverbal cues (Hall, 1978, 1979; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979) has been qualified in an important way (Rosenthal & DePaulo, 1979a, 1979b). Although females are in fact very much superior to males in decoding very overt and intentionally communicated cues (such as cues from the face, which is a very controllable channel), they are less superior, or not superior at all, at decoding more covert, "leaky," or unintended cues (such as cues from the body or the tone of voice). When different types of nonverbal cues were arranged from most controllable to least controllable (most leaky), women showed a systematic decrease in their superiority over men in going from the less to the more leaky channels. Rosenthal and DePaulo suggested that these results might show that women were more polite or accommodating in their decoding of nonverbal cues. That is, perhaps women politely refrain from decoding effectively the less controllable cues of the encoder. The operation of this kind of politeness mechanism would be consistent with traditional sex role standards.

The plausibility of the Rosenthal and DePaulo hypothesis is strengthened by (a) the well-documented result that females are interpersonally more polite and accommodating than men (LaFrance & Carmen, 1980; LaFrance & Mayo, 1978; Thorne & Henley, 1975; Weitz, 1976) and (b) the evidence suggesting that social relationships may suffer when people are especially skillful at decoding nonverbal messages that they were not intended to receive (Rosenthal et al., 1979; Rosenthal & DePaulo, 1979a, 1979b). If it is in fact disruptive to smooth interpersonal functioning for a participant to "know too much" about the state of the

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other, then we would expect females to show relatively less advantage over men in decoding nonverbal cues when those cues are under less control of the sender and more likely to be unintended than intended cues. Evidence based on over 60 studies supports these predictions (Rosenthal & DePaulo, 1979a, 1979b).

The present investigation examined the developmental acquisition of females' nonverbal accommodatingness. We wanted to know whether women might develop a pattern of nonverbal decoding skills consistent with the idea that there might be social hazards to being "too good" at decoding certain nonverbal cues. In fact, a great deal of research has been directed toward studying the development of nonverbal skills in children (for reviews see Charlesworth & Kreutzer, 1973, and DePaulo & Rosenthal, 1980), but relatively few studies have examined the socialization variables that may facilitate or inhibit the development of particular nonverbal styles and skills in children (cf. Blanck, Zuckerman, DePaulo, & Rosenthal, 1980).

Accordingly, this study examined female superiority in decoding four types of nonverbal cues that were arranged from the most controllable channel to the least controllable channel, employing both a cross-sectional and a longitudinal paradigm.

The channels examined were (a) the face, which has been shown to be the most informative and controllable channel (e.g., Ekman & Friesen, 1969; Izard, 1971; Rosenthal et al., 1979; Zuckerman, DeFrank, Hall, Larrance, & Rosenthal, 1979); (b) the body, which is more likely than the face to give off or "leak" deception cues (e.g., Ekman & Friesen, 1969, 1974); (c) the tone of voice, which has been shown to be an additional source of nonverbal leakage or deception cues (e.g., Ekman, Friesen, & Scherer, 1976; Streeter, Krauss, Geller, Olsen, & Apple, 1977; Zuckerman, DeFrank, Hall, Larrance, & Rosenthal, 1979; or for a review see DePaulo, Zuckerman, & Rosenthal, 1980) and may leak one's true feelings about oneself (e.g., Bugental, Caporael, & Shennum, 1980; Bugental, Henker, & Whalen, 1976; Bugental & Love, 1975; Holzman & Rousey, 1966) or about others (Weitz, 1972); and (d) discrepancies between video and audio nonverbal cues, which are also difficult to control and are an additional source of leakage (e.g., DePaulo, Rosenthal, Eisenstat, Rogers, & Finkelstein, 1978; Zuckerman, Blanck, DePaulo, & Rosenthal, 1980). Consistent with a socialization hypothesis of the development of sex differences in accommodation, it was predicted that female superiority over males in decoding leakier channels would decrease with age, both in the cross-sectional and longitudinal analyses.

Method

Subjects

For the cross-sectional analysis, three samples of participants were administered various measures of sensitivity to nonverbal communication. The pre-high school sample was obtained from a summer camp and included most of the campers between the ages of 9 and 15; there were 250 children (121 males and 129 females). Samples of 109 high school students (46 males and 63 females) and 81 college students (32 males and 49 females) were tested during the academic year.

For the longitudinal analysis, 48 children (24 males and 24 females) between the ages of 11 and 14, taken from the larger experimental sample at the summer camp, were tested during the course of the longitudinal 1-year study.

Procedure

Four measures of sensitivity to nonverbal cues derived from the Profile of Nonverbal Sensitivity (PONS) Test were administered to all samples.[1] Details of the first three measures are given in Rosenthal et al. (1979), and details of the fourth measure are given in DePaulo et al., (1978; see Appendix of the present article). Briefly, the measures were as follows:

Face. A 20-item test of sensitivity to facial expressions.

Body. A 20-item test of sensitivity to body movements.

Tone. A 40-item test of sensitivity to speech masked by content-filtering (Rogers, Scherer, & Rosenthal, 1971) and randomized-splicing techniques (Scherer, 1971).

Discrepancies. A 128-item test of sensitivity to the degree of discrepancy between the tone of voice and either facial expressions or body movements.

The four measures are listed in the order in which they fall on a dimension of "leakiness." Rosenthal and

[1] For the pre-high school sample the four measures of nonverbal sensitivity were derived from the Nonverbal Discrepancy Test (DePaulo et al., 1978). The high school sample and the college sample were administered three short forms of the PONS (face, body, tone) in addition to the discrepancy test.

DePaulo's (1979a, 1979b) results have provided good support for the construct validity of this particular ordering of the four measures. Further, recent evidence (with regard to accuracy results), based on over 60 studies (Rosenthal & DePaulo, 1979a, 1979b), has shown that the initial ordering of these four types of cues fits very well indeed with the ordering of the magnitude of women's loss of superiority in decoding these cues.

Results

Cross-Sectional Analysis

The size of the effect of female superiority in σ units (d) was computed from the accuracy scores for each of the four channels.[2] Effect sizes were further examined in linear contrasts. The contrast weights assigned to the three age levels for the four channels (face, body, tone, discrepancy) were, for the pre-high school sample: $-3, -1, 1, 3$; for the high school sample: 0, 0, 0, 0; and for the college sample: $3, 1, -1, -3$. These contrasts test the prediction that with age, female superiority increases for the overt cues and decreases for the covert cues.

The top half of Table 1 shows the magnitude of females' superiority over males (in σ units) for each of the four channels for all three age groups. The bottom half of Table 1 shows the interaction effects between the rows and columns (i.e., the residuals after correcting for the differences in the row means and the differences in the column means). Examination of the interaction effects of Table 1 shows the predicted crossing of linear trends, with female superiority increasing with age for more overt channels but decreasing with age for more covert or leaky channels.

The Linear Trend in Age × Linear Trend in Channel effect showed that as age increased, females lost more and more of their advantage for the more leaky or more covert channels while they gained more and more of their advantage for the less leaky channels, $F(1, 5) = 33.81$, $p = .0022$, $r = .93$.

The present results suggest that as females grow older, they may become more nonverbally accommodating. Perhaps females learn from experience that there may be social hazards to being "too good" at the decoding of leaked or unintended nonverbal cues. As previously stated, there are indications that women who are less accommodating in these nonverbal ways are judged by others to have less successful interpersonal outcomes (Rosenthal & DePaulo, 1979a, 1979b).

Longitudinal Analysis

For the longitudinal analysis involving 48 pre-adolescents, the size of the effect of female superiority in σ units (d) was once again computed from the accuracy scores for each of the four channels and examined in linear contrasts. The contrast weights assigned to the differences in accuracy scores (in σ units) for the 1-year longitudinal study for the four channels (face, body, tone, discrepancy) were $3, 1, -1, -3$. This contrast tests the prediction that during the course of the year, females' superiority increases for the overt cues and decreases for the covert cues.

Table 2 shows the magnitude of females' superiority over males (in σ units) for each of the four channels and for the testing years of 1978 and 1979. Table 2 shows the predicted linear trend, with females' superiority decreasing over the course of the longitudinal 1-year study for the more covert or leaky channels, $r(2) = .96$, $p = .020$, one-tailed.

These results show that during the course of the 1-year longitudinal study, females lost significantly more of their advantage over males as the channels became more leaky. Consistent with a learning interpretation, the present findings suggest that females become more nonverbally accommodating as they grow older. The question of whether females learn with retesting or with practice to be more nonverbally accommodating is also raised. Further, it is interesting to note that if men and women do show a noticeable change in the predicted directions just from retesting (i.e., from an experience of just a few hours of testing time), they become more or less sensitive to just those cues that we would expect them to.

Discussion

The present investigation examined the developmental acquisition of females' non-

[2] The d is an estimate of the size of the effect, expressed in standard deviation units (Cohen, 1977). Cohen considers a d of .20 to be a small effect, .50 a medium effect, and .80 a large effect.

Table 1
Female Superiority in Sensitivity to Four Types of Nonverbal Cues for Three Age Levels (in σ Units)

Decoding skill	Age level: Pre-high school (n = 250)	High school (n = 109)	College (n = 80)	r[a]
		Means		
Face	−.06	.36	.38	.88
Body	.30	.24	.34	.40
Tone	.28	.32	−.02	−.81
Discrepancy	.29	.22	−.28	−.92
r[b]	.76	−.66	−.96*	
		Residuals (interaction)		
Face	−.29	.05	.25	.99
Body	.00	−.14	.14	.50
Tone	.08	.04	−.12	−.94
Discrepancy	.21	.06	−.26	−.98
r[b]	.96*	.28	−.99**	

[a] The correlation of age level with degree of female superiority (df = 1).
[b] The correlation of leakiness of channel with degree of female superiority (df = 2).
* $p < .025$. ** $p < .005$, both one-tailed.

verbal accommodatingness both cross-sectionally and longitudinally. We wanted to know whether women's greater social civility that is evident in their decoding skills might have been learned through socialization. In other words, we wanted to know whether women might have learned through socialization that there might be social hazards to being "too good" at decoding certain nonverbal cues.

Table 2
Female Superiority in Sensitivity to Four Types of Nonverbal Cues for the Years 1978 and 1979 (in σ Units)

Decoding skill	1978	1979	Difference
Face	−.20	−.12	.08
Body	.35	.08	−.27
Tone	.45	.08	−.37
Discrepancy	.08	−.43	−.51
r[a]	.42	−.50	−.96*

Note. N = 24 males and 24 females.
[a] The correlation of leakiness of channel with degree of female superiority (df = 2).
* p = .020, one-tailed.

Rosenthal and DePaulo (1979a, 1979b) have shown that when four measures of skill in decoding nonverbal cues were arranged from most controllable to least controllable (most leaky), women showed a systematic decrease in their superiority over men going from the less to the more leaky channels. Additional evidence for this hypothesis that women were relatively less likely than men to eavesdrop on leaky nonverbal channels was accompanied by the suggestive evidence that there may be social costs to eavesdropping (Rosenthal & DePaulo, 1979a, 1979b). The greater one's skill at decoding the leakier channels, the relatively less effective are one's interpersonal relationships as judged by outside observers, a finding that was stronger for women than for men.

Two studies were conducted that addressed the hypothesis that female superiority over males in decoding leakier channels would (a) decrease with age, defined cross-sectionally, and (b) decrease during the course of a 1-year longitudinal study.

The cross-sectional study showed that as age increased, females lost significantly more and more of their advantage for the more

leaky or covert channels, while they gained more and more of their advantage for the less leaky channels. The results of the longitudinal 1-year study supported those of the cross-sectional study—During the year, women lost more and more of their advantage in the more leaky channels. Interestingly, for this particular sample of pre-adolescents the pattern of greater relative accuracy for less leaky channels that is found in adult females did not occur.

The present results suggest, consistent with a learning (i.e., socialization) interpretation, that as females grow older, they may become more nonverbally accommodating. Further, the findings suggest that females may learn through experience (e.g., from retesting, practice, or through maturation) that there may be social hazards to being "too good" at decoding leaked or unintended nonverbal cues. These developmental changes in females' nonverbal accommodatingness may be guided, in part, by the increase of females' awareness of traditional sex role standards with age (e.g., Kohlberg, 1966).

There may be value to our learning more about the effects of socialization on the development of nonverbal skills. Such research directions may begin to open the inquiry of why such sex differences develop and change in children, as well as in adults.

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Appendix

The first three measures of sensitivity to verbal cues were derived from the PONS test, a 47-minute film consisting of 220 2-sec audio and/or visual nonverbal stimuli. In each 2-sec segment, a 24-year-old female acts in one of 20 different emotional situations. The 20 situations are categorized with reference to four different types of emotion, each created by the crossing of two affective dimensions: positivity–negativity and dominance–submission. Hence, there are five positive-dominant situations (e.g., talking to a lost child), five negative-dominant situations (e.g., expressing strong dislike), five positive-submissive situations (e.g., expressing deep affection), and five negative-submissive situations (e.g., asking forgiveness). The situations were originally categorized as either positive or negative and as dominant or submissive according to the ratings of two different samples of judges (Rosenthal et al., 1979).

The 220 PONS items consist of a random ordering of these 20 situations, each represented in 11 different "channels" of nonverbal communication. Three channels are pure video channels: face only, body only (neck to knees), and face plus body. Two channels are pure audio channels: "content filtered" (CF) and "randomized spliced" (RS). In both of these channels, verbal messages are rendered incomprehensible. CF preserves sequence and rhythm (RS does not). RS saves pitch and intensity. The other six channels are "mixed" channels consisting of all audiovisual combinations of the two audio with the three video channels.

From each of the 220 items, subjects select one of two situational labels, one of which correctly describes the situation and one which incorrectly describes it. The incorrect alternative was assigned to each item by randomly choosing one of the 19 situation labels that was not the correct answer.

The fourth measure, the Nonverbal Discrepancy Test (NDT), employs 8 of the 20 situations of the PONS test, 2 from each of the four affective quadrants of the PONS. Half of the scenes in the NDT are represented in the face channel, and half are represented in the body channel. In addition, half of the scenes represented in each of these two video channels are also represented in the content-filtered audio channel, and half of the scenes are represented in the randomized-spliced audio channel.

In the discrepancy test, each of the eight scenes is paired with every other scene twice. Hence, there are 128 items in the test (8 Scenes × 8 Scenes × 2 Replications). Each item consists of the simultaneous pairing of either a face or a body with a content-filtered or randomized-spliced voice. Every possible audio-video pairing (face–CF, face–RS, body–CF, body–RS) occurs exactly 32 times. For one quarter of the items, the audio and the video segments are from the same affective quadrant (e.g., a positive-dominant face might be paired with a positive-dominant voice). One quarter of the items consist of audio and video segments from exactly opposite quadrants (e.g., a positive-dominant face might be paired with a negative-submissive voice). The audio and video segments of the remaining items differ on only one of the affective dimensions (e.g., a positive-dominant face might be paired with a positive-submissive voice). In this case, the discrepancy would be along the dominance dimension, since both evaluative inputs are the same (i.e., both are positive). Alternatively, a positive-dominant face might be paired with a negative-dominant voice. In this case, both inputs assume the same value on the dominance dimension (i.e., both are dominant), but they differ on the evaluative dimension (i.e., one is positive and the other is negative).

Subjects rate each scene on a 9-point scale of discrepancy. Their accuracy (or sensitivity) is a function of the degree to which they rate as more discrepant those scenes in which the video and audio channels are, in fact, more discrepant, compared to their ratings of the scenes in which the video and audio channels are, in fact, less discrepant.

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