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SOCIAL AND NONSOCIAL DECENTRATION IN HEARING-IMPAIRED AND NORMAL HEARING CHILDREN

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Twenty-three hearing-impaired and 25 normally hearing children between 7 and 14 years of age were administered a social decentration task, a nonsocial decentration task (a set of conservation problems), and a test of nonverbal intelligence. Although the two groups did not differ with respect to nonverbal intelligence, the hearing-impaired children obtained significantly lower scores than their normally hearing peers on both the social and nonsocial decentration measures. Within both groups, there was a significant positive correlation between social decentration and nonsocial decentration, which is consistent with Piaget's contention that centration-decentration is a cognitive dimension underlying the structuring of both social and nonsocial content. Within the hearing-impaired sample, degree of hearing loss was not associated with either social or nonsocial decentration.

ACCORDING TO PIAGET's developmental theory, conceptual thought becomes increasingly dominant over immediate sensory impressions in the child's structuring of interactions with the environment. An essential ingredient in this development is the ability to decenter, or refocus attention from one aspect of a situation to another. In his work on the development of conservation, Piaget (1952) demonstrated that centration on a single dimension of a situation leads to erroneous conclusions about observed events. When liquid from one of two identical glasses filled to the same level is poured into a taller, thinner glass, for example, centration on either the height or width of the column of liquid in the new glass results in the belief that the two glasses contain unequal quantities of liquid. Decentration, however, permits simultaneous consideration of both height and width, allowing relation of changes in one dimension to compensating changes in the other (Looft, 1972).

Piaget (e.g., 1950) and others (e.g., Feffer, 1959) have argued that decentration is essential for objectivity in the child's structuring of social as well as nonsocial stimuli. In a social context, decentration allows one to shift from one's own point of view to those of others. The more mature the child's cognitive processes, the better the child can integrate these different perspectives, such that the bias present in any one viewpoint is balanced by the others (Feffer & Suchotliff, 1966). Several

writers have contended that social decentration is a basic requirement for effective social interaction (e.g., Feffer & Suchotliff, 1966; Flavell, Botkin, Fry, Wright, & Jarvis, 1968).

Most children eventually learn to decenter their attention and to differentiate and then integrate several features of an object as well as different points of view. Piaget (e.g., 1950) maintained that the progression from centered to decentered thought results in large part from repeated interpersonal interactions, and conflicts in particular, in which children reexamine their beliefs and perceptions when confronted with dissonant information from others. Prelingually hearing-impaired children, however, may be at risk for experiencing deficiencies in the quantity and quality of language-mediated social interaction (Liben, 1978). According to Piaget's theory, when children experience such deficiencies in social interaction, they may exhibit delays in the development of decentration.

Although language development among severely and profoundly hearing-impaired children is often delayed, the significance of hearing-impairment for the development of decentration does not lie in the linguistic deficits per se. As Piaget (e.g., 1970) has consistently argued, language alone does not account for the development of logical thought. Human intellect, and language itself, reflect more fundamental laws governing the coordination of actions, which are evident even in preverbal, sensorimotor activity. This view has been supported by research with hearing-impaired children (e.g., Furth, 1966; Kates, Yudin, & Tiffany, 1962; Watts, 1979).

Language and speech deficits, nonetheless, may profoundly affect the quantity and quality of interaction with significant people in the child's environment. Considerable evidence reveals that hearing-impaired children are at risk for experiential deficits, including less time interacting with peers (Levy-Shiff & Hoffman, 1985), lack of student-initiated communication in classrooms (Craig & Collins, 1970), difficulty communicating with parents (Evans, 1975; Schlesinger & Meadow, 1972), and an overall reduction in transmission of information (Liben, 1978).

According to Piagetian theory, hearing-impaired children experiencing such deficiencies may show deficits in both social and nonsocial decentration. In addition, the ability to decenter in social and nonsocial situations may be related in hearing-impaired as well as normally hearing children because social and nonsocial decentration are conceptualized as parallel processes, both influenced by early social interaction.

Hearing-impaired children have been found to score lower than normally hearing children on experimental tests requiring nonsocial decentration, particularly conservation tasks (e.g., Furth, 1964, 1966; Watts, 1979). Such tasks, however, have traditionally been structured in a manner which may be unfair to hearing-impaired children. Typically, the experimenter alters the appearance of an object while inquiring about its quantity. Thus, unlike most adult-child interactions, the nonverbal behavior (altering the appearance) is opposed to the speaker's intended meaning (inquiring about quantity) (McGarrigle & Donaldson, 1975).

As a result, children may interpret questions about quantity as referring to some aspect of the object's appearance, because appearance is made salient by the experimenter's actions (McGarrigle & Donaldson, 1975). This argument is particularly germane to the assessment of hearing-impaired children, who are especially likely to focus on nonverbal cues. Indeed, when conservation instructions have been modified to direct hearing-impaired children's attention toward relevant stimulus attributes, their performance has improved (e.g., Rittenhouse, 1981; Rittenhouse & Spiro, 1979). Rittenhouse (1987) cautions, however, that it is premature to assume cognitive equality between hearing and hearing-impaired children because of improved performance on modified conservation problems, and he calls for additional research on the question of cognitive difference between children with and without hearing-impairments.

With regard to social decentration, there has been little study of hearing-impaired children, and the available literature is inconclusive. Although several studies suggest that hearing-impaired children have more difficulty than their normally hearing peers in making inferences about others' experiences, including feelings (Bachara, Raphael, & Phelan, 1980; Odom, Blanton, & Laukhuf, 1973), informational needs (Hoemann, 1972), and visual percepts (Dwyer, 1983; Hoemann, 1972), other studies suggest that hearing-impaired children are not delayed in social decentration (e.g., Breslaw, Griffiths, Wood, & Howarth, 1981; Youniss & Robertson, 1970). Kusche and Greenberg (1983) have argued that hearing-impaired children may be capable of differentiating among perspectives, but may be delayed in correctly interpreting information available to others.

Currently, little is known about the emergence of decentration in hearing-impaired children and the factors, such as degree of hearing loss, which may influence its development. In addition, data are lacking concerning the influence of prelingual hearing loss on the relationship between social and nonsocial decentration. The purposes of this study were (a) to assess the effects of hearing-impairment on social and nonsocial decentration, (b) to determine whether hearing-impairment influences the association between social and nonsocial decentration, and (c) to examine the relationship between degree of hearing loss and decentration.

METHOD

Subjects

Hearing-impaired subjects were selected from a group of 32 hearing-impaired children attending a summer day camp in Southern Rhode Island. Participants met the following criteria: (a) age between 7 and 14 years, (b) age at onset of hearing loss of 2 years or earlier, (c) simultaneous manual and spoken English used in educational setting, (d) no educationally significant disability in addition to hearing loss, and (e) parental consent for participation. The final group con-

sisted of 23 hearing-impaired children, 14 boys and 9 girls, ranging in age from 7 to 14 years ($M = 10$ years, 9 months, $SD = 2$ years). The mean unaided hearing loss in the better ear, averaged over 500, 1000 and 2000 Hz, was 81 dB (range = 42–113, $SD = 23$). Parents of subjects had normal hearing in all cases except two (in one case the hearing-impaired parent used speech and speechreading, and in the other the parents used manual English). According to school records, the causes of hearing loss were genetic factors (6), complications during pregnancy (4), trauma at birth (3), maternal rubella (3), spinal meningitis (1), and unknown (6).

During the academic year, 21 of the hearing-impaired children attended the Rhode Island School for the Deaf, a public day school employing simultaneous manual and spoken English. The remaining 2 hearing-impaired subjects attended a self-contained classroom for hearing-impaired students within a regular Rhode Island public school. The mode of instruction in this classroom was also simultaneous manual and spoken English. Participants were predominantly members of middle or lower-middle class families from suburban communities.

Normally hearing subjects were selected from a group of 30 children attending the same day camp as the children with hearing-impairments. Participants met the following criteria: (a) age between 7 and 14 years, (b) no educationally significant disability, and (c) parental consent for participation. The final group consisted of 25 normally hearing children, 14 boys and 11 girls, ranging in age from 7 to 13 years ($M = 10$ years, $SD = 1$ year, 9 months). Twelve of the normally hearing subjects were either a sibling or cousin of a hearing-impaired child attending the camp. As were the hearing-impaired subjects, hearing children were predominantly members of middle or lower-middle class families from suburban communities.

Both hearing and hearing-impaired samples were divided into two age groups: 7–9 years of age and 10 years-and-above. In the hearing-impaired sample, there were 11 younger ($M = 9$ years, 1 month, $SD = 10$ months) and 12 older ($M = 12$ years, 3 months, $SD = 1$ year, 5 months) children. In the normal hearing sample, there were 12 younger ($M = 8$ years, 6 months, $SD = 11$ months) and 13 older ($M = 11$ years, 4 months, $SD = 11$ months) children.

Measures

Social decentration. Social decentration was assessed with Chandler's bystander cartoon measure (Chandler, 1973). Considerable data support the internal consistency, temporal stability, and construct validity of this measure (Enright & Lapsley, 1980). The materials were four cartoon sequences containing no written text. Each cartoon sequence consisted of eight frames depicting a protagonist involved in an emotionally-upsetting situation. A second character, or bystander, was introduced after the upsetting situation and witnessed the protagonist's display of emotion, but was unaware of the cause. In one story, for example, a boy's sand castle was ruined when a girl ran over it with her tricycle. The boy (protagonist), visibly upset, walked home where he found his little brother (bystander)

building a card castle. The protagonist then blew down the card castle. Each sequence was designed so that subjects were exposed to privileged information unavailable to the bystander, permitting evaluation of the extent to which subjects could differentiate between their own perspectives and that of the less-informed bystander. Instructions to children began as follows:¹

I am going to show you some pictures. The pictures tell a story. I want you to describe what's happening in the story. Some of the stories are about a boy and some are about a girl. (Subjects were shown pictures of the boy and girl and were asked to name them.)

O.K., I am going to show you a story and you will describe what's happening in the story. You have plenty of time, so slowly and carefully look at each picture in the story. Pay attention to the people's feelings and thoughts. When you are finished studying the story, describe what's happening in each picture. I will write down what you say, so please go slowly.

Do you understand what you are supposed to do?

O.K. Here is the first story. Study it carefully. Look at each picture. Remember to pay attention to the people's feelings and thoughts. When you understand the story, describe it. Go ahead.

Description of cartoon sequences required only minimal language skills and all children were successful in recounting the events. For each sequence the examiner inquired into the protagonist's affective state after the upsetting event and the relationship between this event and the protagonist's subsequent mood and behavior. All subjects demonstrated understanding of the relationships between the upsetting events and the behaviors which followed.

All drawings were left in place and subjects were then asked to retell the story from the bystander's perspective, beginning with the frame in which the bystander was introduced. Direct inquiry was made into (a) what the bystander thought the protagonist felt, and (b) what the bystander thought the protagonist felt mad, sad, etc. about. The experimenter was consistently precise in specifying that the bystander's perceptions were of interest and pointed to the bystander with each reference to him or her.

Transcripts were made of all responses. Two independent raters, both unaware of the hearing status of the respondents, applied a 5-point scoring system which quantifies the amount of privileged information in the bystander's account of events (Chandler, 1973). Scores ranged from 0, for responses in which the subject without qualification explicitly attributed to the bystander knowledge of privileged information, to 4 for responses in which there was no intrusion of privileged information in the bystander's account.² Each response was rated in-

¹ Instructions were adapted from Chandler's unpublished manual.

² Chandler's scoring system assigns higher scores to more egocentric responses. This procedure was reversed so that higher scores corresponded to greater social decentration.

dependently of all others. Total social decentration scores were derived by summing the scores for the four cartoon sequences. The intraclass correlation coefficients between the summed ratings of the two judges, across the four sequences, were 1.0 (i.e., agreement was perfect) for the hearing-impaired sample and .99 for the hearing sample. The final social decentration score was the mean of the two raters' scores and ranged from 0 to 16.

Conservation. As discussed above, conventional conservation instructions are likely to direct hearing-impaired children toward irrelevant stimulus dimensions, resulting in underestimation of their abilities. In the present study, subjects were presented with number, mass, and liquid conservation problems, respectively, using a procedure based on Rittenhouse's attribute specific instructions (Rittenhouse, 1981). In the current tasks a specific context was created for the conservation judgment, the relevant attribute was named, and the amount of verbalization describing each alternative (i.e., $A > B$, $B > A$, $A = B$) was held constant. The latter consideration is important because in number and liquid conservation problems reported previously, more verbalization has been used to describe the $A = B$ alternative than the others (e.g., Chang & Gonzales, 1987; Rittenhouse, 1981), and it is possible that some children may adopt a response bias in which they choose the alternative corresponding to the most verbalization.

In the conservation of number problem, children were presented with 2 rows of candy containing 6 pieces each. The rows were aligned in one-to-one correspondence. The experimenter said, "Suppose you are really hungry, and you want to eat a lot of candy. Does this row have the most number of pieces, or does this row have the most number of pieces, or do they have the same number of pieces?" (Use of the relational term *more* was avoided since hearing-impaired children sometimes interpret *more* to mean "Which needs more in order to make them the same?", rather than "Which has more?"; Furth, 1966, p. 115.) Once equivalency of the two rows was established, the experimenter said, "Watch me," and decreased the distance between pieces in one of the rows. The identical question, beginning with "Suppose you are really hungry . . .", was posed again. After the child responded, the experimenter asked, "How do you know they have same number of pieces?" (conservation) or "How do you know this row has the most number of pieces?" (non-conservation).

In the conservation of mass problem, children were presented with two balls of clay of equal size. The experimenter said, "Suppose you want to play with a lot of clay. Is the most amount of clay here, or is the most amount of clay here, or do they have the same amount of clay?" If subjects picked one of the balls, the experimenter said, "Make them have the same amount of clay, so whichever ball you play with, you have the same amount." Once equivalency of the two balls was established, the experimenter said, "Watch me", and rolled one of the balls into a sausage shape. The identical question, beginning with "Suppose you want to play . . .", was asked again. After the child responded, the experimenter asked,

"How do you know they have the same amount of clay?" (conservation) or "How do you know the most amount of clay is here?" (non-conservation).

In the conservation of liquid problem, children were presented with two identical clear plastic 8-ounce cups filled to the same height with grape juice. The experimenter said, "Suppose you are really thirsty and you want to drink a lot of juice. Is the most amount of juice in here, or is the most amount of juice in here, or do they have the same amount of juice inside?" If subjects picked one of the cups, the experimenter said, "Make them have the same amount of juice inside, so whichever one you drink, it would be the same amount." Once equivalency of the two cups was established, the experimenter said, "Watch me," and poured the juice from one of the cups into a taller, thinner clear plastic cup. The identical question, beginning with "Suppose you are really thirsty . . .", was posed again. After the child responded, the experimenter asked, "How do you know they have the same amount of juice inside?" (conservation) or "How do you know the most amount of juice is in here?" (non-conservation).

For each problem, subjects received a score of 1 for a judgment of equality after the transformation, or 0 for a judgment of inequality after the transformation. The total conservation score was the sum of the scores for the number, mass, and liquid problems.³

Nonverbal intelligence. The Block Design subtest from the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974) was the index of nonverbal intelligence. This subtest is highly correlated with the WISC-R nonverbal IQ ($r = .82$) (Wechsler, 1974) and is considered a good measure of general intelligence (e.g., Ogdon, 1977). The standardized administration procedures described in the test manual (Wechsler, 1974) were followed.

Testing Conditions

All children were individually tested in one session lasting approximately 30 minutes. Subjects were seated at a table across from the experimenter in a small room on the camp grounds. Because evaluation of task order effects was not of primary concern and the sample size was relatively small, we felt the most sensitive tests of the hypotheses would be obtained if task order were held constant. Subjects were administered the tests in the following order: conservation, social decentration, and block design. The experimenter was a skilled user of manual English, and instructions to children with hearing-impairments were expressed in simultaneous manual and spoken English. This was the mode of communication used by camp staff members and school teachers.

³ A scoring system based on the justifications for correct judgments was also employed. Use of this system produced no difference in the results in terms of statistical significance.

RESULTS

The first set of analyses determined whether degree of hearing loss within the hearing-impaired sample was associated with either social or nonsocial decentration scores. Hearing-impaired subjects were divided into a profoundly hearing-impaired group (losses ranging from 85–113 dB) and a moderately-to-severely hearing-impaired group (losses ranging from 42–78 dB). The profoundly hearing-impaired group consisted of eleven subjects (6 boys and 5 girls) with a mean loss of 102 dB ($SD = 8.1$). The moderately-to-severely hearing-impaired group consisted of twelve subjects (8 boys and 4 girls) with a mean loss of 62 db ($SD = 12.3$). Young and old hearing-impaired subjects were combined for the present analyses since the small sample size precluded a meaningful test of the hearing loss by age interaction. Inspection of cell means for the three experimental tasks, however, suggests that there were no hearing loss by age interactions.

The means and standard deviations on age, block design, social decentration, and conservation for the profoundly and moderately-to-severely hearing-impaired groups are presented in Table 1. Separate one-way analyses of variance on age and block design, respectively, were first performed to determine if the groups were equivalent in age and intelligence. Although the groups did not differ significantly in age, $F(1,21) = 0.8$, ns, the profoundly hearing-impaired children scored significantly higher than the moderately-to-severely hearing-impaired children on the block design measure, $F(1,21) = 9.1$, $p < .01$. To statistically adjust for the difference in intelligence, separate one-way analyses of covariance for the social decentration and conservation measures were computed, with block design scores as the covariate in both analyses.⁴ The differences between the groups did not reach statistical significance for either social decentration, $F(1,20) = 2.5$, ns, or conservation, $F(1,20) = 4.1$, ns.

Table 1
Means and Standard Deviations for Age and Experimental Tasks by Degree of Hearing Loss

Measure	Profound	Moderate-to-Severe
Age (in months)	124.3 (29.4)	133.5 (18.4)
Block design	11.7 (4.3)	7.0 (3.2)
Social decentration ^a	8.0 (7.4)	3.7 (3.4)
Conservation ^a	1.8 (1.3)	0.7 (1.0)

Note. Standard deviations are in parentheses following means.

^a Means adjusted for block design scores.

⁴ Tests of the parallel slopes hypothesis for both measures failed to reject the hypothesis of homogeneous slopes, indicating that the effects of changes in block design on social decentration and conservation, respectively, were the same for both groups.

In a potentially more sensitive test of the association between hearing loss and decentration, the two groups were combined and degree of hearing loss was treated as a continuous variable. Forced entry multiple regression analyses were performed to predict social decentration and conservation scores, respectively. Block design scores were entered first into the equations and the contribution of degree of hearing loss was then assessed. Degree of hearing loss did not contribute significantly to the prediction of either social decentration, $F(1,20) = 2.3$, ns, or conservation, $F(1,20) = 3.4$, ns. Because degree of hearing loss was not independently associated with either social or nonsocial decentration, moderately-to-severely and profoundly hearing-impaired children were combined for all subsequent analyses.

The means and standard deviations on the three experimental tasks, by hearing status and age, are presented in Table 2. A 2 (hearing status) by 2 (age) analysis of variance on block design scores showed no hearing status, age, or hearing status by age effects. Separate 2 (hearing status) by 2 (age) analyses of variance on decentration scores revealed significant hearing status effects for both social decentration, $F(1,44) = 8.4$, $p < .01$ (see Table 3), and conservation, $F(1,44) = 12.2$, $p < .01$ (see Table 4). In both cases, the mean of the hearing children was significantly higher than that of the hearing-impaired children. There were no main effects for age and no hearing status by age interactions for either of the decentration measures.

Within both hearing and hearing-impaired groups, social decentration and conservation scores were significantly correlated. As shown in Table 5, these correlations remained significant after statistical adjustment for age and block design, respectively. When both age and block design were adjusted simultaneously, the correlation was significant within the hearing-impaired group and approached significance with the hearing group ($p = .055$). Separate tests of the difference

Table 2
Means and Standard Deviations on Experimental Tasks by Hearing Status and Age

		Measure		
Group	N	Social decentration	Conservation	Block design
Hearing-impaired				
Younger	11	4.2 (6.1)	1.1 (1.4)	9.2 (2.6)
Older	12	7.1 (6.8)	1.3 (1.4)	9.3 (5.7)
Combined	23	5.7 (6.5)	1.2 (1.3)	9.3 (4.4)
Hearing				
Younger	12	10.1 (6.8)	2.1 (1.2)	10.8 (3.5)
Older	13	11.6 (5.0)	2.8 (0.8)	9.4 (2.5)
Combined	25	10.9 (5.9)	2.4 (1.1)	10.0 (3.0)

Note. Standard deviations are in parentheses following means.

Table 3

Summary of 2 (hearing status) by 2 (age) Analysis of Variance of Social Decentration Scores

Source of variation	Sum of squares	Degrees of freedom	Mean square	F
Hearing status	322.2	1	322.2	8.4*
Age	57.3	1	57.3	1.5
Hearing status $\times$ age	6.3	1	6.3	0.2
Error	1690.8	44	38.4	
Total	2076.2	47		

* $p < .01$.

Table 4

Summary of 2 (hearing status) by 2 (age) Analysis of Variance of Conservation Scores

Source of variation	Sum of squares	Degrees of freedom	Mean square	F
Hearing status	17.9	1	17.9	12.2*
Age	2.7	1	2.7	1.8
Hearing status $\times$ age	0.6	1	0.6	0.4
Error	64.8	44	1.5	
Total	86.0	47		

* $p < .01$

Table 5

Zero, First, and Second Order Correlations between Social Decentration and Conservation

Adjusted for	Hearing-impaired	Hearing
	.74***	.60**
Age	.72***	.55**
Block design	.66**	.50*
Age and block design	.60**	.41 ^a

Note. All p 's are two-tailed.

^a $p = .055$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

between two correlation coefficients revealed no statistically significant differences in the magnitude of the zero, first, and second order correlation coefficients between the hearing and hearing-impaired groups.

DISCUSSION

Piaget has argued that children learn to decenter in social and nonsocial contexts through social interaction. Because research indicates that many hearing-impaired children have fewer and linguistically less complex social interactions in comparison to their hearing peers, it was hypothesized that they may be delayed in the ability to decenter. The present results are consistent with this hypothesis. On a task requiring subjects to differentiate between information available to themselves and others, as well as a task requiring coordination of different physical dimensions, this sample of hearing-impaired children scored significantly below the normally hearing children. The comparable performance of the two groups on the block design test indicates that the discrepancies in social and nonsocial decentration scores were not due to a difference in general intellectual level.

An alternative explanation for the lower scores of the hearing-impaired children is that they lacked the linguistic experience necessary to understand the experimenter and/or to respond effectively to the questions asked. Although the two groups most likely did differ with respect to linguistic skill, it is unlikely that this discrepancy *per se* accounted for the differences in performance. All instructions to the hearing-impaired children were presented in simultaneous manual and spoken English by an experienced sign language user, allowing them to communicate in the mode with which they were most familiar. Furthermore, the conservation tasks were designed specifically for use with hearing-impaired children and were based on procedures that have been shown to facilitate conservation performance in this population (Rittenhouse, 1981). In addition, all participants were able to describe the cartoon sequences depicted in the social decentration task and demonstrated understanding of the connections between the upsetting events and the protagonists' subsequent behaviors.

The lower scores of the hearing-impaired children may result from a poor match between the particular communication needs of children with impaired hearing and their early social environment. Even when hearing-impaired children learn a manual communication system in school, there may be few, if any, members of their families who use that system skillfully and consistently (Freeman, Malkin, & Hastings, 1975). Furthermore, the existence of family members who use manual communication does not generally provide a hearing-impaired child with access to verbal exchanges that are not addressed directly to the child (Kusche, Garfield, & Greenberg, 1983). The role of language-mediated social experience in the development of decentration might be evaluated by comparing hearing-impaired children of hearing-impaired parents with those of hearing parents on decentration tasks. We expect that those with hearing-impaired parents would obtain higher scores, as has consistently been found in studies of academic achievement (Meadow, 1980).

A number of investigators have argued that social decentration is essential for effective interpersonal functioning (e.g., Feffer & Suchotliff, 1966; Flavell et al.,

1968). The ability to shift from one's own to another's point of view, for example, may facilitate communication by allowing one to structure one's verbalizations to meet the informational needs of others (Feffer & Suchotliff, 1966). Deficits in social decentration, therefore, may lead to difficulties in social interaction. Seemingly simple social tasks, such as initiating and terminating conversations, may cause considerable difficulty for children who have trouble decentering. Furthermore, deficits in social decentration may become increasingly problematic as children grow older and the demands of social situations become more complex. Empirical research bearing on the relationship between social decentration and social behavior, however, has not produced consistent findings (Krebs & Russell, 1981; cf. Underwood & Moore, 1982).

Degree of hearing loss within the hearing-impaired group did not contribute significantly to the prediction of either social or nonsocial decentration ability. Rittenhouse, Morreau, and Iran-Nejad (1981) similarly reported that degree of hearing loss was unrelated to conservation performance. These findings suggest that teachers and parents should provide moderately and severely hearing-impaired children, as well as profoundly hearing-impaired children, with an experiential foundation for development of concrete operational thought. Although such an approach is frequently advocated for the hearing-impaired (e.g., Chang & Gonzales, 1987; Watts, 1979), the often superior speech quality of moderately and severely hearing-impaired children relative to their profoundly hearing-impaired peers may lead to overestimation of their level of cognitive development and the use of less appropriate educational strategies.

The significant correlations between social decentration and conservation within the hearing and hearing-impaired groups are consistent with previous research relating performance on social decentration measures and experimental tasks requiring nonsocial decentration in normally hearing children (Feffer & Gourevitch, 1960; Rubin, 1973; Swinson, 1965). These findings support Piaget's contention that centration-decentration is a cognitive dimension underlying the structuring of both social and nonsocial content. The results further suggest that prelingual hearing loss does not alter the relationship between social and nonsocial decentration.

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