

# Hearing Mothers and Their Deaf Children: The Relationship between Early, Ongoing Mode Match and Subsequent Mental Health Functioning in Adolescence

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In the few studies that have been conducted, researchers have typically found that deaf adolescents have more mental health difficulties than their hearing peers and that, within the deaf groups, those who use spoken language have better mental health functioning than those who use sign language. This study investigated the hypotheses that mental health functioning in adolescence is related to an early and consistent mode match between mother and child rather than to the child's use of speech or sign itself. Using a large existing 15-year longitudinal database on children and adolescents with severe and profound deafness, 57 adolescents of hearing parents were identified for whom data on language experience (the child's and the mother's) and mental health functioning (from a culturally and linguistically adapted form of the Achenbach Youth Self Report) was available. Three groups were identified: auditory/oral (A/O), sign match (SM), and sign mismatch (SMM). As hypothesized, no significant difference in mental health functioning was found between the A/O and SM groups, but a significant difference was found favoring a combined A/O and SM group over the SMM group. These results support the notion of the importance of an early and consistent mode match between deaf children and hearing mothers, regardless of communication modality.

The most salient fact of deafness is that it renders spoken language inaccessible in the normal fashion. This, and the fact that over 90% of deaf children are born to hearing parents (Moore, 2001; Marschark, Lang, & Albertini, 2002), has far reaching implications for many aspects of development including language acquisition, familial and social relationships, and access

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to information and education. While there is no reason to believe that deafness itself renders children more prone to psychopathology (Marschark, Lang, & Albertini, 2002), deaf children and adolescents face a myriad of social, educational, and communication barriers in their daily lives that may contribute to an increase in the likelihood of experiencing psychosocial problems.

A review of the literature finds relatively little research on the mental health functioning of deaf children and adolescents. Results of studies that have been done are difficult to compare because of differences in methodology and the samples studied. Widely varied estimates of the prevalence of mental health problems among deaf children and adolescents are reported. Depending on the definitions of deafness and on the instruments used, prevalence rates range from 8% to 61% (Hindley, Hill, McGuigan, & Kitson, 1994; Vostanis, Hayes, Du Feu, & Warren, 1997; MacLean & Becker, 1979; Musselman, MacKay, Trehub, & Simon-Eagle, 1996; Musselman, Mootilal, & MacKay, 1996; reviews in Meadow & Trybus, 1979; Schlesinger & Meadow, 1972; and Greenberg & Kushé, 1989). Despite the great variability, the bulk of the literature suggests that, in general, deaf children and adolescents are at greater risk for psychosocial maladjustment than their hearing counterparts.

That language plays an important role in child development and cognition has long been widely accepted. Vygotsky (1986), proposed a complex model

of language and cognition that emphasized the social nature of development and learning. He viewed language as the most important of the cognitive tools for transmitting information among individuals and from one generation to another. He also identified a developmental shift from the interpersonal to the intrapersonal use of language as a cognitive tool for individual problem solving and thought.

More recently, investigators have begun to revisit the complex links of language to cognitive, social, and emotional development. Several studies have investigated the relationships between language skill and the psychosocial functioning of children in the general population. A review of this literature reveals that most studies have found a negative relationship between language skills and psychiatric difficulties (Beitchman et al., 2001; Beitchman, Cohen, Konstantareas, & Tannock, 1996; Cohen, 2001; Gallagher, 1999). High comorbidity rates have been reported between language and communication impairment and a wide range of childhood psychiatric disorders including attention deficit hyperactivity disorder (Tannock & Schachar, 1996), behavior disorders (Stevenson, 1996), schizophrenia (Caplan, 1996), and attachment disorders (Crittenden, 1996). The relationships between the biological, interpersonal, and social factors that present in the various language and communication impairments are obviously of a complex nature, and causal relationships are not easily determined.

The study of prelingually deaf children, however, affords us a unique opportunity to investigate these relationships because the communication and language development challenges faced by these children are not generally due to language or communication disorders per se, nor the result of general cognitive deficits. Rather, the vast majority (over 90%) of deaf children are born to hearing parents who have no prior knowledge of deafness or sign language. The specific modality of the family's language (speech) is, by virtue of the child's deafness, inaccessible in the normal fashion. As such, the study of deaf children and adolescents may be seen as a more direct study of the relationship of language itself to mental health. What then, might be the implications for the development of language, learning, cognition and psychosocial health of deaf children?

Much of the research related to the language and mental health of deaf children has focused on comparisons between deaf children who use auditory/oral (A/O) communication and those who use manual (sign) communication. Once again there is variability in the literature but, overall, findings suggest that deaf children and adolescents of hearing parents who communicate in an A/O mode and who are mainstreamed in school tend to fare better on measures of mental health than those who use sign language and are in special school settings (MacLean & Becker, 1979; Fundudis, Kolvin, & Garside, 1979). Some have suggested that, even for adolescents who sign, the additional use of speech may be a protective factor (Vostanis et al., 1997).

These groups, however, have important differences in language development in addition to language modality. Research to date shows that, at least to six years of age, deaf children of signing deaf parents follow the same developmental timelines and milestones as hearing children (Bonvillian & Folven, 1993; Petitto, 2000; Petitto & Marentette, 1991; Meadow, Greenberg, Erting, & Carmichael, 1981; Meier, 1991). There is also evidence that these children generally outperform deaf children of hearing parents in language, academic functioning, and psychosocial adjustment (Vernon & Koh, 1970; Balow & Brill, 1975; Zweibel, 1987). The advantages reported for deaf children of deaf parents are typically attributed to a fully and naturally accessible language environment and to a high level of parental acceptance and preparedness for raising a deaf child (e.g., Musselman, 2000).

One important barrier to research in this area has been the paucity of appropriate, reliable assessment tools for use with deaf children. Most researchers have had to rely on measures developed for use with hearing children, which lack deaf norms. One notable exception is the Meadow/Kendall Social-Emotional Assessment Inventory (1980), an observational rating scale typically completed by teachers and school personnel to identify positive classroom and school behaviors as well as problem behaviors of deaf children and adolescents.

In recent years, some researchers have investigated the mental health functioning of deaf children and adolescents using three companion instruments de-

veloped by Achenbach (1991). The Child Behavior Checklist (CBCL), the Teacher Report Form (TRF), and the Youth Self Report (YSR) are widely used and well-standardized tools for measuring child and adolescent psychopathology in the general population. Each questionnaire consists of over 100 items that the informant is asked to rate on a three-point scale (*not true, sometimes true, often true*) for the item's applicability to the child. The instrument generates a Total Problems Score (TPS) as well as broadband *T*-scores for Internalizing Problems (INT) and Externalizing Problems (EXT). In addition, the instrument yields a number of subscale scores within these broadband factors. The INT scale is made up of the Withdrawn, Somatic Complaints and Anxious/Depressed subscales, and the EXT scale is made up of the Delinquent Behavior and Aggressive Behavior subscales. Based on the *T*-scores, one can calculate whether or not a score places the adolescent in the "clinical range." In general, *T*-scores of 60–62 are considered borderline, while higher scores are considered clinical and indicative of significant internalizing (emotional) or externalizing (behavioral) problems. Scores on the broadband factors in the clinical range place the youth at or above the 90th percentile for age and sex.

Results of the studies using the parent-report (CBCL) and teacher-report (TRF) forms of the Achenbach instrument with deaf children and adolescents are mixed. Van Eldik (1994) studied 41 deaf Dutch boys between the ages of 6 and 11 years who attended day schools for the deaf. Van Eldik found a prevalence rate of mental health difficulties of 12% on the CBCL among these boys, which was not significantly different from the rate of 10% found among their hearing peers. It is important to note that van Eldik was trying to establish as "normal" a deaf group as possible and had excluded any deaf boys who had been referred to mental health services within the previous year.

In another study, Furstenberg and Doyal (1994), using the TRF, studied 63 hard-of-hearing and deaf youth between the ages of 11 and 21 years across a range of educational settings. They found that, as a group, the scores of these children and adolescents on the TRF were within the normal range, suggesting that the prevalence rate for mental health difficulties in their

sample was no higher than that in the general population.

In a third study, Vostanis et al. (1997) studied 84 deaf children ranging in age from 2 to 18 years who were attending schools for the deaf. Using the CBCL they found a prevalence rate of 40% for children scoring at or above the borderline range. There were no differences between those who signed only versus those who used both sign and speech. No children who used only speech were included in the study.

The many differences in sample characteristics such as age, sex, degree of hearing loss, communication method, and educational placement along with differences in respondent make it difficult to compare and interpret the mixed results of these studies.

Investigators adapted the YSR for use with deaf adolescents (MacKay & Trehub, 1993; Musselman, MacKay, et al., 1996). Items on the YSR were modified by translating them into American Sign Language (ASL) and then back into English, using simple vocabulary and basic sentence structures. The result is a version of the YSR that is semantically more transparent to ASL users as well as to less skilled readers. Examples of modifications made to YSR items are as follows:

1. I don't feel guilty after doing something I shouldn't (original).  
If I do something wrong, I feel guilty (revised).
2. I cut classes or skip school (original).  
I miss classes/school without permission (revised).
3. I stand up for my rights (original).  
I speak out for my rights/beliefs (revised).
4. I have a hot temper (original).  
I get very angry quickly (revised).

The YSR was also modified to reflect the fact that most deaf students are bicultural, living and relating in both deaf and hearing worlds. As such, the YSR was modified to evaluate the role of context (i.e., deaf versus hearing environment) in the self-reported symptomatology of deaf teens. Thirty of the 113 YSR items (15 Internalizing, 15 Externalizing) were asked twice, first with reference to a deaf group and then with reference to a hearing group. Examples of contextual modifications to the YSR are as follows:

1. I argue a lot (original).  
I argue a lot with deaf/hearing-impaired people (revised).  
I argue a lot with hearing people (revised).
2. I feel lonely (original).  
I feel lonely with deaf/hearing-impaired people (revised).  
I feel lonely with hearing people (revised).
3. I get teased a lot (original).  
Deaf/hearing-impaired people tease me (revised).  
Hearing people tease me (revised).
4. I can do certain things better than most kids (original).  
I can do some things better than deaf/hearing-impaired teenagers (revised).  
I can do some things better than hearing teenagers (revised).

Youth Self-Reports were administered in a combination of print plus each student's preferred communication mode (spoken English, ASL, Signed English) by a certified sign language interpreter and native signer. The adapted YSR form was administered to deaf adolescents who had participated in a longitudinal study of development (Musselman, Lindsay, & Wilson, 1988). It is important to note that this marks the first time that deaf adolescents had themselves been asked about their social-emotional functioning.

The investigators reported test-retest reliability of the adapted YSR ( $r = .87$ ) comparable to that of the original Achenbach form. The researchers (MacKay & Trehub, 1993; Musselman, MacKay, et al., 1996) found higher rates of self-reported social-emotional difficulties in deaf adolescents relative to a control group of hearing adolescents: 51% versus 29%, with overall average scores falling at or above the borderline cutoff. Further analysis within the deaf group revealed an interesting pattern of results as a function of communication mode on each of the broadband scores. The same rank ordering of group means was found on all three scales. The A/O adolescents reported the lowest (i.e., healthiest) average scores, late-signers (those who had learned after age six) reported the highest scores (i.e., most problematic) and the scores of the early-signers (those who had learned before age six)

fell somewhere in between. This is consistent with previous literature suggesting that deaf children who communicate using spoken language exhibit better mental health than those who communicate in sign language. The finding of differences between early and late signers, however, is new.

Part of the reason for these differences may be due to the fact that the A/O and sign groups differ in ways other than communication mode alone. A/O groups represent a highly select group of deaf individuals who are considered to function adequately using spoken language alone. These adolescents have the additional advantage of sharing a common, albeit not easily accessible or fully fluent, language with their families from early childhood. A shared communication system with caregivers and others undoubtedly facilitates interactions that promote linguistic, cognitive, and socioemotional growth.

By comparison, the sign groups included few youth who were exposed to sign in infancy by parents who were skilled signers. Most began signing in the preschool period or later, generally after encountering difficulties in acquiring spoken language (Musselman & Akamatsu, 1999). These individuals had likely experienced significant changes in school environments as well as communication mode. The delay they experienced in exposure to sign language and the lack of exposure to caregivers experienced in sign may have resulted in diminished access to instructional and social interactions.

The importance of early and consistent language stimulation in childhood is widely accepted (Newport, Bavelier, & Neville, 2001; Bortfeld & Whitehurst, 2001; Grimshaw, Adelstein, Bryden, & MacKinnon, 1998). Evidence that this is also true for deaf children, regardless of language modality, can be found in studies by Mayberry and Eichen (1991) and Geers and Schick (1988). Mayberry and Eichen revisited the "critical period" for language acquisition by investigating the long-range outcome of sign language acquisition. They studied 49 deaf signers who had used sign language for an average of 42 years, having first acquired it at ages ranging from birth to 13, and found significant effects of age of acquisition on all levels of linguistic structure.

In their 1988 study of the acquisition of spoken English and signed English by deaf children of deaf parents and deaf children of hearing parents, Geers

and Schick found that children using spoken language alone and deaf children of deaf parents had similar levels of English-language development that exceeded that of deaf children of hearing parents. They interpreted these results as suggesting that consistent language stimulation throughout the elementary school years was a critical factor in the development of English, regardless of the language or mode of expression. These results mirror the overall findings in the literature regarding mental health, namely the apparent advantage—among deaf children with hearing parents—of using spoken language rather than sign and the overall advantage of deaf children with deaf parents compared to those with hearing parents.

No studies have explored the relationship between language and mental health by comparing signing deaf children of hearing parents whose exposure to sign occurred relatively early and was ongoing throughout early development with those whose exposure occurred later and/or was not ongoing. Such a comparison would yield a signing group that was more comparable to A/O groups included in previous studies and would help disentangle the effects of language mode and experience from parental hearing status. It is virtually impossible to obtain a group of early signers with hearing parents whose language experience is truly comparable to that of an A/O group. A/O deaf children are exposed to spoken language from birth by parents who are native speakers. While important differences will remain, such comparisons will have important theoretical and policy implications.

The purpose of the present study was to investigate the relationship between an early and developmentally continuous mode match between hearing mothers and their deaf children and subsequent mental health functioning in adolescence. It is widely recognized that for optimal language development to occur, very early exposure to a mutually accessible language is necessary. Practically speaking, however, such a language environment is extremely difficult to provide for deaf children with hearing parents. Hearing parents who choose an A/O mode of communication for their child are likely to be fluent users of the language themselves, but by virtue of the child's deafness this language is not easily or fully accessible to the child. Hearing parents who choose to use sign with their child are presenting

language in a visual mode that is fully accessible to the deaf child, but they are unlikely to be fluent signers, and as such provide their children with diminished language input.

With these caveats in mind, three groups were identified that distinguished between both language mode and mode match in an effort to provide a signing group whose language experience was more nearly equivalent to that of the A/O group. The three groups are auditory/oral (A/O), sign match (SM), and sign mismatch (SMM). The SM group was defined as those youth who began signing relatively early (i.e., before age five) with their mothers and continued to sign into adolescence. The SMM group was comprised of youth who either did not start using sign early in their development and/or did not have mothers who signed. While the SM group does not fully represent the same degree of early language exposure and mode match as enjoyed by A/O children, it does more closely approximate the experience of A/O children, distinguishing them from other signing children.

It was hypothesized that there would be no differences in mental health between the A/O and the SM group (hypothesis 1). It was also hypothesized that a combined A/O and SM group would have healthier mental health profiles than the SMM group (hypothesis 2).

## Method

### Participants

The data was pulled from a large data pool previously gathered by Musselman et al. (1988) and MacKay and Trehub (1993) as part of a longitudinal study of deaf children from a range of educational settings in Ontario. The original study population consisted of all three- to five-year-old children in the province of Ontario who were enrolled in an educational program for deaf children. About 80% of the families agreed to participate, yielding a sample of 153 children. The children had severe ( $\geq 70$  dB) or profound ( $\geq 90$  dB) deafness. Almost all of the children were prelingually deaf.

In adolescence, 65 of these children were located and agreed to participate in a further study (MacKay &

**Table 1** Characteristics of the sample by group

	A/O ( $n = 15$ ) M ( $SD$ )	SM ( $n = 15$ ) M ( $SD$ )	SMM ( $n = 27$ ) M ( $SD$ )	Total ( $n = 57$ ) M ( $SD$ )
Age at Youth Self Report (yrs-mos)	15-9 (1-5)	15-8 (1-1)	15-10 (1-2)	15-9 (1-2)
Hearing loss (unaided 3-point average)	92dB (12.99)	110dB (7.55)	100dB (12.76)	101dB (13.40)
Performance IQ	102 (13.97)	102 (16.79)	96 (11.06)	99 (13.71)
Age of sign acquisition (yrs-mos)	n/a	2-10 (1-4)	6-4 (3-9)	—
Percentage female	73.3	53.3	74.1	68.4

Note. A/O = auditory/oral, SM = sign match, SMM = sign mismatch.

Trehub, 1993; Musselman, MacKay, et al., 1996). Their hearing loss ( $M = 100.7$  dB) and Performance IQ ( $M = 99.2$ ) did not differ significantly from the original sample, indicating that the adolescent subsample was representative of the original sample and of deaf students in general. The sole exception was gender, which was biased in terms of females (68.4%) versus males (31.6%), who were considerably more reluctant to participate in the adolescent study (the original preschool sample contained 56% girls and 44% boys).

The 57 adolescents of hearing parents were divided into three groups on the basis of language experience: The auditory/oral group (A/O,  $n = 15$ ) consisted of children who used spoken English both in early childhood and in adolescence, as did their mothers. The sign match group (SM,  $n = 15$ ) consisted of children who used sign both in early childhood (prior to age 5 years) and adolescence, as did their mothers. The sign mismatch group (SMM,  $n = 27$ ) consisted of children who used sign in adolescence but not in early childhood or who, while signing in early childhood, had a mother who did not. The mean age of sign acquisition for the SM group was 2 years, 10 months and, for the SMM group, 6 years, 4 months. The socioeconomic status of families was scored using Blisshen's index, which reflects education and income levels and has been standardized on a Canadian sample (Blisshen, Carroll, & Moore, 1987). An ANOVA conducted on this measure found no significant differences among any of the groups. Characteristics of the sample by group are presented in Table 1.

In order to determine if there were differences in residual hearing among the groups, a one-way ANOVA was conducted on both the unaided and the

aided hearing thresholds by group, followed by a test of multiple comparisons (Tukey's honestly significant difference [HSD] test) where appropriate in order to determine where the overall difference lay. Results of the analysis on the unaided thresholds found a significant main effect by group,  $F(2, 55) = 9.76, p < .001$ . Tests of multiple comparison (Tukey's HSD) were conducted to determine which groups differed from one another. Tukey tests found a significant difference between the A/O and SM groups,  $F(\text{Mean Difference} = -18.59) p < .001$ , with the A/O group having more residual hearing; and between the SM and SMM groups  $F(\text{Mean Difference} = 10.16) p = .025$ , with the SMM group having more hearing. No significant difference in unaided hearing thresholds was found between the A/O and SMM group (Mean Difference =  $-8.43) p = .067$ . Results of the analysis of aided thresholds found a significant main effect by group,  $F(2, 46) = 5.10, p = .01$ . Tukey tests on aided thresholds found a significant difference between the A/O and SM groups,  $F(\text{Mean Difference} = -21.07) p = .01$ , with the A/O group having more residual hearing. No significant difference in aided hearing thresholds was found between the SM and SMM groups  $F(\text{Mean Difference} = 14.02) p = .06$ , or between the A/O and SMM group (Mean Difference =  $-7.05) p = .52$ .

The sample also included a small group of deaf children of deaf parents ( $n = 7$ ). While these were too few to constitute a formal comparison group, observations are made as relevant to further elucidate the analysis. Characteristics of this small group show that their hearing loss ( $M = 101.0$  dB) and Performance IQ

**Table 2** Youth Self Report (YSR) *T*-scores by group

	A/O ( <i>n</i> = 15)		SM ( <i>n</i> = 15)		SMM ( <i>n</i> = 27)		Total ( <i>n</i> = 57)		<i>p</i>
	M	( <i>SD</i> )	M	( <i>SD</i> )	M	( <i>SD</i> )	M	( <i>SD</i> )	
Total problem	56.53	(5.34)	59.20	(6.06)	63.15	(8.61)	60.37	(7.66)	.019
Total internalizing	55.53	(4.31)	56.80	(4.99)	59.81	(7.81)	57.89	(6.54)	.093
Total externalizing	53.73	(7.15)	55.27	(6.68)	60.89	(8.36)	57.53	(8.19)	.009

*Note.* A/O = auditory/oral, SM = sign match, SMM = sign mismatch.

( $M = 99.0$ ) were comparable to that of the deaf children of hearing parents.

### Measures

*Language mode.* Language mode in early childhood (prior to age five years) was the mode in which the child was educated as reported by parents and by schools. The cutoff of age five was selected because it resulted in the creation of groups with statistically viable numbers of subjects, rather than for any theoretical reason. Children in programs using sign were assigned to either the SM or SMM group on the basis of the age at which they were first exposed to sign and their mother's use of sign. Mother's mode was determined by observing videotapes of mother-child interaction both in early childhood and adolescence.

*Mental health.* Scores obtained from the previously administered adapted version (MacKay & Trehub, 1993) of the YSR were used as the measure of mental health functioning. YSR scores using the 30 deaf-referenced items were highly correlated with, and did not differ significantly from, those using the hearing-referenced items ( $r = .87$ ). Nevertheless, it was felt that the items used for an individual's score should be those most directly relevant to their social experience. Since A/O teens were all integrated, it was expected that they would have mostly hearing friends. Conversely, most signing teens were at least partially segregated and were thus expected to have mostly deaf friends. Therefore the decision was made for the present study to use the scores relating to the hearing reference group for the A/O adolescents and to the deaf reference group for the SM and SMM adolescents.

### Data Analysis

Correlations between the broadband scores of the YSR were performed to determine the extent to which the

INT and EXT scores were related and to assist in determining which statistical procedures were appropriate to compare groups. MANOVAs were selected to compare the INT and EXT scores across the sample groups (A/O, SM, SMM). Univariate analyses were conducted as appropriate.

In keeping with the previously stated hypotheses, planned orthogonal comparisons (reverse Helmert contrasts) were conducted to compare the A/O and SM groups, and a combined A/O and SM group with the SMM group.

Chi-square ( $\chi^2$ ) tests were conducted on each of the scales to determine if the three groups differed significantly in the frequency of adolescents with YSR scores in the three categories of normal, borderline, and clinical. As appropriate, chi-square tests comparing the A/O and SM groups and the combined A/O and SM group with the SMM group were also conducted.

## Results

### Deaf Adolescents' Self-Reported Mental Health

The mean YSR scores as a function of communication group are presented in Table 2. Of the comparison groups, the A/O adolescents reported the lowest (i.e., healthiest) scores and the SMM adolescents the highest scores, with the scores of the SM adolescents falling in between. Although the group of deaf adolescents of deaf parents was too small to be included in the formal analysis, it is interesting to note that the mean scores for this group on each of the scales (TPS  $M = 54.14$ ,  $SD = 5.90$ ; INT  $M = 52.00$ ,  $SD = 3.61$ ; EXT  $M = 54.43$ ,  $SD = 7.14$ ) were the lowest of all the groups (i.e., lower/healthier than the A/O adolescents).

**Table 3** Percentage of deaf students with total problem scores in the normal, borderline and clinical ranges

	A/O ( <i>n</i> = 15)	SM ( <i>n</i> = 15)	SMM ( <i>n</i> = 27)	Total ( <i>n</i> = 57)
Normal	73.3	46.7	29.6	45.6
Borderline	13.3	20.0	11.1	14.0
Clinical	13.3	33.3	59.3	40.4
Total	100.0	100.0	100.0	100.0

Note. A/O = auditory/oral, SM = sign match, SMM = sign mismatch.

### Group Differences in Mental Health Functioning

The Pearson correlation revealed that each of the two broadband scores was highly correlated with the overall problem score (INT,  $r = .90$ ,  $p < .01$ ; EXT,  $r = .85$ ,  $p < .01$ ), and to each other ( $r = .74$ ,  $p < .01$ ). Therefore, MANOVA was used to analyze the data in order to reduce error.

The MANOVA on the INT and EXT scores found a marginally significant multivariate main effect for group,  $F(4, 106) = 2.416$ ,  $p = .053$  (Wilks's Lambda). Given that this result approached significance and that the mean scores by group were in the predicted direction, follow-up univariate analyses were conducted. On tests of between-subject comparisons, a significant main effect for group on the EXT scale,  $F(2, 54) = 5.112$ ,  $p = .009$ , was found. No significant effect for group was found on the INT scale,  $F(2, 54) = 2.48$ ,  $p = .093$ .

In order to test the specific hypotheses as outlined previously, reverse Helmert contrasts were conducted to compare the SM and A/O groups, and a combined A/O and SM group with the SMM group, on the EXT scale. No significant differences were found between the A/O and the SM groups. This result supports hypothesis 1, that there would be no difference between adolescents who experienced an early and ongoing mode match, regardless of modality. When comparing the combined A/O and SM group with the SMM group, a significant difference was found on the EXT scale ( $p = .003$ ). This result supports hypothesis 2, that adolescents who shared an early and ongoing mode match with their mothers would present with healthier mental health profiles than those who did not.

**Table 4** Percentage of deaf students with internalizing scores in the normal, borderline and clinical ranges

	A/O ( <i>n</i> = 15)	SM ( <i>n</i> = 15)	SMM ( <i>n</i> = 27)	Total ( <i>n</i> = 57)
Normal	86.7	66.7	48.1	63.2
Borderline	13.3	26.7	18.5	19.3
Clinical	—	6.7	33.3	17.5
Total	100.0	100.0	100.0	100.0

Note. A/O = auditory/oral, SM = sign match, SMM = sign mismatch.

Since the overall analysis revealed a significant main effect for group on the EXT scale, further exploration of this scale was appropriate. The Pearson correlation revealed that each of the two subscale scores (Delinquent, Aggressive) was highly correlated with the overall EXT score (DEL,  $r = .87$ ,  $p < .01$ ; AGG,  $r = .95$ ,  $p < .01$ ), and highly correlated with each other ( $r = .78$ ,  $p < .01$ ). Therefore, a MANOVA was conducted on the DEL and AGG subscales, and a significant multivariate main effect for group was found,  $F(4, 106) = 2.995$ ,  $p = .022$  (Wilks's Lambda). Follow-up univariate analyses found a significant main effect for group on the DEL scale,  $F(2, 54) = 4.162$ ,  $p = .021$ , and on the AGG scale,  $F(2, 54) = 6.296$ ,  $p = .003$ . Reverse Helmert contrasts were again conducted to compare the groups of interest on each of the two subscales. Comparisons of the A/O and SM groups found no significant difference on either the DEL or the AGG subscale. When contrasting the combined A/O and SM group with the SMM group, significant differences were found on both the DEL subscale ( $p = .003$ ), and the AGG subscale ( $p = .001$ ).

Tables 3, 4, and 5 show the percentage of participants in each group falling in the normal, borderline, and clinical ranges on the TPS, INT, and EXT scales, respectively. As shown on these tables, the percentage of students with scores above the clinical cutoff of 60, which defines the borderline and clinical ranges, was 54% on the TPS, 37% on the INT, and 42% on the EXT. This is higher than the figures for the general population, which are 18% for each of the TPS, INT, and EXT scales. The rank ordering of groups was identical to that obtained for the scale scores, namely the A/O group had the least number of adolescents falling in the borderline and clinical ranges, followed by the SM group and, lastly, the SMM group.

Chi-square analyses were performed comparing the number of adolescents in each of the three groups with scores falling below, versus at or above, the borderline cutoff. The results of these analyses showed that the groups differed significantly on the TPS [ $\chi^2(2, 57) = 7.43, p = .024$ ], the INT scale [ $\chi^2(2, 57) = 6.26, p = .044$ ] and the EXT scale [ $\chi^2(2, 57) = 9.29, p = .010$ ]. Given that the overall chi-square analysis was significant, further chi-square analyses were conducted to compare the A/O and SM groups and the combined A/O and SM group with the SMM group. No significant differences were found between the A/O and S/M groups. However, the combined A/O and SM group did differ significantly from the SMM group on each of the scales, TPS [ $\chi^2(1, 57) = 5.28, p = .02$ ], INT [ $\chi^2(1, 57) = 4.97, p = .03$ ], EXT [ $\chi^2(1, 57) = 9.15, p < .01$ ]. Chi-square analysis of the EXT subscales revealed no significant difference between the A/O and SM groups. Significant differences were found between the combined A/O and SM group versus the SMM group, on both the DEL subscale [ $\chi^2(1, 57) = 6.23, p = .01$ ], and on the AGG subscale [ $\chi^2(1, 57) = 12.85, p < .01$ ].

## Discussion

The study investigated the relationship between the presence of an early and ongoing mode match between hearing mothers and their deaf child and the subsequent mental health functioning of those children in adolescence. Specifically, it sought to further investigate the reasons behind the apparent advantage reported for adolescents who use spoken language over those who use sign language, and hypothesized that deaf children who experienced an early and consistent exposure to sign in the home would have levels of mental health functioning in adolescence similar to that of A/O children and would be healthier than children exposed to sign later or inconsistently.

Overall, a consistent pattern emerged across all measures: The A/O group obtained the lowest (i.e., the healthiest) scores, the SMM group achieved the highest (i.e., the most problematic), and the SM group fell between these two groups. The overall analysis by group revealed a marginally significant main effect. The same rank ordering of groups was evident in the analyses comparing the distribution of the three groups

**Table 5** Percentage of deaf students with externalizing scores in the normal, borderline and clinical ranges

	A/O ( <i>n</i> = 15)	SM ( <i>n</i> = 15)	SMM ( <i>n</i> = 27)	Total ( <i>n</i> = 57)
Normal	80.0	73.3	37.0	57.9
Borderline	6.7	13.3	14.8	12.3
Clinical	13.3	13.3	48.1	29.8
Total	100.0	100.0	100.0	100.0

*Note.* A/O = auditory/oral, SM = sign match, SMM = sign mismatch.

between those falling in the normal range and those with scores at or above the clinical cut-off. Here the chi-square tests were significant for all three scales.

The statistical analysis addressed two hypotheses. Hypothesis 1 was that no difference in mental health functioning would be found between adolescents who shared an early and ongoing mode match with their mothers, regardless of modality (i.e., between the A/O group and the SM group). The results show that, as hypothesized, there were no significant differences between these groups on any of the scores. Hypothesis 2 was that those adolescents who shared an early and ongoing mode match with their mothers, whether speech or sign (i.e., the A/O and SM groups), would present with healthier mental health profiles than those who did not (i.e., SMM group). The results showed that, as hypothesized, there was a significant difference favoring the combined A/O and SM group as compared to the SMM group on the Externalizing scale and on its two subscales, (i.e., Delinquency and Aggressive).

What is most striking about the data itself is the consistent pattern of scores in which A/O adolescents present as the healthiest followed by the SM and then the SMM adolescents. Although it did not reach statistical significance, the apparent difference between the A/O and the SM group may result from the fact that, while more comparable than in previous studies, the A/O group still retains an advantage in terms of the age of initial language exposure and the quality of the language mode match with their mothers. While mothers in the SM group did begin to sign at roughly the same time as their children, they were not native signers. Furthermore, evidence shows that hearing parents acquire only modest levels of skill in sign even after considerable use (Vaccari & Marschark, 1997;

Meyers & Bartee, 1992). In a preliminary study, ratings performed on the sign skill of the mothers of these adolescents showed that they attained an average score of only Survival using a modification of Newell, Caccamise, Boardman, and Holcomb's (1983) Sign Communication Proficiency Interview. Only a few mothers scored Intermediate+ and none scored at the Advanced or Native levels (Beaton-Vasquez, 2002).

Furthermore, the percentage of adolescents scoring at or above the clinical cut-off even in the A/O group was higher than in the general population. While only suggestive, it is noteworthy in this regard that the scores of the small group of deaf adolescents with deaf parents were better than those of the A/O group, this being the only group who shared a common and barrier-free language with their parents from birth.

It is possible that there are other differences between the SM and SMM groups that might impact on their mental health. One might ask what factors led to the later exposure of the SMM group to sign? In considering this question the greater hearing of this group is suggestive. Among the measures obtained on the sample in early childhood was a spontaneous sample of spoken language, which yielded two measures: number of words intelligible (NWI) and number of utterances intelligible (NUI). The mean scores of the three groups on these measures followed the same order as the hearing thresholds: NWI—A/O (126.19), SMM (27.68), SM (1.93); NUI—A/O (11.31), SMM (4.12), SM (.93). A MANOVA to compare the groups found a significant multivariate main effect for group,  $F(4, 102) = 6.19, p < .001$ , (Wilks's Lambda). On tests of between-subject comparisons, significant main effects for group were found on the NWI measure,  $F(2, 52) = 13.42, p < .001$ , and on the NUI measure,  $F(2, 52) = 9.68, p < .001$ . Levene's statistic was calculated to test for homogeneity of variance of groups for each of the early speech measures. Results indicated that the assumption of equal variance was violated on both the measures, NWI,  $F(2, 52) = 17.52, p < .001$ , and NUI,  $F(2, 52) = 15.88, p < .001$ . Because of the lack of homogeneity of variance, Tamhane's T2 statistic for unequal variance was used in posthoc tests, to determine which groups differed from one and other. Results showed a significant difference between each of the three groups on each of the two measures.

These results clearly show that, in early childhood, the A/O group had the most intelligible speech, the SM group had the least intelligible speech, and the SMM group fell in the middle. This is the same pattern of results as for hearing thresholds as reported earlier. It is interesting that despite the finding that children in the SMM group had more hearing and better speech than those in the SM group in early childhood, those in the SM group displayed healthier mental health profiles in adolescence than those in the SMM group. These findings further support the notion that it is not oral language itself that impacts on mental health functioning, but rather the early and consistent establishment of a shared mode.

Another possible explanation for the poorer mental health of the SMM group is that their parents were less sensitive to their children's need for an alternative communication system and that it is this caregiver characteristic that is associated with the youths' mental health outcome.

That a significant main effect for group was not found on the INT scale but was found on the EXT scale suggests that it was primarily the latter that contributed to differences on the overall total problem scores. Further analysis of the EXT subscale found significant contrasts on each of the Delinquent and Aggressive subscales. It may be that the presence or absence of shared mode and the quality of the language model may most significantly impact on behaviors of an externalizing nature. Specifically, as suggested by Calderon (2000), it may be that "without good models for verbal [or sign] mediation of behavioral difficulties and facilitative instruction for alternative adaptive behaviors or reasons why the behavior is inappropriate, children/adolescents tend to exhibit acting-out behavior," (p. 152). That this is true for hearing as well as deaf children has previously been documented in the literature (Greenberg & Kusché, 1993). Unfortunately, one of the limitations of the present study is that it did not formally investigate the quality of language input and therefore does not allow for conclusive comments here. We can speculate, however, that the children in our SMM group, who typically used oral language early on, may have developed an externalizing manner of responding to communication frustration, which was not yet overcome in the adolescent years. Despite

the finding that early on they had better spoken language than their peers in the SM group, it appears that the addition of sign was not sufficient to overcome this pattern of externalizing behavior problems.

Studies of the mental health of deaf individuals are always limited by the fact that there exist almost no measures developed for and normed on a deaf population (Moore, 2001). Thus, the apparently poorer overall scores may reflect the lack of validity of the test. It has particularly been argued (Moore, 2001) that the existing measures are especially biased against users of sign language. An attempt was made to circumvent this charge in the present study by developing an ASL-compatible version of an existing measure. Nevertheless, the test is still English-based and lacks deaf norms. An argument in favor of the utility of this modified form of the YSR is the fact that the SM group scored better than the SMM group. Were the measure biased in favor of English, the SM group might be expected to fare worse, since they have poorer spoken language skills.

The results of the present study have a number of implications for researchers, parents, teachers, and mental health professionals. Consistent with much of the previous research on this topic, the present study found an overall higher rate of mental health problems among deaf adolescents than is typically reported in the general population of their hearing peers. As stated in the introduction, given the pervasive barriers these individuals face, this makes both clinical and theoretical sense. Musselman, MacKay, et al., (1996) have previously suggested that "asymmetries in the communication skills of parents, teachers and deaf adolescents may [further] impede the development of normal relationships, leading to the emergence of a variety of adjustment problems" (p. 566). The results of the present study not only reinforce the importance of early and ongoing mode match between child and family but also, in the interest of prevention of mental health problems, emphasize both the importance of attempts to identify as early as possible those deaf children who are likely to succeed with sign and not with spoken language, and the importance of fostering proficient sign language use among parents of deaf children who sign.

Secondly, given the long-standing controversy which has existed in the field of education of deaf

children (see Moore, 2001; Winefield, 1987) with regard to communication method, future researchers must endeavor more carefully and stringently to define groups when assigning students to oral versus signing groups for purposes of comparison. The effect of suggesting (erroneously) that it is oral communication itself that promotes better mental health functioning is to place a heavy burden on deaf children/youth and their families (Marschark, 1997), especially given that mastery of spoken language is an extremely difficult and elusive skill for prelingually deaf people and the vast majority never achieve proficiency in spoken language (Musselman, 1990; MacKay-Soroka, Trehub, & Thorpe, 1987; 1988). The results of this study suggest that, given appropriate and timely input, sign language can also serve as an effective communication medium for fostering socioemotional development, and further underscores the importance of research on how hearing parents of deaf children can become fluent signers early in their child's development.

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