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Parenting Stress among Parents of Deaf and Hearing Children: Associations with Language Delays and Behavior Problems

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Abstract

Objective—This study evaluates predictors of both general and context-specific parenting stress in a cross-sectional sample of hearing parents of young deaf and hearing children.

Design—Participants were 181 children who were deaf and 92 children with normal hearing. Perceived parenting stress was measured using both general and context-specific measures. Predictors of parenting stress included parent-reported and observed child behavior problems and language delays.

Results—After controlling for maternal education and family income, parents of deaf children reported more context-specific but not general parenting stress than parents of hearing children. Both parent-reported and observed behavior problems were higher in the deaf group compared to the hearing group. Children's hearing status related to child behavior problems by way of oral language delays. Furthermore, hearing status related to parenting stress by way of language delays and child behavior difficulties.

Conclusions—Context-specific measures of parenting stress reflect unique challenges of this population. Both language delays and child behavior problems are associated with increased parenting stress. Identification of specific stressors related to parenting a deaf child helps to inform the development of early interventions.

INTRODUCTION

Considerable evidence suggests that parenting stress affects parent-child relationships and important child outcomes. Higher levels of parenting stress have been related to poorer social and emotional development and higher rates of behavior problems in both deaf and hearing children (Crnic & Low, 2002; Hintermair, 2006; Lederberg & Everhart, 2000). Early childhood deafness presents unique and long-term challenges for parents, including communication

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difficulties, increased medical/audiological care, and educational challenges (Lederberg & Golbach, 2002). The current study examined parenting stress using both general and context-specific measures of parenting stress in a large, national cohort of hearing parents of deaf and hearing children. Context-specific measurement is important because it is more sensitive to the challenges of early childhood deafness than are general measures of stress (Quittner, Glueckauf, & Jackson, 1990). This study also sought to identify key mechanisms underlying stress in these parents, including demographic variables, language delays, and child behavior problems.

Parenting Stress in Parents of Deaf Children

To date, several studies have examined the rates of parenting stress among parents of young deaf children. However, contradictory findings have emerged. The earliest study used both general and context-specific measures of parenting stress in 96 parents of young deaf children (ages 2 to 5) and 118 parents of age- and gender-matched hearing children (Quittner et al., 1990). Higher levels of stress were found on both the general (i.e., Parenting Stress Index, PSI; Abidin, 1983) and context-specific measures (i.e., Family Stress Scale, FSS; Quittner et al., 1990; Quittner et al., 1991). These results were supported in a subsequent study of parents of 24 deaf children who received a cochlear implant (Quittner, Steck, & Rouiller, 1991). Parents in the previous study reported higher levels of parenting stress on the same context-specific measure (i.e., FSS), and these elevated levels of stress were related to more symptoms of depression and anxiety.

Three ensuing studies using the PSI with parents of deaf and hearing children did not find significant differences between the deaf and hearing groups. Meadow-Orlans (1994) assessed stress in 20 parents of 9-month-olds diagnosed with a mild to profound hearing loss. No statistically significant differences in parenting stress scores were found between the deaf and hearing groups. However, 25% of the mothers in the deaf group, compared to only 5% in the hearing sample, scored above the clinical cutoff. Thus, it is possible that there was not sufficient power to detect statistically significant differences. In addition, these results may have been affected by high levels of parent education and early identification of childhood deafness (i.e., by 7 months of age) that likely contributed to lower stress scores given that communication expectations are minimal during infancy. Meadow-Orlans (1994) suggested that parenting stress may increase as children grow and the communication gap between parents and their children becomes more apparent.

In a subsequent, longitudinal study, Lederberg and Golbach (2002) assessed the developmental changes in parenting stress among mothers of deaf ($n = 23$) and hearing children ($n = 23$). This study also assessed the impact of educational support on parenting stress. Mothers of 2-year-olds with hearing loss reported higher levels of stress. However, group differences were not found at 3 years and 4 years of age. This is the only longitudinal study of stress in parents of deaf children. The findings, however, were complicated by the selection of a context-specific measure designed for parents of children with disabilities (Questionnaire on Resources and Stress-Short Form, QRS-F; Friedrich, Greenberg, & Crnic, 1983) for the 2-year-old assessment and a general measure of parenting stress (PSI) at the two subsequent assessments. Significant differences in stress were only found on the disability-specific, but not general, measure. The major stressors endorsed by parents in the deaf group included communication difficulties and concerns about the future. Thus, Lederberg and Golbach (2002) postulated that parents of deaf children are more likely to experience stress in areas specific to their child's disability. Zaidman-Zait and Most (2005) also reported communication difficulties as the primary stressor for parents of children with hearing loss. Overall, these findings highlight the importance of measuring context-specific stressors in parents of children with hearing loss.

In a large study conducted by Pipp-Siegel, Sedey, and Yoshinaga-Itano (2002), mothers of young children (6 months to 5½ years) with hearing loss differed from the normative sample on one subscale of the PSI (Parental Distress Subscale). Parents of deaf children reported less stress than the normative sample; however, this difference was small (0.23 effect size). These results were inconsistent with previous research. Prior to this study, the majority of research has found no differences in general parenting stress in parents of hearing children compared to parents of deaf children, with the exception of Quittner and colleagues (1990). However, although Pipp-Siegel found lower levels of parenting stress in parents of hearing children, 13% of the sample scored above the clinical cut-off for the measure.

Finally, Asberg, Vogel, and Bowers (2008) explored the correlates of parenting stress in parents of deaf children. Seventeen percent of their sample scored above the clinical cut-off on the PSI; however, the average PSI score ($M = 72.71$) was not statistically different from the normative sample. These results were interpreted with caution, due to the relatively small sample size ($n = 35$) and large age range (2 to 16 years old) that extended beyond the developmental window of the PSI.

In summary, evidence of elevated levels of parenting stress among parents of deaf children is mixed. The variability in these findings may be partly explained by sample size, age at diagnosis, and amount of support provided to parents. One of the few consistent findings among these studies is that context-specific measures have shown greater sensitivity to the stressors reported by parents. Of the six studies addressing stress in parents of deaf children, three used a context-specific measure, and all three found statistically significant elevations in parenting stress relative to hearing populations. These findings strongly suggest that context-specific measures are more sensitive to the experiences of parents of children with hearing loss.

Predictors of Parenting Stress

Previous research has identified several factors that contribute to parenting stress in parents of deaf children. These factors have included income, age at diagnosis, extent of hearing loss, language abilities, mode of communication, and perceived social support (Asberg et al., 2008; Meadow-Orlans, 1994; Pipp-Siegel et al., 2002). However, previous studies have yet to address the mechanisms by which these predictors operate to influence parenting stress. Moreover, child behavior problems have yet to be included as a predictor of parenting stress in parents of deaf children. In the normal hearing literature, behavior problems have been linked to higher rates of parenting stress (Floyd & Gallagher, 1997). Elevated rates of behavior problems in deaf children have been documented (Barker et al., 2009; Mitchell & Quittner, 1996; van Eldik, Treffers, Veerman, & Verhulst, 2004; Vostanis, Hayes, Du Feu, & Warren, 1997); however, their influence on parenting stress has not been determined. The current study examined the link between child behavior problems and parenting stress in parents of young deaf children.

Communication—For hearing parents of deaf children, parent-child communication becomes a central issue because parents must actively learn how to communicate with their infants, rather than relying on intuitive communication strategies (Koester, Papoušek, & Smith-Gray, 2000). Regardless of the mode of communication parents adopt with their child (oral language, sign language, or a combination of the two), they face challenges in trying to replace learned habits of communication with new strategies (Jamieson, 1994). This process of adaptation can result in disrupted interactions that strain parents and children which, in turn, may negatively affect parenting roles and responsibilities (Quittner et al., 1990; Tamis-LeMonda, Uzgis, & Bornstein, 2002). Studies have shown that hearing parents of deaf children are more likely to be directive, even intrusive with their child (Meadow, Greenberg, Erting, & Carmichael, 1981; Nienhuys & Tikotin, 1983; Spencer & Gutfreund, 1990) and may

be less “attuned” to the child’s need to visually and tactilely explore the environment (Lederberg & Mobley, 1990; Spencer, Bodner-Johnson, & Gutfreund, 1992). There is some suggestion that these directive behaviors are an appropriate adaptation to children’s linguistic development. This assertion is supported by a study conducted by Lederberg and Everhart (2000) that reported mothers of deaf children to be as responsive to their child’s attentional focus as mothers of hearing children, and directive behaviors appeared to be an appropriate adaptation to the child’s linguistic development.

Children’s language skills may also influence parent-child interactions through one or both of the following pathways: (1) they could directly help children regulate their attention, emotion, and behavior or (2) they could facilitate communication with parents enabling children and parents to coordinate their interactions (Gallagher, 1999). Strong support has recently been found for both pathways in children who are deaf (Barker et al., 2009), suggesting that children’s language abilities strongly influence parent-child interactions.

Normal hearing children with language delays face additional challenges because their language abilities do not keep pace with the increasing developmental demands of early childhood (Bornstein, Selmi, Haynes, Painter, & Marx, 1999; Irwin, Carter, & Briggs-Gowan, 2002). These challenges are magnified by the presence of childhood deafness. The stress parents of deaf children experience is likely related to the discrepancy between these developmental demands and their child’s ability to meet them (Lederberg & Golbach, 2002). It may also be difficult for parents to adjust their behavior and expectations to better match their children’s unique communication needs. These difficulties likely increase as the child gets older because of the increased differences between parents’ intuitive expectations of the child’s capabilities and the child’s actual abilities. To our knowledge, only one study has directly assessed the relation between children’s language ability and parenting stress in deaf children (Pipp-Siegel et al., 2002). Parents of children with less language reported higher levels of parenting stress and perceived their children as more difficult.

In summary, research has consistently reported language delays and communication difficulties in deaf children. Children’s language ability has an impact on their behavior in terms of their ability to regulate their attention, emotion, and behavior and also facilitates communication with their parents. Furthermore, children’s language ability is related to parenting stress; parents of children with lower language abilities report higher levels of parenting stress. This relation may be due to the discrepancy between parents’ expectations and the children’s actual language or the result of the process of learning new communication strategies to interact effectively with their child.

Behavior problems—Several studies have shown that, compared to hearing children, deaf children have higher rates of behavior problems, such as aggression, non-compliance, and inattention (Barker et al., 2009; Mitchell & Quittner, 1996; van Eldik et al., 2004; Vostanis et al., 1997). These higher rates of behavior problems have yet to be linked to parenting stress in parents of deaf children; however, this link has been established in children with other disabilities (Floyd & Gallagher, 1997). To our knowledge, this is the first study to include child behavior problems as a predictor of parenting stress.

In terms of behavior problems in deaf children, children’s oral language ability is related to behavior problems, parent-child communication, and attention regulation. Using a large sample of deaf and hearing children, Barker and colleagues (2009) showed that lower language ability was related to poorer attention regulation, less parent-child communication, and increased child behavior problems. Moreover, attention regulation partially mediated the relation between language delays and child behavior difficulties, indicating that internal regulation (i.e., sustained attention) is an important mechanism through which language affects behavior

problems. It has also been suggested that poorer parent-child communication may relate to emotional regulation. Children depend, in part, on their parents to learn how to regulate their emotions. Poor communication between parents and children may interfere with this process and may be interpreted by others as negativity or problem behavior (Vaccari & Marschark, 1997).

Current Study

Despite consistent evidence demonstrating significant communicative and behavioral, difficulties among deaf children, few studies have linked objective measures of children's language development to increased rates of child behavior problems or higher levels of parenting stress. The current study used data from a large, national cohort of young deaf children awaiting cochlear implantation, as well as a group of similar-aged hearing children, to assess the links among hearing status, language delays, child behavior problems, and parenting stress. Four hypotheses were tested: (1) parents of deaf children were expected to report higher levels of general and context-specific stress than parents of hearing children; (2) deaf children were expected to have greater language delays and more behavior problems than hearing children; (3) language delays were expected to mediate the relation between hearing status and child behavior problems; and (4) language delays and behavior problems were expected to mediate the relation between hearing status and parenting stress.

METHODS

The Childhood Development after Cochlear Implantation (CDaCI) study is a multicenter, national cohort investigation of the effectiveness of pediatric cochlear implants. Participants were recruited from six clinical implant centers and two preschools that enrolled hearing children (Fink et al., 2007). Inclusion criteria for children in the CDaCI study were: (1) age under 5 years, (2) severe to profound sensorineural hearing loss, and (3) parents committed to educating the child in spoken English. Exclusion criteria included significant cognitive impairment (i.e., a Bayley Mental or Motor score of less than 70 or Leiter International Performance Scale – Revised [Leiter-R] score of less than 66). To increase the generalizability of the findings to a broader population of children receiving cochlear implants, we included children with scores above 70 and 66 on our cognitive measures. Hearing children were selected to be similar to the deaf children in terms of age and gender. All participants were assessed at Baseline (prior to implantation for the deaf group) and every 6 months (from point of activation for deaf group) for 3 years. Institutional review boards at all centers and preschools approved the study protocol.

Data for these analyses were drawn from the Baseline assessment (i.e., prior to cochlear implant surgery). Comparisons of the demographic data between the deaf and hearing cohorts indicated similar child age, gender, and ethnic composition. However, the deaf sample had a higher proportion of Hispanic or Latino children, lower parental education, and lower income (see Table 1).

Participants

The full CDaCI cohort consisted of 188 deaf and 97 hearing children. Seven parents of deaf children and 5 parents of hearing children self-identified as having some degree of hearing loss. Because our hypotheses were framed in terms of deaf children with hearing parents, all 12 of these families were omitted from the analyses presented in this study.

Demographic information is presented in Table 1. Deaf children had a *M* age of 2.2 years, *SD* = 1.2, and hearing children had a *M* age of 2.3, *SD* = 1.1. Among the deaf children, the age of onset of hearing loss varied between birth and 3.6 years, *M* = 0.2 years, *SD* = 0.6, and the

mean Pure Tone Average (PTA4) for the better ear was 106.3, $SD = 17.4$. Hearing loss was diagnosed at a M age of 0.9 years, $SD = 0.9$. Furthermore, average length of hearing aid use prior to implantation was 1.1 years, $SD = 1.0$. For a majority of the deaf children (56%), the onset of hearing loss was at birth.

Procedures

After an initial medical screening for children in the deaf group, a baseline assessment was scheduled prior to cochlear implant surgery, $M = 6.9$ weeks, and thus represented pre-implant functioning. This assessment was conducted by a speech and language pathologist either at the implant center or, in the case of one of the preschools from which hearing children were recruited, at the preschool. The assessment was typically conducted during two half-day appointments to lessen fatigue for the child and family. During the first day, parents completed demographic and self-report measures of communication and behavior, and children were assessed with language measures, cognitive tests, and an audiological exam. On the second day, children participated in videotaped structured play and problem-solving tasks with and without parents, and parents completed psychosocial questionnaires about their children. All measures, including the language testing, were conducted in spoken English. Parents in the deaf group received a \$100 honorarium annually, travel stipends if required, and extended warranties for the implants as reimbursement for their time and effort; parents in the hearing group received the same honorarium.

Parenting Stress

General parenting stress—The Parenting Stress Index-Short Form (PSI-SF; Abidin, 1995) is a 36-item measure derived from the well-validated full-length PSI, but can be completed by parents in less than 10 min. The PSI has been used in studies of deaf as well as hearing children (e.g., Lederberg & Golbach, 2002; Meadow-Orlans, 1994; Pipp-Siegel et al., 2002; Quittner et al., 1990; Victor, Bernat, Bernstein, & Layne, 2007). Each item is rated on a 5-point scale from *strongly agree* to *strongly disagree*. Items are divided into three subscales: Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child. Total raw scores were used in all analyses. Internal consistency and test-retest reliability for these scales is good, ranging from .78 to .85. Internal consistency coefficients for the current sample ranged from .83 to .86 for the deaf and from .82 to .88 for the hearing group.

Context-specific stress—The Family Stress Scale (FSS; Quittner et al., 1990; Quittner et al., 1991) is a context-specific measure of perceived parenting stress for parents of young deaf and hearing children. The FSS consists of 16 items with both general and context-specific stressors. Eleven items address general family stressors (i.e., finances, discipline) and 5 items address stressors specific to early childhood deafness (e.g., communication, managing hearing-aids/cochlear implants). Items are rated on a 5-point scale, from *not at all stressful* to *extremely stressful*. Raw scores were averaged across all items. Internal consistency coefficients ranged from .76 to .86, indicating strong reliability. Internal consistency in this sample was .89 for the deaf group and .67 for the hearing group.

Behavior Problems

Parent-reported behavior problems—Child Behavior Checklist 1½ -5 (CBCL; Achenbach & Rescorla, 2000). The CBCL is a well-validated behavior checklist that measures the frequency of a variety of child behavior problems. It yields a total score which can be divided into two empirically derived composite scales, Internalizing and Externalizing Behavior Problems, and one Sleep Problem scale. Total raw scores were used in all analyses. All subscales have demonstrated good internal consistency, with coefficients ranging from .68 to .87, and test-retest reliability reported at .85 over an 8-day period. Internal consistency

coefficients for this sample ranged from .65 to .91 for the deaf and .66 to .89 for the hearing groups.

Observational measure of child negativity—Child negativity toward the parent was coded from 20 min of videotaped interactions. These interactions included an unstructured 10-min Free Play task designed using Bornstein and colleagues' (1996) general format, a structured 5-min Problem-Solving task and a semi-structured 5-min Art Gallery task (Deckner, Adamson, & Bakeman, 2003; Quittner, Leibach, & Marciel, 2004). The Free Play task provided parent-child dyads with an age-appropriate selection of toys. Parents were instructed to play with their child "as they would at home" (Bornstein et al., 1996). The Problem-Solving task involved an age-appropriate easy and challenging puzzle. Parents were asked to help the child complete the easy puzzle first, and then focus on the hard puzzle. The Art Gallery task consisted of five art posters placed at varying heights around the room (Deckner et al., 2003). Parents were instructed to discuss the pictures with their child and determine which he or she liked best and least (for details refer to Quittner et al., 2004).

Across all tasks, dyadic behavior was coded using an adaptation of the 36-month Mother-Child Structured Interaction Qualitative Rating Scales developed for the NICHD Early Child Care Study (NICHD Early Child Care Research Network, 2003). One dyadic, six parent, and four child ratings were made at the end of each task using a 7-point scale, with specific behavioral anchors associated with each point on the scale (e.g., "Child is negativistic only briefly in any overt fashion"). Only the Child Negativity code, which is a measure of behavior problems, was used in this study (see Appendix A). Children were given higher Negativity scores for behaviors such as throwing toys, hitting, or refusing to comply with the parent. To calculate interrater reliability, two independent coders rated 20% of the tapes. Inter-rater reliability, using intra-class correlation, was .91, indicating excellent reliability.

Language

Reynell Developmental Language Scales (RDLS; Reynell & Gruber, 1990). The RDLS are commonly used, well-validated language scales for children ages 1 to 7. They have been used with deaf and hearing children (DesJardin, Ambrose, & Eisenberg, 2009; Horn, Fagan, Dillon, Pisoni, & Miyamoto, 2007; Laing, Law, Levin, & Logan, 2002). This measure consists of a Verbal Comprehension and Expressive Language scale. Both scales have acceptable split-half reliability coefficients across age groups, ranging from .74 and .93. Children's scores can be compared to normative data to produce either standard scores or language age. In the current study, we used language age as a marker for the extent of delay. Language delay was calculated by subtracting the child's language age from his or her chronological age. Receptive and expressive language delays were modeled separately.

RESULTS

Analytic Strategy

Tests of group differences and tests of mediation were used to evaluate the major hypotheses of this study. All tests were performed within a structural equation modeling (SEM) framework. This approach offered five advantages over traditional tests of group differences and mediation: (1) it provided more flexibility than multivariate analyses of variance (MANOVA) when examining group differences on correlated outcomes (Cole, Maxwell, Arvey, & Salas, 1993); (2) it allowed for tests of moderation for all parameters (e.g., variances, covariances, means, regression coefficients); (3) it allowed for simultaneous tests of multiple correlated mediators (e.g., multiple measures of behavior problems, language delays, and parenting stress); (4) it was able to flexibly handle missing data; and (5) it provided tests of the fit between the hypothesized model and observed data (Bollen, 1989).

Modeling proceeded in four steps. First, descriptive analyses were performed to identify problematic cases and variables. Second, mean differences between the deaf and hearing groups were evaluated. Third, multiple group analyses were performed to test whether variables related similarly in different subsets of the deaf cohort (i.e., age of confirmed deafness, mode of communication), and between the deaf and hearing groups. These multiple group analyses tested whether it was appropriate to combine different subsets of the deaf cohort, and informed the final mediation model. Finally, mediation models were tested using path analysis. All analyses for this paper were performed using Mplus (Muthén & Muthén, 2006). Model fit was evaluated using four indices: Chi-Square test of model fit (cut off $>.05$), comparative fit index (CFI; cut off $>.95$), root mean square error of approximation (RMSEA; cut off $<.05$), and standardized root mean square residuals (SRMR; cut off $<.10$; Bollen, 1989; Muthén & Muthén, 2006).

Descriptive Statistics

Missing data—Missing data were minimal (i.e., 0 to 10%) for all measures except the CBCL. Thirty-two percent of the data on the CBCL was missing because some children in both groups were younger than the lower age limit of the measure (i.e., 18 months). Because the CBCL is a standardized, normed instrument, it added important information to the model. In addition, other measures of behavior problems for young children do not distinguish between infancy and toddlerhood (Abidin, 1995). For these reasons, we included the CBCL in the model, despite the large amount of missing data for younger children. The reason for missing CBCL data was known and predicted by children's age; therefore, the data likely met the missing at random assumption (MAR; Rubin, 1976). Full information maximum likelihood (FIML) was used to produce the estimates presented in this study. Table 2 compares the group means with and without imputation, demonstrating minimal differences between the two.

Skewed language distributions—Both receptive and expressive language scores showed significant floor effects in the deaf group, skewness (SE) = 2.37 (.18) and 1.75 (.18), respectively. Thirty-nine deaf children were at or below 12 months of age, however, 116 had a receptive language age at or below 12 months; 98 deaf children had an expressive language age at or below 15 months. These floor effects were due, in part, to the limited oral language abilities of the children in the sample as well as the 18.6 % of parents who reported primarily using sign language with their children. As stated earlier, the extent of language delay, as compared to the absolute level of language ability, is an important influence on parenting stress. Language delay was calculated by subtracting each child's language age from their chronological age. This measure was normally distributed.

Group Differences

The deaf and hearing groups were compared using an SEM model where all outcome variables were simultaneously regressed on Hearing Status (0 = hearing, 1 = deaf), and their error terms were allowed to correlate. As hypothesized, parents in the deaf group reported more general stress, $z = 3.13, p < .01$, context-specific stress, $z = 5.67, p < .01$, and child behavior problems, $z = 2.53, p = .01$, than parents in the hearing group. Four percent of deaf children scored within the borderline to clinical range (T-score ≥ 65) on the CBCL, compared to no children in the hearing group. Children in the deaf versus hearing group also showed more negativity toward their parents during 20 min of videotaped interactions, $z = 3.01, p < .01$. Moreover, children in the deaf group were more delayed on measures of receptive and expressive oral language than children in the hearing group, $z = 10.04, p < .01$, and $z = 7.03, p < .01$, respectively. After controlling for child age, family income, and parent education, group differences on parent-reported behavior problems and general parenting stress were no longer significant, $z = .84, ns$, and $z = 1.29, ns$, respectively. Group differences on all other variables remained significant.

To compare the types of stressors experienced by parents of deaf versus hearing children, stressors were rank-ordered using their mean severity scores (Table 3). Highest ranked stressors for parents of deaf children were: (1) communicating with their child, (2) finances, (3) educational concerns, and (4) child's safety. In contrast, highest ranked stressors for the hearing group were: (1) finances, (2) discipline, (3) child's safety, and (4) following routines. These results indicated that parents of deaf children rated stressors specific to deafness (i.e., communication and educational placement) as among the most challenging.

Multiple Group Analyses

Children in the deaf group differed on a number important dimensions. One dimension was when their hearing status was diagnosed (before versus after 18 months of age; $n = 133$ and 47 respectively). Another dimension was mode of communication (Table 1). Pooling data across sub-groups assumes that the groups are homogeneous in terms of the relations among variables. Therefore, before pooling the data from children in the deaf group, we tested whether time of diagnosis and mode of communication moderated the relations among the major outcomes and predictors used in this study (language delays, child behavior difficulties, and parenting stress). These tests were conducted by constraining the covariance matrices for each subgroup to be equal, and then systematically releasing constraints and comparing the chi-square from the constrained and unconstrained models. A parameter was determined to statistically differ between subgroups if the difference in chi-square exceeded 3.84 (e.g., $p < .05$). This procedure was applied separately to the two aforementioned dimensions. Importantly, the size of these subsets precludes powerful tests of moderation, but they were capable of detecting large differences among the covariance matrices (e.g., differences between correlation coefficients $> .377$).

The first analysis compared children whose hearing status was confirmed prior to and following 18 months of age. These two groups were generally similar and only differed on 6 of 27 possible parameters (6 variances, 15 covariances, 6 means). Three of these parameters (means for expressive and receptive language delays, and child negativity) were dependent on child age. These differences were expected given the moderate relation between age at diagnosis and children's age, $r(179) = 0.52$. The remaining three parameters included: higher variance in the FSS for the younger group, higher covariance between FSS and PSI for the older group, and higher variance in expressive language delay for the younger group. Because the subgroups were generally similar, we combined them for the remainder of the analyses.

The second analysis compared children based on mode of communication. Parents were asked to classify their child's primary mode of communication as one of the following: Speech, Simultaneous¹, Sign, Other. These four groups differed on 3 of the 27 possible parameters. Larger means and greater variability for parent-reported behavior problems were found in the Sign and Other groups than in the Speech and Simultaneous groups. There was also more variability in receptive language delay in the "other" group. Given the similarities among these four groups, they were combined for the remainder of the analyses.

After pooling data from all children in the deaf group, comparisons were made between the covariance matrices of the deaf and hearing groups. All variables related similarly in both groups except for relations among expressive and receptive language delays, and child age. In the deaf group, these three variables were more highly correlated than in the hearing group (Table 4). These differences were likely due to the significant language delays in the deaf sample. Because the relations between the other variables were similar within each group, we

¹Because of the small number of parents endorsing both Simultaneous and Sign language, this group was combined with the Simultaneous/Speech group for these analyses.

combined the deaf and hearing groups and proceeded with tests of mediation, but modified the model to address the different relations among language delays and children's ages. The differences in the relations between receptive and expressive language delays were addressed by generating two mediation models, one for receptive and one for expressive language delays. The relations among chronological age and receptive and expressive language delays were addressed by including a hearing-status by age interaction as a covariate for the delays in language.

Mediation Models

Mediation was tested using a model that included hearing status, language delays (receptive and expressive language were tested separately), parent-reported behavior problems, observed negativity toward the parent, general parenting stress, and context-specific stress (see Figure 1). This model also tested whether both types of language delays mediated the relation between hearing status and parent-reported and observed child behavior problems.

It was hypothesized that children's language delays would mediate the relation between hearing status and child behavior problems. The indirect paths from hearing status to parent-reported behavior problems via language delays were significant, Receptive: $\beta = .07$; $z = 2.76$, $p < .01$; Expressive: $\beta = .06$; $z = 3.15$, $p < .01$, as were the indirect paths leading to observed child negativity, Receptive: $\beta = .13$; $z = 4.19$, $p < .01$; Expressive: $\beta = .12$; $z = 4.30$, $p < .01$. These results indicated that language delays contributed to both perceived behavior problems and observed negativity among these young deaf children.

Because differences in language delays related to differences between the deaf and hearing groups' behavior problems, assessing the role of behavior problems as mediators of parenting stress (both general and context-specific) required tests of extended indirect paths. These extended paths began at hearing status, moved through language delays and behavior problems, and ended at general and context-specific stress. Six of the eight possible extended paths (four paths for receptive language, four paths for expressive language) were significant. Specifically, the path from hearing status to context-specific stress via receptive language delays and parent-reported behavior problems was significant, $\beta = .02$, $z = 2.49$, $p = .01$, as was the similar path ending in general stress, $\beta = .03$, $z = 2.60$, $p < .01$. The indirect path that included observed child negativity, rather than parent-reported behavior problems, was significant for context-specific, but not general stress: context-specific stress $\beta = .02$, $z = 2.50$, $p = .01$; general stress $\beta < .01$, $z = 0.53$, *ns*. The same pattern of results was found for expressive language delays, $\beta = .02$, $z = 2.79$, $p < .01$; $\beta = .03$, $z = 2.91$, $p < .01$; and $\beta = .02$, $z = 2.30$, $p < .01$; $\beta < .01$, $z = .54$, *ns*.

The model for receptive language delays showed good fit, $\chi^2(24) = 21.64$, $p = .60$; CFI = 1.00; RMSEA < .01; SRMR < .01 (Figure 3). This model accounted for 30% of the variance in general stress, 26% of the variance in context-specific stress, 17% of the variance in parent-reported behavior problems, 10% of the variance in observed child negativity, and 86% of the variance in receptive language delays. The model for expressive language delays also showed good fit, $\chi^2(23) = 13.69$, $p = .94$; CFI = 1.00; RMSEA < .01; SRMR = .03 (Figure 3). This model accounted for 30% of the variance in general stress, 26% of the variance in context-specific stress, 18% of the variance in parent reported behavior difficulties, 11% of the variance in observed child negativity, and 89% of the variance in expressive language delays.

These results suggested that hearing status influenced general and context-specific stress by way of child behavior problems and observed child negativity. Importantly, the direct effect from hearing status to context-specific stress indicated that there are still additional aspects of rearing a deaf child, beyond language delays and child behavior problems that contribute to higher levels of parenting stress.

DISCUSSION

The current study used a large national cohort of deaf children to examine associations among early childhood deafness, oral language delays, child behavior problems, and parenting stress. It also used performance-based (Reynell), observational (parent-child interactions), and parent-report measures (CBCL), as well as general and context-specific measures of parenting stress (PSI, FSS).

Overall these findings showed that parents of deaf children do not report elevated levels of general parenting stress when compared to parents of hearing children, which is consistent with earlier studies (Asberg et al., 2008; Meadow-Orlans, 1994; Pipp-Siegel et al., 2002). In contrast, support was found for higher levels of deaf-specific parenting stress in parents of deaf versus hearing children. These results also converge with previous studies. In two previous studies, Quittner and colleagues (1990, 1991) used the same context-specific measure employed in this study (Family Stress Scale) and found elevated levels of parenting stress. Additionally, in a longitudinal study, Lederberg and Golbach (2002) used a disability-specific measure during their first assessment and found higher levels of parenting stress. However, in subsequent assessments, they used a general measure of parenting stress (Parenting Stress Index) and found no differences between groups.

Results from this study also indicated that context-specific measures were more sensitive to differences in observed child behavior than general measures. This finding was strengthened by the use of both parent-report and observational data. Furthermore, the context-specific measure assessed the unique challenges faced by parents of deaf children. Parents endorsed communication difficulties, educational concerns, maintaining hearing aid devices, and having to be a language teacher for their child. This ranking ordering of stressors, as well as the mean scores on the Family Stress Scale, are similar to the two previous studies using this measure, despite the fact that they were conducted nearly 20 years ago (Quittner, 1992; Quittner et al., 1991; Quittner et al., 1990;). Furthermore, both prior studies found strong associations between levels of parenting stress and psychological function (e.g., depression, anxiety). These findings expand on those of Sach and Whynes (2005), which identified stressors specific to parenting a child with a cochlear implant, such as enabling one's child to function in a hearing world and educating a child with hearing loss. Given that parenting stress has consistently been linked to poorer child outcomes in both deaf and hearing populations (Crnic & Low, 2002; Hintermair, 2006; Lederberg & Everhart, 2000), identification of context-specific stressors could help clinicians working with parents of deaf children.

As has been shown previously using both observational and parent report measures, deaf children exhibited higher rates of behavior problems (non-compliance, inattention) than hearing children (Barker et al., 2009; Mitchell & Quittner, 1996; van Eldik et al., 2004; Vostanis et al., 1997). Results also indicated that language delays were related to the differences in child behavior problems between deaf and hearing children. These findings extend those recently reported by Barker and colleagues (2009), who found that oral language abilities explained elevated rates of child behavior problems in deaf children older than 18 months. Using the same cohort and measures, the current study expanded those results to children younger than 18 months and tested relations among language delays, child behavior problems and parenting stress. To our knowledge, this is the first study to examine these relations in deaf children.

Regarding the relations among language delays, child behavior problems, and parenting stress, it appears that language delays influence parenting stress by way of child behavior problems. A variety of processes could account for this mediational process. First, children who have significant language delays may have difficulty regulating their emotions, attention, and behavior. This hypothesis has been supported in young deaf children (Barker et al., 2009;

Vaccari & Marschark, 1997); however, the current study did not include a measure of emotional or attentional regulation and could not directly test this mechanism. Second, children with language delays have difficulties expressing their needs, which others have suggested may lead to frustration and acting out behaviors (Donahue, 1983). Finally, children with communication difficulties may have difficulty understanding parental instructions. This may be particularly true for the current sample, given that parents seeking a cochlear implant may not be as invested in learning deaf-specific communication strategies in hopes their child will ultimately be able to understand spoken language. These communication difficulties may lead parents of deaf children to interpret their children's behavior as non-compliant (Vaccari & Marschark, 1997). Additionally, child behavior problems are more challenging to manage in the context of poor parent-child communication, which may lead to greater parenting stress.

Several clinical implications can be drawn from these results. First, parent-child communication contributes to child behavior problems and parenting stress, suggesting it is an important target for intervention. Moreover, given that the relation between children's hearing status and context-specific parenting stress remained significant after accounting for children's language delays, there may be other variables contributing to parenting stress. For example, obtaining audiological and medical care may be particularly stressful for these parents. This study documented a number of specific aspects of parenting a deaf child that are stressful. This type of information may serve as a guide for cochlear implant programs seeking to reduce parental stress. For example, new research has begun to identify the specific facilitative language techniques that are predictive of better language development (DesJardin & Eisenberg, 2007). These strategies could reduce the stress associated with being both a parent and language teacher and facilitate optimal use of the auditory information provided by the implant.

This study had several limitations. First, it was cross-sectional and although directional hypotheses were based on both theory and previous findings, they could not be confirmed using the current design. Second, there was little variation in the language level of the deaf children, reducing the amount of variance we could explain. This was partly due to floor effects on the oral language measure in the deaf sample and partly due to the young age of these children at baseline. Third, this study assessed oral language only, because this was the primary outcome for this clinical trial. Furthermore, all children in the deaf group were scheduled for cochlear implant surgery. Because parents may have felt anxious about their child's surgery, their ratings of parenting stress may have been inflated (Scrimin, Haynes, Altoe, Bornstein & Axia, 2009); however, their average stress scores were comparable to previous studies. Finally, because all children in the deaf group were implant candidates, it is not clear whether these results would generalize to children and parents who have not chosen to pursue implantation.

Future studies should use longitudinal designs that allow for tests of the temporal ordering of these variables. It would also be valuable to include measures of emotional, attentional, and behavioral regulation. Before designing effective interventions for parents, optimal parenting strategies for deaf children should be identified (DesJardin, Eisenberg, & Hodapp, 2006).

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APPENDIX

Mother-Child Structured Interaction

Qualitative Rating Scale

Adapted From NICHD Study of Early Child Care

Modified by A. Quittner for the CDaCI study

Child Negativity

Child negativity is the degree to which the child shows anger, dislike, or hostility toward the mother. At the high end, the child is repeatedly and overtly angry at her, e.g., forcefully rejecting her ideas, showing angry and resistant expression, pouting, or being unreasonably demanding or critical of her. For the lowest rating, there are neither overt nor covert signs of such anger. Expressions are essentially positive toward mother whether or not the child is compliant or much involved with her. Low ratings may include brief instances of frustration or rejections of mother's help.

1. Very Low. Child shows no signs of negativism. She/he shows through consistently positive interactions toward the mother that s/he has a truly positive relationship toward her and feels no abiding anger toward her.
2. Low. Child shows no clear indications of negativism, but the tone of some interactions is less positive than one would desire in an ideal relationship toward the mother.
3. Moderately Low. Child is negativistic only briefly in any overt fashion, but these suggest some noticeable anger and resistance in the child's interactions with mother.
4. Moderate. Child shows clear negativism toward the mother on several occasions or one significant occasion, but these are rather isolated episodes separated by periods in which the child behaves quite positively toward the mother.
5. Moderately High. Child is frequently negativistic or a few instances of strong or intense negativism, but these are not predominant in the interactions.
6. High. Child's anger is a predominant aspect of their interactions, but it is shown in more sporadic and generally subtler ways than in #7.
7. Very High. Child is repeatedly and overtly angry or resistant toward the mother. The degree of anger here seems so strong that the child cannot disguise it in subtle ways for long, but it repeatedly appears in her/his interactions with her.

Figure 1.
Theoretical model.

Figure 2.

Final model for receptive language delays.

^a Hearing status was coded as 1 = CI, 0 = NH;

^b Family Income and Parent Education were correlated at .55 and were correlated with Hearing Status (−.38 and −.27 respectively);

^c Hearing Status by Child Age Interaction correlated with Child Age at .83 and with Hearing Status at .12; Only significant paths and parameters are shown.

Figure 3.

Final model for expressive language delay

^a Hearing status was coded as 1 = CI, 0 = NH;

^b Family Income and Parent Education were correlated at .55 and were correlated with Hearing Status (-.37 and -.27 respectively);

^c Hearing Status by Child Age Interaction correlated with Child Age at .83 and with Hearing Status at .12; Only significant paths and parameters are shown.

TABLE 1

Demographics of the CDaCI Cohort^a

Characteristic		Deaf (<i>n</i> = 181)	Hearing (<i>n</i> = 92)
Age (years)	<i>M</i> age (SD)	2.2 (1.2)	2.3 (1.1)
Age of onset of hearing loss (years)		0.2 (0.6)	--
Pure-tone average (PTA4; better ear)		106.3 (17.4)	--
Age at diagnosis (years)		0.9 (0.9)	--
Age at first hearing aid use (years)		1.1 (0.9)	--
Length of hearing aid use (years)		1.1 (1.0)	--
Onset of hearing loss	Sudden	6% (11)	--
	Progressive	34% (61)	--
	Congenital	56% (102)	--
Cause of hearing loss	Genetic	26% (47)	--
	Other	15% (26)	--
	Unknown	60% (108)	--
Gender % (<i>n</i>)	Male	49% (88)	38% (35)
	Female	51% (93)	62% (57)
Race	White	74% (133)	80% (74)
	African American	9% (17)	12% (11)
	Asian	6% (11)	1% (1)
	Other	8% (14)	5% (5)
Ethnicity *	Hispanic	19% (36)	10% (9)
	Non-Hispanic	77% (139)	88% (81)
Communication Mode ^a	Speech	22% (61)	--
	Sign Language	13% (35)	--
	Simultaneous/Speech Emphasis	20% (56)	--
	Simultaneous/Sign Emphasis	4% (11)	--
	Other / Undecided	12% (22)	--
Parents' education **	< High school	8% (14)	4% (4)
	High school grad	14% (26)	2% (2)
	College	78% (140)	92% (85)
Parents' Income **	< \$15,000	8% (15)	5% (5)
	\$15 – 29,999	12% (21)	3% (3)
	\$30 – 49,999	23% (41)	5% (5)
	\$50 – 74,999	17% (31)	15% (14)
	\$75 – 100,000	14% (25)	14% (13)
	\$100,000 +	16% (28)	50% (46)
Number of siblings in the home (<i>M</i> (SD))		1.1 (1.1)	0.9 (.9)
Full term pregnancy	Yes	86% (156)	78% (72)
	No	11% (19)	12% (11)

^a children in this study were cochlear implant candidates and all parents committed to teach their children spoken English. These categories, therefore, represent the primary communication mode used prior to enrollment in this study.

*
 $p < .05$,

**
 $p < .01$;

TABLE 2

Group Differences on All Variables

	Raw Mean (Standard Error)		Full-Information Mean (Standard Error)	
	Deaf	Hearing	Deaf	Hearing
Child age (months)	26.86 (1.08)	27.40 (1.38)	26.86 (1.08)	27.40 (1.38)
Family income (\$10,000)	6.14 (0.30)	9.38 (0.41)*	6.01 (0.30)	9.27 (0.41)*
Parent education (years)	14.37 (0.14)	15.47 (0.15)*	14.36 (0.14)	15.47 (0.15)*
General parenting stress	63.98 (1.30)	57.32 (1.53)*	63.96 (1.30)	57.32 (1.53)*
Context-specific stress	2.06 (0.05)	1.63 (0.04)*	2.06 (0.05)	1.62 (0.04)*
Receptive language delay (months)	12.66 (0.94)	-1.14 (0.54)*	12.58 (0.94)	-1.14 (0.54)*
Expressive language delay (months)	10.04 (0.95)	0.12 (0.54)*	9.96 (0.95)	0.46 (0.56)*
Receptive language (raw score)	5.83 (0.77)	30.32 (1.93)*	--	--
Expressive language (raw score)	8.58 (0.74)	7.55 (1.61)*	--	--
CBCL total behavior problems	25.36 (1.64)	18.77 (1.56)*	24.81 (1.60)	18.73 (1.49)*
Child negativity	1.40 (0.04)	1.22 (0.03)*	1.40 (0.04)	1.27 (0.03)*

*
 $p < .05$

TABLE 3

Top Context-Specific Stressors for Parents of Deaf and Hearing Children

Rank	Deaf	Missing	Mean Rating	Hearing	Missing	Mean Rating
1	Communication (understanding you, speaking)	2	2.75	Finances	21	2.06
2	Finances	7	2.71	Discipline	3	2.05
3	Educational concerns	1	2.49	Safety (crossing the street)	4	1.78
4	Safety (crossing the street)	5	2.43	Following routines (mealtimes, bedtime)	3	1.76
5	Keeping the hearing aids/cochlear implants on and working	8	2.27	Outings in the community (Keeping track of child; managing child's behavior)	4	1.74
6	Discipline	2	2.13	Marital relationship	6	1.63
7	Medical/audiological care	1	2.07	Educational concerns	5	1.62
8	Other people's curiosity or lack of understanding about child's deafness	25	2.02	Relationships with parents or extended family	3	1.42
9	Outings in the community (Keeping track of child; managing child's behavior)	2	1.96	Behavior problems	4	1.41
10	Having to be a language teacher for your child (alphabet, numbers)	2	1.93	Relationships with other children	3	1.35

TABLE 4

Correlation Matrix by Hearing Status

Upper Triangle = deaf intercorrelations; Lower Triangle = hearing intercorrelations									
	1	2	3	4	5	6	7	8	9
1. Child age		-.05	-.05	.14	.03	.92	.95	.26	.15
2. Family income	-.19		.47	-.31	-.21	.18	.15	-.33	-.13
3. Parent education	-.14	.60		-.18	-.12	.18	.13	-.28	-.16
4. General parenting stress	.16	-.18	-.13		.45	-.14	-.17	.56	.12
5. Context-specific stress	.02	-.10	.03	.44		-.06	-.06	.42	.26
6. Receptive language delay	-.14	-.35	-.30	.03	.01		.97	.29	.21
7. Expressive language delay	-.57	-.43	-.22	-.10	-.13	.45		.30	.21
8. CBCL total problems	.04	-.30	-.38	.40	.27	-.14	-.13		.28
9. Child negativity	-.16	-.17	-.15	-.07	.20	-.27	-.14	.25	
Deaf means	26.86	6.01	14.36	63.96	2.06	12.58	9.96	24.81	1.40
Deaf standard deviations	14.57	3.79	1.91	17.38	0.69	12.68	12.71	18.56	0.53
Hearing means	27.40	9.27	15.47	57.32	1.62	1.14	-0.46	18.73	1.21
Hearing standard deviations	13.23	3.87	1.41	14.67	0.39	5.14	5.30	13.61	0.32

Bold = correlations that differ between deaf and hearing groups