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Psychosocial Status of Children with Auditory Processing Disorder

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Abstract

Background: Children with hearing loss often exhibit reduced psychosocial status compared to children with normal hearing. It is reasonable to assume that psychosocial function may also be affected in children diagnosed with auditory processing disorder (APD). However, there are no published studies specifically addressing the psychosocial health of children with APD.

Purpose: This investigation examined relationships between APD and psychosocial status, with an aim to examine nonauditory factors that may influence quality of life of children diagnosed with APD.

Research Design: A two-matched group design was employed. Participants and their mothers completed appropriate versions of the Dartmouth Primary Care Cooperative Information Project Charts for Adolescents (COOP-A), the Behavioral Assessment System for Children, Second Edition (BASC-2), and the Social Skills Rating System (SSRS).

Study Sample: Participants consisted of 19 children (aged 9.5–17.8 yr; mean = 11.9) diagnosed with APD and 20 gender- and age-matched (mean = 12.8 yr) children with no evidence of APD by history or audiological assessment. Primary caretakers (mothers) of the participants also completed psychosocial questionnaires according to their perception of their participating child's function.

Data Collection and Analysis: Data were collected at a single visit, following APD diagnosis. Data from each questionnaire were analyzed using appropriate statistical methods for two-group comparisons.

Results: Analysis of child reports revealed significantly greater psychosocial difficulty in the APD group on subscales of the COOP-A and BASC-2. Increased problems in the APD group were also reported by parents on subscales of the COOP-A, BASC-2, and SSRS. Eta-squared values for all significant findings indicated moderate to large effect sizes, suggesting findings may be generalized to other children in this age group. No between-group differences were found on any subscale for APD children with or without a confirmed or suspected language disorder.

Conclusion: We found that children with APD exhibit increased psychosocial difficulty in several areas compared to children without APD.

Key Words: Age effects, auditory processing disorder; Behavioral Assessment System for Children, Second Edition; Clinical Evaluation of Language Fundamentals, Fourth Edition; Dartmouth Primary Care Cooperative Information Project Charts for Adolescents; psychosocial status; Social Skills Rating System

Abbreviations: ACPT = Auditory Continuous Performance Test; ADD = attention deficit disorder; APD = auditory processing disorder; BASC-2 = Behavioral Assessment System for Children, Second Edition;

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(C)APD = (central) auditory processing disorder; CELF-4 = Clinical Evaluation of Language Fundamentals, Fourth Edition; COOP-A = Dartmouth Primary Care Cooperative Information Project Charts for Adolescents; SSRS = Social Skills Rating System

It has been well documented that children with perceptual and communication difficulties, such as minimal degrees of hearing loss, often exhibit reductions in psychosocial (emotional and social) health status compared to children with normal hearing. Children with hearing loss may display increased depression, physical aggression, withdrawal, loneliness, and decreased self-esteem and academic attainment (Davis et al, 1986; Davis et al, 1981; Henggeler et al, 1990; Knutson and Lansing, 1990; Maxon et al, 1991; Bess et al, 1998; Hicks and Tharpe, 2002).

For example, Davis and colleagues (1986) found that children with mild to moderate sensorineural hearing loss were more likely to exhibit aggressive behaviors and to express corporeal complaints than their peers with normal hearing. In the same study, parents of participants with hearing loss produced patterns of greater impulsivity and aggressive behaviors, as well as more social isolation and academic difficulties, compared to the instrument's normative data set.

It is reasonable to assume that children with other speech-perceptual difficulties, such as auditory processing disorder (APD), also may experience reduced psychosocial function. In support of this assumption, the *Technical Report: (Central) Auditory Processing Disorders*, by the Working Group on Auditory Processing Disorders of the American Speech-Language-Hearing Association (ASHA, 2005) reported:

> In addition to the language and academic difficulties often associated with (C)APD, some individuals with (C)APD have a higher likelihood of behavioral, emotional, and social difficulties. Communication deficits and associated learning difficulties may adversely impact the development of self-esteem and feelings of self-worth. [p. 4]

The authors of the technical report further advise that there is no evidence that (central) auditory processing disorder ([C]APD) is the cause of severe psychological or sociopathic problems, and milder emotional or social difficulties are not necessarily diagnostic of (C)APD, yet "whenever significant psychosocial concerns are present in an individual with (C)APD, the individual should be referred to the appropriate specialist for evaluation and follow-up" (p. 4). However, as the lack of references in this area of the report suggests, there currently is a paucity of data regarding the exact nature and extent of the psychosocial difficulties in children with APD.

According to ASHA (2005), "(C)APD can lead to or be associated with difficulties in learning, speech, language (including written language involving reading and spelling), social, and related functions" (p. 3). However, neither the ASHA technical report nor the *American Academy of Audiology Clinical Practice Guidelines: Diagnosis, Treatment, and Management of Children and Adults with Central Auditory Processing Disorder* (American Academy of Audiology [Academy], 2010) report many resources for clinicians attempting to manage the potential social and emotional sequelae of (C)APD. The Academy (2010) document does cite a small number of studies reporting on successful management of psychosocial aspects of (C)APD using FM listening systems. In one such study, Johnston and colleagues (2009) reported significant improvements in parents' ratings of their children's locus of control, depression, anxiety, and interpersonal relationships following an extended trial with a personal FM system. This study suggests the possibility of ameliorating the social and emotional difficulties associated with APD, an important finding in light of reports that untreated APD commonly leads to reduced communication (Smaldino and Crandell, 2004), which in turn can lead to loneliness, social anxiety, depression, anger, and fear (Crandell, 1998). It is clear that additional research and study is needed in order for audiologists and other professionals to obtain a more complete understanding of the social and emotional health of children with APD.

There is evidence that self-report surveys are effective in evaluating the health status of people across a variety of cultures and chronic conditions (Bronfort and Bouter, 1999; Gilbertson and Langhorne, 2000; McFall et al, 2000). Numerous psychosocial health surveys have been designed for use with pediatric or adolescent populations that examine specific dimensions of social and emotional functioning. Two such examples of these surveys are the Social Skills Rating System (SSRS) (Gresham and Elliot, 1990), and the Behavioral Assessment System for Children, Second Edition (BASC-2) (Reynolds and Kamphaus, 2004). Both the SSRS and the BASC-2 utilize self-report questionnaires designed for use by teachers, parents, and/or students. In addition, the Dartmouth Primary Care Cooperative Information Project Charts for Adolescents (COOP-A; Wasson et al, 1994) is a screening tool for assessment of psychosocial function in adolescents by both parents and students.

The SSRS provides information on the positive and negative social skill behaviors of students. The SSRS has both parent and child versions, which may be used singly or in combination in order to provide a complete profile of a student's social function. SSRS data can be

utilized in order to inform parents, teachers, and other support personnel of social skills behaviors in and out of the classroom as well as possible underlying causes. The SSRS has been utilized for children with communication and/or sensory impairments (Cartledge et al, 1996; Buhrow et al, 1998; Koning and Magill-Evans, 2001). For example, Cartledge et al (1996) utilized the SSRS to evaluate social competence between three groups of adolescents with hearing loss enrolled in varying educational settings.

The BASC-2 provides a profile of adaptive and maladaptive behaviors and emotions of children and adolescents. BASC-2 data are often used by school and clinical psychologists when making educational and psychological diagnoses and determining possible disability classifications in schools. The Parent Rating Scales (PRS) of the BASC-2 are used to measure both adaptive and problem behaviors in community and home settings in 14 subcategories, which combine into composite scales. The Self-Report of Personality (SRP) scale of the BASC-2 measures 16 subcategories of attitudes and emotions of students as they rate themselves.

The COOP-A charts are designed to assess physical, emotional, and social dimensions of function. The COOP-A was designed to be used by primary care physicians in their offices as a screening tool to evaluate the overall quality of life of adolescents. The COOP-A has been utilized to investigate the overall health status of children with varying degrees of hearing loss (Bess et al, 1998; Hicks and Tharpe, 2002; Kreisman et al, 2004). In one of these, Hicks and Tharpe (2002) examined the health status of 10 children between the ages of 6 and 11 yr with either mild-to-moderate or high-frequency SNHL, and 10 age- and grade-matched counterparts with normal hearing. While no statistical significance between groups was found, the authors noted that the percentage of the group of children with hearing loss that rated themselves as 3 or higher (more dysfunction) on the COOP-A charts was greater compared to their peers with normal hearing in seven of nine subscale questions administered.

Kreisman and colleagues (2004) utilized the COOP-A to determine if any psychosocial difficulties similar to those exhibited by children with hearing loss also existed in children with APD. Responses from ten children (mean = 11.6 yr) with APD and their parents were compared to data collected from the two groups of children reported by Hicks and Tharpe (2002). Results suggested that children with APD experience greater psychosocial dysfunction than their peers without APD across a number social and emotional content areas relating to quality of life. Specifically, the APD group exhibited significantly higher (poorer) ratings on the COOP-A Emotional Feeling and Family subscale charts than did children with normal hearing and no APD. In addition, the parents of the participants with APD reported greater psychosocial difficulties than did their children on all but one of the COOP-A subscale charts.

With the exception of these preliminary findings, there remains a paucity of data examining the psychosocial function of children with APD. The present investigation aimed at further exploring hypothesized emotional and/or social difficulties that may be present in this population. Increased knowledge of the impact of APD on psychosocial status of children is likely to contribute to more effective management and improved quality of life for children with this disorder.

METHODS

Participants

The first 39 children who met the inclusion criteria as detailed below and agreed to serve as subjects were included as participants. They were divided into two groups. The experimental group consisted of 19 volunteer pediatric participants between 9.5 and 17.8 yr of age with a diagnosis of APD (APD group). A corresponding gender- and age-matched volunteer group (normal group) consisted of 20 children with no evidence of APD by history or audiological assessment and no other medical or academic disability.

All 39 participants met the following criteria:

- Aged between 10 and 18 yr, ±6 mo;
- Pure-tone air conduction hearing threshold levels equal to or better than 15 dB HL at all frequencies tested (250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz), bilaterally;
- A score of 90 to 100% on monosyllabic word recognition testing in quiet at an intensity level of 40 dB sensation level (SL) re three-frequency pure-tone average (PTA) of air conduction thresholds at 500, 1000, and 2000 Hz;
- Normal middle ear function defined by middle ear peak pressure values between −150 and +100 daPa, static compliance of 0.3 to 1.4 mL, and ear canal volume of 0.6 to 1.5 cm^3 in both ears;
- Average or above intellectual function for age as measured by the Raven's Standard Progressive Matrices (Raven, 1976), the Matrices subtest of the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman and Kaufman, 2004), or documented by another full-scale intelligence assessment completed by a licensed psychologist within a time period of 2 yr;
- Negative history of attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD) as determined by parental report and normal performance on the Auditory Continuous Performance Test (ACPT; Keith, 1994a), or attention skills within normal limits as documented per previous evaluation by a licensed psychologist within a time period of 2 yr (the reader is directed to Chermak and Musiek, 1997; Chermak et al, 1998; and Chermak et al, 1999 for further discussion of the differential diagnosis of APD and ADD);

- English as a primary language as reported by the participant's parent; and
- Normal growth and development and no history of significant medical problems via parental report.

Participants were recruited from the Department of Communication Sciences and Disorders/University of Florida Speech and Hearing Clinic (UFSHC), the University of Florida Department of Communicative Disorders Speech and Hearing Center at Shands Hospital, the Towson University Speech-Language-Hearing Clinic (TUSLHC), and the Center for Amplification, Rehabilitation and Listening (CARL) at Towson University. Two participants from the APD group and four children in the normal group were tested at the University of Florida in Gainesville, whereas the remaining participants (17 APD, 16 normal) were tested at Towson University in Towson, Maryland.

Diagnosis of APD

An APD for a child was defined by scores 2 SDs below the mean for at least one ear on at least two different procedures of the APD test battery (ASHA, 2005).

- The Synthetic Sentence Identification with Ipsilateral Competing Message (SSI-ICM; Noffsinger et al, 1994; Wilson and Strouse, 1998; Feeney and Hallowell, 2000)
- The Staggered Spondaic Word (SSW) Test (Katz, 1963; Katz, 1986)
- The Dichotic Digits, Double Pairs Test (Musiek, 1983; Audiology Illustrated, 1994)
- The Frequency Pattern Sequence test (Musiek, 1994; Audiology Illustrated, 1994)
- The Duration Pattern Sequence test (Musiek, 1994; Audiology Illustrated, 1994)
- The Auditory Random Gap Detection Test (RGDT; Keith, 2000a).

If a participant scored 2 SDs below normal limits on one of the six diagnostic auditory processing measures described above, the SCAN-C: Test for Auditory Processing Disorders in Children—Revised (Keith, 2000b) or SCAN-A: Test for Auditory Processing Disorders in Adolescents and Adults (Keith, 1994b) Competing Words, Auditory Figure-Ground, and Filtered Words subtests were administered. Further details on test procedures are available from the sources cited for each assessment.

APD assessment was conducted in a single-walled sound-treated booth (Industrial Acoustics Company) using a calibrated GSI-61 clinical audiometer and ER-3A insert earphones.

Any participant who did not have previous clinical documentation of attention within normal limits underwent assessment with the ACPT. In addition to the above procedures, any participant who was considered for inclusion in the APD group for the study due to results 2 SDs below the mean on any of the six diagnostic APD procedures previously mentioned also completed the SCAN-C or SCAN-A: Test for Auditory Processing Disorders in Children—Revised Competing Words subtest, Filtered Words subtest ,and Auditory Figure-Ground subtest. Standard administrative and scoring procedures, as outlined in the manuals for each APD test, were followed.

Psychosocial Assessment

The SSRS, BASC-2, and COOP-A were utilized to assess psychosocial status. These questionnaires were utilized because previous investigations have shown them to be valid for these purposes in children with hearing loss or other communication disorders (Cartledge et al, 1996; Bess et al, 1998; Koning and Magill-Evans, 2001; Redmond, 2002; Hicks and Tharpe, 2002; Kreisman et al, 2004). The COOP-A pilot study (Kreisman et al, 2004) provided preliminary findings suggesting the use of the charts to be appropriate for use with children with APD and their parents; thus the COOP-A was used in the present investigation. The selection of the other two instruments was based on the desire for more robust, standardized comprehensive assessments of emotional and social function in children that matched with the normative ages of the COOP-A (10–18 yr), had both self-report and parent rating forms, and yielded subscale measurements that would lend themselves to comparable analysis across instruments.

The SSRS provides information on the positive and negative social skill behaviors exhibited by students in and out of the classroom (Gresham and Elliot, 1990). The SSRS items are rated according to both perceived frequency (Never, Sometimes, or Very Often) and importance (Not Important, Important, or Critical). For further information on the SSRS, the reader is referred to Gresham and Elliot (1990) and Koning and Magill-Evans (2001).

The BASC-2 provides a profile of adaptive and maladaptive behaviors and emotions of children and adolescents ages 2 through 21 yr (Reynolds and Kamphaus, 2004). This instrument is widely used by school and clinical psychologists in determining Individuals with Disabilities Education Act (IDEA) and *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) classifications. The BASC-2 has forms designed specifically for use by parents with a different section designed for use by the students themselves. For further information regarding the BASC-2, the reader is referred to Reynolds and Kamphaus (2004) and Titus et al (2008).

The COOP-A is a quality of life screening instrument designed for use with individuals between 10 and 20 yr of age (Wasson et al, 1994). The COOP-A charts are designed to screen across physical, emotional, and social dimensions of functioning in an individual. Each individual chart consists of a question and five illustrative alternatives from which an individual may choose an answer most appropriate for him- or herself based on a five-point Likert scale wherein 5 represents the greatest dysfunction and 1 represents the least dysfunction. For more information regarding the COOP, the reader is referred to Wasson et al (1994), Bess et al (1998), Hicks and Tharpe (2002), and Kreisman et al (2004).

Psychosocial assessment was conducted individually in quiet rooms of the UFSHC, the TUSLHC, or the CARL. Administration procedures as outlined in the respective test manuals were followed. The accompanying parents of the participants were asked to complete their appropriate questionnaires independently, utilizing a pencil and paper version of the assessments. For the SSRS and the BASC-2 questionnaires, parents were asked to complete the questionnaires according to the printed instructions. For the COOP-A, the parents were asked to respond to each chart according to their perception of their participating child's function in each given area. They were instructed to ask questions of the investigator if any item was unclear.

The same examiner administered questionnaires to all pediatric participants in a face-to-face interview. Pediatric participants were instructed to respond to each individual item on the questionnaires either by verbal or pointed responses, and the examiner recorded the child's responses accordingly on the questionnaire's corresponding answer sheet. When no language disorders were suspected, the participant was given a choice for the examiner to read the questions to them or to complete the questionnaires on their own. When independent completion was chosen, test instructions were given for standard self-administration procedures, with the examiner available in the room to answer questions. All participants were encouraged to answer as openly as possible, according to what they believed to be true for themselves, and only the subject's final response to any given item was recorded. Additionally, all participants were reassured that the confidentiality of their responses would be maintained.

Language Assessment

Language screening for all participants was conducted individually via the Clinical Evaluation of Language Fundamentals, Fourth Edition (CELF-4) Screening Test (Semel et al, 2003). Screenings were conducted in a quiet room using the CELF-4 Screening Test booklet and following the administration procedures as outlined in the CELF-4 manual. All participants who did not pass the CELF-4 Screening Test were referred for a comprehensive language evaluation by a speech-language pathologist. Prospective normal participants who did not pass the CELF-4 Screening Test were not included in the study.

All participants in the normal group had a history of normal language development as indicated by parent report and verified by the CELF-4 Screening Test. The CELF-4 Screening Test also was administered to the participants of the APD group if they did not initially present with a diagnosis of language disorder via parent or clinical report in order to identify a comprehensive profile of these participants. The participants evaluated for inclusion in the APD group and the normal group that did not pass the CELF-4 Screening Test were referred for a comprehensive diagnostic language evaluation by a speech-language pathologist.

Institutional Review Board Approval

Prior to participating in the study, each child's accompanying parent was required to sign an *Informed Consent Form* (ICF) approved by the University of Florida Institutional Review Board (IRB) if the participant was enrolled in the study in Gainesville, Florida, and/or an ICF approved by the Towson University IRB if the participant was enrolled in the study in Towson, Maryland. Additionally, each pediatric participant was required to indicate a willingness to participate in the study via a Child Assent Script approved by the respective IRBs. The study was not blind in that all participants and their parents knew which study group (APD or normal) they were being included in during their completion of the questionnaires. All participants received free hearing and auditory processing evaluations as well as a comprehensive written report, trial use of a suitable FM system when appropriate, and a $20 Target gift card upon completion of the research protocol.

STATISTICAL ANALYSES

Statistical analyses were conducted to explore differences between groups on psychosocial subscale scores. Standard two-group analysis procedures were utilized to compare groups on each subscale of the three instruments. T-tests were completed on the continuous scales (SSRS and BASC-2) while a nonparametric equivalent (Mann-Whitney *U* test) was completed for comparison of the COOP-A ordinal data. Eta-squared and r-square values were calculated for the continuous and ordinal data, respectively, to assess effect sizes and magnitudes of the differences between groups as a measure of generalizability of the findings. For the COOP-A subscale charts, r-square values were calculated (Rosenthal, 1991).

Post hoc analyses using the Spearman rank-order correlation (rho) test for nonparametric data and Pearson product-moment correlation coefficients (r) for continuous variables were utilized in order to evaluate possible correlations between subscale scores and age. Strength of correlation was interpreted according to Cohen (1988), with r values of ±0.50 interpreted as strong, ± 0.30 as moderate, and ±0.10 as weak. To assess differences between genders, independent-samples *t*-tests (BASC and SSRS) and a Mann-Whitney *U* test (COOP-A) were conducted. Post hoc analyses also were conducted on all subscales of each of the three psychosocial questionnaires to compare the pediatric participants in the APD group with confirmed or suspected language impairment (n = 9) to the pediatric participants in the APD group with normal language function (n = 10) using the two-group procedures described above.

RESULTS

Participant Demographics

Descriptive data were compiled for gender, age, linguistic function status, grade level, and type of school (public, private, and home) between the normal and APD groups. A summary of descriptive statistics can be found in Table 1. Preliminary analyses were completed to determine if any differences existed between the normal and APD groups on age or gender. Results indicated that there was no age difference between the normal group (M = 12.79, SD = 2.35) and the APD group [M = 11.93, SD = 2.09; $t(37) = -1.20$, p = 0.24]. A χ^2 test revealed no group difference by gender ($\chi^2 = 0.27$, $n = 39$).

Peripheral Auditory Status

Initial descriptive findings were evaluated in order to ensure comparable peripheral hearing status between groups. Audiometric results were within normal limits for all participants in both groups per inclusion criteria. Mean audiometric findings for both groups are displayed in Figure 1. Tympanometric results were also within normal limits for all participants in both groups per inclusion criteria. Mean diagnostic distortion product otoacoustic emissions (DPOAEs) were within normal limits for both groups, though a small and equivalent proportion of participants in each group had DPOAE amplitudes below normal limits for one or more test frequencies. Using the diagnostic auditory processing test battery criterion, a student was diagnosed with an auditory processing disorder if findings for at least one ear were 2 SDs below the mean on at least two different procedures. A summary of results on the APD test battery for those students who were included in each group is shown in Table 2.

Psychosocial Status

Statistical analyses were conducted on each of the three instruments (COOP-A, BASC-2, and SSRS) comparing the results for the pediatric participants in the APD group to those of the pediatric participants in the normal group, and comparing the results of the parents of the participants in the APD group to those of the parents of the participants in the normal group. Statistical analyses were completed using SPSS 13.0 for Windows (SPSS Inc., Chicago, IL). See Table 3 for a summary of findings and details of statistical results between pediatric participant groups. See Table 4 for a summary of findings and details of statistical results between parent groups, as described below.

In summary, participants in the APD group reported greater psychosocial problems than participants in the normal group on the Emotional Feelings and Overall Health subscales of the COOP-A and the Emotional Symptoms Index of the BASC-2. Parents of participants in the APD group reported greater problems for their children than the parents of participants in the normal group on 12 of 22 subscales. Statistical comparison indicated differences for the Pain, School Work, Emotional Feelings, and Self-Esteem subscale charts of the COOP-A, all four composite subscales of the BASC-2 (Externalizing Problems, Internalizing Problems, Behavioral Symptoms Index, and Adaptive Skills Index), and the Responsibility, Externalizing Problem Behaviors, and Internalizing Problem Behaviors of the SSRS.

No statistically significant findings for gender differences were observed for any of the subscales of interest from the COOP-A, the SSRS, or the BASC-2.

There were a few correlations associated with age across the various significant findings of the psychosocial subscales; only the significant findings will be highlighted. On the COOP-A, there was a moderate correlation on the Overall Health subscale chart for children to report lower overall health as they advanced in age (Spearman rho = 0.30, n = 39, p = 0.06), and a small correlation between increasing age of the child and decreasing parental reports on the Self-Esteem subscale chart of self-esteem problems in their children (Spearman rho = −0.24, n = 37, p = 0.15). The analysis of age on the BASC-2 Parent Rating Scales' Adaptive Skills Index composite subscale indicated a small positive correlation between the two variables ($r = -0.15$, n = 36, p = 0.39). These findings suggest a trend for parents to rate their children as having more positive adaptive skills, such as coping or communication skills, as they grow older.

The analysis of age on the ratings for the parent-completed SSRS Responsibility subscale yielded a Pearson's r value of .534 (n = 36, p = 0.001), indicating a strong correlation between increasing participant age

Table 1. Number of Subjects in the APD and Normal Groups for Various Demographic Characteristics

		APD Group (n = 19)	Normal Group (n = 20)
Gender	Male	9	6
	Female	10	14
Age (yr)	Mean	11.93	12.79
	Range	9.6–17.8	9.6–16.9
Grade Level	4	3	2
	5	7	4
	6	4	2
	7	2	2
	8	1	4
	9	0	2
	10	0	1
	11	2	2
	12	0	1
Language	Normal	10	20
	Impaired	9	0
Type of School	Public	9	7
	Private	8	8
	Home	2	5

and parental reports of higher responsibility skill levels in their children (Cohen, 1988). The analysis of age on the parental ratings for the Externalizing Problem Behaviors subscale of the SSRS yielded a Pearson's r value of -0.294 (n = 36, p = 0.08), indicating a small to medium correlation between increasing participant age and parental reports of higher responsibility skill levels in their children. The analysis of age on the Internalizing Problem Behaviors subscale of the SSRS Parent Form indicated a small negative correlation between the two variables (r = −0.10, n = 36, p = 0.57). These findings suggest a trend for parents to rate their children as displaying fewer internalizing problem behaviors, such as anxiety or sadness, as they grow older. A summary of all correlation findings for the various psychosocial subscales assessed may be found in Table 5.

Comparisons between Language-Normal and Language-Impaired Subgroups of APD

Preliminary analyses were completed to determine if any statistically significant differences existed between the language-impaired and language-normal APD subgroups on age or gender. Results indicated that there was no significant difference in age between the language-normal subgroup (M = 12.20, SD = 1.87) and the language-impaired APD group [M = 11.69, SD = 2.35; $t(17) = 0.52$, p = 0.61] and no significant subgroup difference in gender composition ($\chi^2 = 0.50$, n = 19). Statistical significance levels were not reached for any of the parent- or child-completed instrument subscales, suggesting comparable psychosocial function across content areas for the children with and without language impairment who have APD.

DISCUSSION

Three major findings resulted from this study. First, children in the APD group reported significantly more emotional and overall health difficulties than did children in the normal group. Second, parents of children with APD reported that their children experienced greater psychosocial difficulties on multiple domains in comparison to parents of the participants in the control group. Third, for the children in the APD group, no statistically significant differences in psychosocial status were seen between children with and without a confirmed or suspected language disorder.

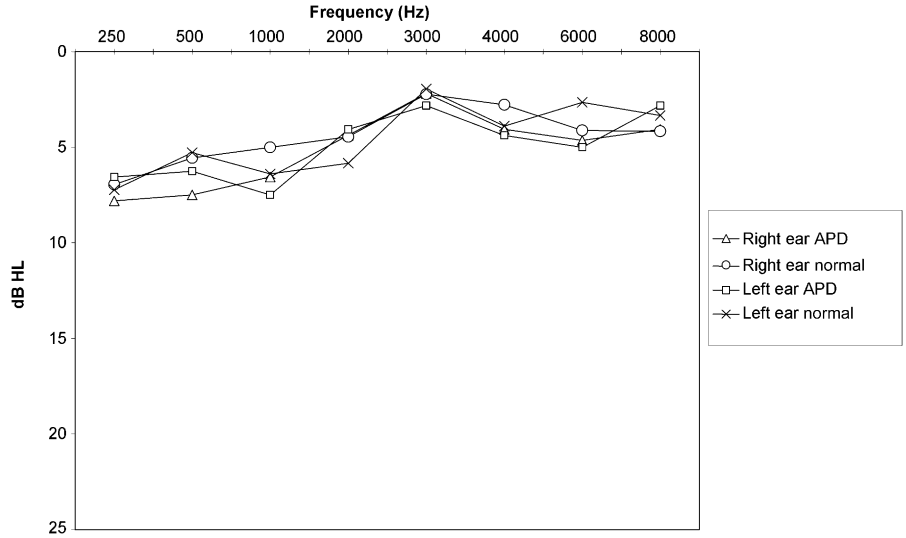

Figure 1. Mean audiometric results for right and left ears of participants in the APD and normal groups.

Table 2. Number of Participants 2 SDs or More Below Mean on Assessments Used in the APD Test Battery for Both the APD and Normal Groups

	APD Group (n = 19)	Normal Group (n = 20)
Staggered Spondaic Word test	17	3
Dichotic Digits, Double Pairs Test	8	0
Frequency Pattern Sequence test	14	1
Duration Pattern Sequence test	16	1
Random Gap Detection Test	7	0
Synthetic Sentence Identification with Ipsilateral Competing Message	6	0
SCAN: Auditory Figure-Ground subtest	5	0
SCAN: Competing Words subtest	5	0
SCAN: Filtered Words subtest	0	0
Auditory Continuous Performance Test	0	0

Children's Self-Reported Psychosocial Status

There were significant differences between groups on the Emotional Symptoms Index of the BASC-2 and the Emotional Feeling and Overall Health subscales of the COOP-A, with the APD group reporting more difficulties than the normal group. The Emotional Symptoms Index includes content items assessing areas such as social stress, anxiety, depression, and self-esteem. High self-reported scores on the Emotional Symptoms Index composite subscale can reflect a global pattern of serious broad-based emotional disorders (Reynolds and Kamphaus, 2004). Children who are diagnosed with APD are more likely to display negative emotional symptoms than normal children. This finding is supported by the significant COOP-A finding on the Emotional Feeling subscale chart, providing further evidence that the APD group reported more emotional symptoms than the normal group.

For the statistically significant subscales based on children's psychosocial reports, there was a moderate effect size for the Emotional Symptoms Index of the BASC-2 and the Overall Health subscale of the COOP-A. The Emotional Feelings subscale of the COOP-A had a large effect (Table 3). Larger effect sizes enhance the ability of findings to be generalized to a larger population of children in this age group with APD. These findings are consistent with those of Kreisman and colleagues (2004).

Table 3. Mean Ranks (*m*) and Sum of Ranks (*U*) for the COOP-A and Means (M) and SDs for the SSRS and BASC-2 for Children's Psychosocial Self-Reports Ratings for the APD Group and the Normal Group with Statistical Results

Children's Self-Reports	APD Group		Normal Group		Statistical Analysis		
COOP-A	*m*	*U*	*m*	*U*	*Z-value*	*p*	r^2
Physical Fitness	18.68	355.00	21.25	425.00	−0.81	0.42	0.02
Pain	21.76	413.50	18.33	366.50	−1.00	0.32	0.03
Stress	22.58	429.00	17.55	351.00	−1.46	0.15	0.06
School Work	22.58	429.00	17.55	351.00	−1.51	0.13	0.06
Emotional Feelings	24.34	462.50	15.88	317.50	−2.53	0.01*	0.17
Behavior	21.89	416.00	18.20	364.00	−1.13	0.26	0.03
Social Support	22.74	432.00	17.40	348.00	−1.62	0.11	0.07
Self-Esteem	22.26	423.00	17.85	357.00	−1.32	0.19	0.04
Family	21.71	412.50	18.38	367.50	−0.96	0.34	0.02
Health Habits I	19.50	370.50	20.48	409.50	−0.98	0.33	0.02
Overall Health	23.66	449.50	16.53	330.50	−2.08	0.04*	0.11
Energy	17.92	340.50	21.98	439.50	−1.23	0.22	0.04
BASC-2	M	SD	M	SD	*t-value (df)*	*p*	η^2
School Problems	121.26	27.97	121.55	30.49	0.03 (37)	0.97	0.00
Internalizing Problems	309.16	36.09	297.45	36.52	−1.01 (37)	0.32	0.03
Emotional Symptoms Index	293.47	32.40	274.10	25.81	−2.07 (37)	0.04*	0.10
Inattention/Hyperactivity	102.11	17.36	97.50	14.87	−0.89 (37)	0.38	0.38
Personal Adjustment	202.00	31.05	211.60	23.27	1.10 (37)	0.28	0.28
SSRS	M	SD	M	SD	*t-value (df)*	*p*	η^2
Cooperation	14.68	2.45	15.53	2.70	1.01 (36)	0.32	0.03
Assertion	14.84	2.04	13.95	3.68	−0.94 (30)	0.35	0.02
Empathy	16.47	2.44	16.45	2.74	−0.03 (37)	0.98	0.00
Self-Control	11.89	2.87	12.80	3.27	0.92 (37)	0.37	0.02

Table 4. Mean Ranks (m) and Sum of Ranks (U) for the COOP-A and Means (M) and SDs for the SSRS and BASC-2 for Parental Psychosocial Ratings for the APD Group and the Normal Group with Statistical Results

Parental Reports	APD Group		Normal Group		Statistical Analysis		
COOP-A	*m*	*U*	*m*	*U*	*Z-value*	*p*	r^2
Physical Fitness	18.97	360.50	19.03	342.50	−0.02	0.98	0.00
Pain	22.53	428.00	15.83	275.00	−2.15	0.03*	0.13
Stress	21.26	404.00	16.61	299.00	−1.44	0.15	0.06
School Work	22.42	426.00	15.39	277.00	−2.13	0.03*	0.12
Emotional Feelings	22.26	423.00	15.56	280.00	−2.28	0.02*	0.14
Behavior	21.00	399.00	16.89	304.00	−1.41	0.16	0.05
Social Support	20.42	388.00	17.50	315.00	−0.99	0.33	0.03
Self-Esteem	22.08	419.50	15.75	283.50	−1.93	0.05	0.10
Family	19.63	373.00	18.33	330.00	−0.39	0.69	0.00
Health Habits I	19.00	361.00	19.00	342.00	0.00	1.00	0.00
Overall Health	21.39	406.50	16.47	296.50	−1.55	0.12	0.07
Energy	18.18	345.50	19.86	357.50	−0.55	0.59	0.01
BASC-2	M	SD	M	SD	*t-value (df)*	*p*	η^2
Externalizing Problems	151.50	19.52	134.22	13.52	−3.09 (34)	0.00*	0.22
Internalizing Problems	167.22	31.45	136.83	12.49	−3.81 (34)	0.00*	0.30
Behavioral Symptoms Index	320.33	40.36	270.78	25.32	−4.41 (34)	0.00*	0.36
Adaptive Skills Index	237.06	32.81	260.94	22.78	2.54 (34)	0.02*	0.16
SSRS	M	SD	M	SD	*t-value (df)*	*p*	η^2
Cooperation	12.44	2.56	13.33	2.45	1.04 (32)	0.31	0.03
Assertion	16.00	2.83	16.00	2.57	0.00 (32)	1.00	0.00
Responsibility	14.78	3.17	16.94	1.92	2.48 (32)	0.02*	0.16
Self-Control	14.67	2.59	16.11	2.49	1.70 (34)	0.10	0.08
Externalizing Problem Behaviors	3.22	1.77	2.00	1.75	−2.09 (34)	0.05*	0.11
Internalizing Problem Behaviors	4.33	2.43	2.50	1.79	−2.58 (34)	0.01*	0.16

Parental Perceptions of Psychosocial Status

Statistically significant differences by parent report were found on subscales of all three psychosocial instruments utilized in the present investigation: the Externalizing Problems, Internalizing Problems, Behavioral Symptoms Index, and Adaptive Skills Index subscales of the BASC-2; the Responsibility, Externalizing Problem Behaviors, and Internalizing Problem Behaviors subscales of the SSRS; and the Pain, School Work, and Emotional Feelings subscale charts of the COOP-A.

On the BASC-2, parents of children with APD reported significantly more problems for all four composite subscales. There were large effect sizes for all findings: Externalizing Problems, Internalizing Problems, Behavioral Symptoms Index, and Adaptive Skills Index. Additionally, parents of children with APD reported significantly more social skills difficulties for their children on the SSRS than parents of the children in the normal group on three of the subscales measured, with moderate (Externalizing Problem Behaviors) to large (Responsibility and Internalizing Problem Behaviors) effect sizes.

On the COOP-A, findings suggest that parents report more social and emotional difficulties for their children with APD than parents of the children with normal auditory abilities. Statistically significant differences were found between groups with moderate (Pain, School Work) to large (Emotional Feelings) effect sizes (Table 4).

Taken in combination, these findings from parental reports indicate an overall pattern of parental concern regarding reduced emotional health status, poor or inappropriate behaviors, and difficult adaptations to school that their children may be experiencing. Interestingly, parents of children with APD perceived significant psychosocial difficulties on more survey scales than were reported by the children themselves. The reason for this discrepancy is unclear: children may be underreporting their emotional and social problems; parents may be overreporting their children's difficulties, or differences may be simply be due to differing perspectives. Notably, Kreisman and colleagues (2004) similarly found that parents reported that their children with APD had greater psychosocial difficulty than their children self-reported.

Language Function Status of the APD Group

A somewhat unexpected finding uncovered on post hoc analysis was the lack of statistically significant differences on any subscale between children in the APD group who had a confirmed or suspected language disorder versus those with no evidence of language disorder. While interpretation of this negative finding should

Table 5. Summary of Correlation Findings for Age and Statistically Significant ($p < 0.05$) Psychosocial Subscales for Children and Parents

Children's Self-Reports		
COOP-A	**Spearman's ρ**	**Correlation with Age**
Emotional Feelings	−0.00	None
Overall Health	0.30	Moderate
BASC-2	**Pearson's r**	
Emotional Symptoms Index	−0.02	None
Parental Reports		
COOP-A	**Spearman's ρ**	
Pain	−0.03	None
School Work	−0.08	None
Emotional Feelings	0.01	None
Self-Esteem	−0.24	Small
BASC-2	**Pearson's r**	
Externalizing Problems	−0.09	None
Internalizing Problems	−0.01	None
Behavioral Symptoms Index	−0.12	Small
Adaptive Skills Index	0.15	Small
SSRS	**Pearson's r**	
Responsibility	0.53	Strong
Externalizing Problem Behaviors	−0.29	Moderate
Internalizing Problem Behaviors	−0.10	Small

be guarded due to the small size of the subject sample, it suggests that APD may impact psychosocial function of children more than other communication disorders. In many ways, and to many professionals who work with children with communication disorders, auditory processing would appear to be invariably linked with language function, and language function intrinsically linked with psychosocial status. It is reasonable to assume that poor speech perception inevitably leads to disordered language reception or expression, poor reading or writing abilities, and a poor ability to effectively communicate, and therefore, that psychosocial function is similarly impacted by all of these disorders. However, the work of Wible et al (2005), based on research with auditory evoked potentials, challenges the presumed correlation of brainstem and cortical auditory processing disorders with language impairment. That is, the connection between auditory processing and language function may not be as clear-cut or unambiguous as one might suspect.

Limitations of This Study

This study has several limitations. First, as the study participants and their parents were not blinded to the categories in which they were included, it is possible that their answers to the items on the psychosocial questionnaires were influenced by their feelings regarding their group status. Second, data were collected and analyzed for a relatively small number of participants meeting the inclusion criterion and available to the investigator when the study was conducted. While moderate to strong effect sizes suggest that findings can be generalized to a larger population, statistical power would be greatly enhanced by a larger number of subjects. Third, due to the normative standards for the COOP-A, no participant below the age of 10 yr could be included in the study. As many children are referred for comprehensive APD evaluations in first, second, or third grades, the study would have more implications for school-age children with APD if the age criterion could be stretched down as young as 7 yr or even younger. Fourth, the groups in the present study were matched for age and gender but not for parental attributes such as education or socioeconomic status. Further research is needed to evaluate the effect of parent or family characteristics on the psychosocial effects of APD. Finally, this study did not seek data from fathers or teachers of participants, two groups for which further study of psychosocial status in children with APD is indicated.

Clinical Implications

The findings of this investigation confirm that children with APD experience emotional and social difficulties of significance when compared with their non-APD peers. Audiologists who provide diagnostic auditory processing evaluations need to be aware of, and to be able to provide informational counseling regarding, not only the communicative disorders associated with the diagnosis of APD but also the psychosocial difficulties that these children may be harboring. Additionally, audiologists should be ready and willing to provide appropriate nonprofessional personal adjustment counseling within their scope of practice for these children with APD and their families, or to refer patients and their parents to appropriate professions for counseling. Just as English (2002) asserts that audiologists can and should be key professionals that may be able to help provide a "safety net" for children with hearing loss as they "(and their parents) face challenges in their psychosocial and emotional development" (p. 15), so too should audiologists be able to provide similar support for comparable difficulties faced by children with APD.

The COOP-A may provide a useful screening tool to parents. The chart method employed by this measure is easy to understand and appears to provide insight into quality of life concerns in children aged 10 to 18 yr with APD. Audiologists should also consider the use of more rigorous psychosocial assessments such as the BASC-2 or the SSRS with their patients, from which they may find outcomes in children with APD that may also warrant nonprofessional counseling follow-up by audiologists, or even suggest referral for further evaluation and/or intervention by medical or psychological professionals.

Future Research

Additional research on the relation between psychosocial function and auditory processing disorders is warranted. Determination of the impact of age of identification and/or age of intervention or remediation on psychosocial status of children with APD is particularly needed. As the great majority (17 of 19) of experimental participants in the present investigation were formally diagnosed with APD within 6 mo of their completion of this study, and none of them were younger than 9.5 yr at their time of participation, it is highly probable that the psychosocial difficulties they and their mothers reported had changed over time. Interreporter differences (especially parent versus child) could also be explored in future investigations to determine effective strategies for accurately defining psychosocial status for children with APD.

Possible differences in the psychosocial characteristics of children with APD versus language impairment also require further investigation due to conflicting research findings, hypotheses, and subjective reports concerning the link between auditory processing and language. Further elucidation of this relationship might be gained by evaluating the psychosocial status of children with a primary diagnosis of language impairment, as well as investigation of the various APD subcategorizations (e.g., organizational deficits, integration deficits, auditory figure-ground deficits, temporal processing deficits, and decoding deficits).

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