SSW Reports

Is the Fisher's Auditory Problems Checklist A good screening tool for the Buffalo Model

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Introduction

In 1996, the American Speech-Language Hearing Association (ASHA) Task Force on Central Auditory Processing Disorders ([C]APD) developed a technical report to assist clinicians in the diagnosis and management of (central) auditory processing disorders in children and adults. This technical report contributed to a renewed clinical interest in (C)APD and, more specifically, concerns about the misdiagnosis of the disorder. The document addressed the need for appropriate tools to screen for (C)APD; yet, no universally accepted screening tool for use with children has been identified. The goal of such a tool would be to accurately identify children who exhibit a need for a more comprehensive battery of diagnostic auditory processing tests.

In agreement with Jerger and Musiek (2000), an auditory processing screening program should 1) emphasize tasks essential in the processing of complex auditory stimuli, such as temporal processing or auditory discrimination and 2) meet the psychometric standards of sensitivity and specificity, clearly defined pass or refer criteria, demonstrate inter-rater as well as test-retest reliability, and show concurrent as well as discriminate validity. The current study explored the usefulness of Fisher's Auditory Processing Checklist (Fisher, 1976) as a screening tool for (C)APD. Fisher's checklist (Fisher, 1976) provides a broad assessment of general characteristics associated with thirteen categories of auditory processing skills. Although testing many of the aforementioned psychometric standards is beyond the scope of this study, the current research explored whether children who scored at or below the cut-off point on Fisher's Checklist (Fisher, 1976) were significantly more likely to receive a diagnosis of (C)APD following the completion of the Buffalo Model Diagnostic test battery.

The routine use of an effective screening tool may help to identify children who would benefit from more extensive and formal (C)APD testing. A survey of audiologists indicated that approximately 75% of the respondents used (C)APD screening questionnaires (Emanuel, 2002). The respondents reported using the following screening tools to identify those in need of a formal auditory processing evaluation: 43% used the Children's Auditory Performance Scale (CHAPS; Smoski, 1990), 25% used the Screening Identification for Targeting Educational Risk (SIFTER; Anderson 1989) and 32% used Fisher's Auditory Problems Checklist (Fisher, 1976). Fisher's Checklist is a questionnaire developed to collect information from the referring source /observer about the perceived auditory processing problems of children at risk for (C) APD. Although the author of Fisher's Auditory Problems Checklist (Fisher, 1976) reports the checklist was an effective screening tool for (C) APD (Van Hattum, 1985), the findings were never published. Further, no additional attempts to explore the potential usefulness of this screening tool have been published. The current study explored the usefulness of Fisher's Auditory Problem's Checklist (Fisher, 1976) as a screening tool for (C) APD by examining whether children who scored at or below the cut-off point were significantly more likely to receive a diagnosis

of (C) APD following the completion of the Buffalo Model diagnostic test battery.

Fisher's Auditory Problems Checklist (Fisher, 1976) contains 25 items, each with a value of 4%. The observer places a checkmark next to each item that is consistent with the exhibited behavior of the child. A child exhibiting no behaviors consistent with auditory problems (i.e., no items checked) would score a 100%. Unpublished research by Fisher identified a cut-off score of 72%, such that children that scored at or below this value warrant a referral for further (C) APD diagnostic testing. Fisher's data showed 92% of the children with a diagnosed (C)APD were below the 72% cut-off score compared to only 11.6% of the un-diagnosed group. The current study used the recommended 72% cut-off score to explore Fisher's Checklist's usefulness in identifying children at risk for (C)APD.

In 1993, Katz introduced the Buffalo Model of (C)APD assessment and management (Musiek & Berge, 1998). This model consists of three primary diagnostic tests: Staggered Spondaic Word Test (SSW; Katz 1998), Phonemic Synthesis Test (PST; Katz, 1998), and W-22 Speech-in-Noise test (Katz, 1998). The SSW presents dichotic spondaic words which are staggered such that the second syllable of the first spondee presented to one ear overlaps the first syllable of the second spondee presented to the other ear (Katz 2007a) The PST presents individual phonemes which must be blended to form a target word (Katz, 2007a). Lastly, the W-22 Speech-in-Noise test presents phonemically balanced words in quiet as well as in an environment of competing background noise (s/n +5dB). The individual must repeat the target word (Katz 2007a). When all three tests are used in conjunction with one another, the battery is quite sensitive with 96% of individuals diagnosed with (C)APD failing one of the tests and 73% of individuals diagnosed with (C)APD failing two or three of the tests (Katz & Marasciulo, 2001).

The Buffalo Model Test Battery categorizes (C)APD into four individual types: Decoding DEC, Tolerance/Fading Memory TFM, Integration INT, and Organization ORG. A person often has more than one type of problem. These four types of (C)APD provide us with a way to categorize those with (C)APD and thereby personalize intervention. A Decoding deficit is a breakdown at the phonemic level that results in an inability to quickly and accurately process what is heard (Stecker, 1998). Tolerance/Fading Memory is an indication of poor short-term auditory memory, figure ground skills and difficulty understanding speech in poor listening conditions (Stecker. 1998). The third category, Integration, is difficulty combining auditory information with other functions such as visual information from nonverbal aspects of a speech signal (Stecker, 1998). Lastly, the category of Organization represents difficulty with organizational tasks and sequencing of sounds and words (Medwetsky, 2002). Again, these categories are not mutually exclusive; the majority of those seen for testing have a deficit in two or more categories (Katz, 2007a; 2007b). Katz (2007a; 2007b) reported that as many as 5-10% of those seen demonstrated all four categories.

A need exists for a (C)APD screening tool that is effective and efficient. However, there is little consensus regarding this issue. Fisher's Checklist is used clinically to screen for (C)APD, although it has not been empirically evaluated. The current study examined the relationship between the Fisher's Checklist and a diagnostic battery following the Buffalo Model for (C)APD testing.

Method

Participants

Fifty-seven charts were reviewed to determine if they met the inclusion criteria of a completed Fisher's Checklist (Fisher, 1976) and the Buffalo Model Diagnostic test battery. Seventeen charts were excluded due to an incomplete test battery, diagnosis of Attention Deficit Hyperactivity Disorder or a Fisher's Checklist (Fisher, 1976) score above 72%. Forty children between the ages of 6 and 13 years old, (*M=9.25, SD= 1.82*) who met the inclusion criteria of a completed Fisher's Checklist and the Buffalo Model Diagnostic test battery who were evaluated at

Bloomsburg University's Speech Hearing and Language Clinic from 2003 to 2008 were included in this study. They consisted of 23 boys (57.5%) and 17 girls (42.5%). The mother was the most common individual (87.5%) to complete the Fisher's Checklist. Each child exhibited normal peripheral hearing and normal middle ear function. The mean three-frequency pure tone average (PTA) for the participants was 4.93 dB HL (*SD=4.37)* for the right ear and 4.84 dB HL (*SD=4.71)* for the left ear. Participants' scores on the Fisher's Auditory Problems Checklist ranged from 32% to 72%, with a mean score of 54% (*SD=12.91)*.

Procedures

Fisher's Checklist percentage score, scores from the SSW, PST and W-22 Speech-in-Noise test, as well as the specific type of (C)APD diagnosis (i.e. Decoding, Tolerance/ Facing memory, Integration and/or Organization) were recorded on the test results spreadsheet. Table 1 summarizes the findings of the case review. This table presents the percentage of individuals identified with and without a (C)APD and the outcome of the Buffalo Test Battery. Please note that tests outside the Buffalo Battery may have been used to identify a disorder. Data were analyzed and entered into Statistical Package for Social Sciences (SPSS) for Windows for analysis. Given the nominal scales of measurement upon which the data were recorded, a Chi Square Goodness of Fit test was conducted to examine if the children who scored at or below the cut-off on Fisher's Checklist were more likely to obtain abnormal scores on each of the three tests in the Buffalo Model diagnostic test battery.

Table 1

Percentages of Test Outcomes for Fisher's Checklist and the Buffalo Battery

	SSW	PST	W-22	Percentage
No (C)APD Diagnosis	Normal	Normal	Normal	5% (n=2)
	Normal	Abnormal	Normal	5% (n=2)
	Normal	Abnormal	Abnormal	2.5% (n=1)
(C)APD Diagnosis	Abnormal	Normal	Abnormal	27.5% (n=11)
	Abnormal	Normal	Normal	17.5% (n=7)
	Abnormal	Abnormal	Normal	15% (n=6)
	Abnormal	Abnormal	Abnormal	10% (n=4)
	Normal	Normal	Abnormal	10% (n=4)
	Normal	Abnormal	Abnormal	5% (n=2)
	Normal	Abnormal	Normal	2.5% (n=1)

Note. (C)APD diagnosis based upon the Buffalo Model categorization; however, tests not included in the Buffalo Model were used in some of the evaluations. SSW = Staggered Spondaic Word Test. PST = Phonemic Synthesis Test. W-22 = W-22 Speech-in-Noise test. (C)APD = (central) auditory processing disorder.

Results

As illustrated in Figure 1, thirty (30) participants (75%) were diagnosed with a Tolerance/ Fading Memory deficit, twenty eight (28) participants (70%) with a Decoding deficit, twenty one (21) participants (52.5%) with a deficit in Organization, and twelve (12) participants (30%) with an Integration deficit. Figure 2 illustrates the distribution of the four types of (C)APD that were identified in the current study. The most commonly identified combination of (C)APD types included deficits in Decoding, Tolerance/Fading Memory and Organization. Six participants (15%) were diagnosed with all four types of (C)APD. A Chi Square Goodness of Fit test showed that children who scored at or below the cut-off score of 72% on Fisher's Checklist were significantly more likely to receive a diagnosis of (C)APD (X^2 1 = 22.5, P<0.05) following comprehensive diagnostic evaluation. Analyses showed that children identified by Fisher's Checklist as warranting further diagnostic testing were significantly more likely to have abnormal scores on the SSW (X21+6.4,p<0.5) but not on the PST or the W-22.

Figure 1 – Number of Participants Identified with each category of (C)APD

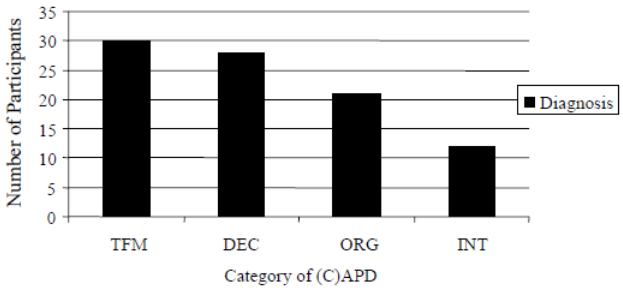

Figure 2 – Distribution of (C)APD type(s)

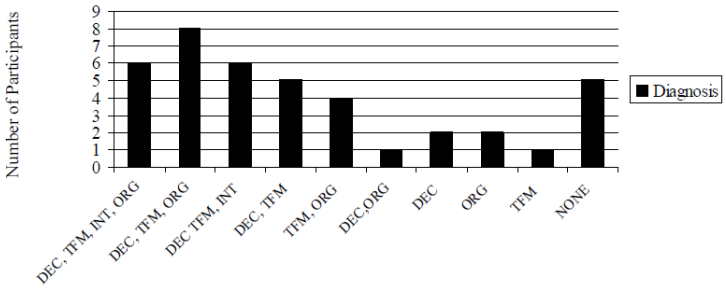

Table 1 shows outcomes of Fisher's Checklist (Fisher, 1976) as well as each of the clinic's standard diagnostic tests (i.e., SSW, PST, and W-22) and the percentage of those participants who fell in each category. Bloomsburg University of Pennsylvania's (C)APD test battery changes based on the outcomes of tests administered. The tests used to identify a processing disorder for the sample in this study were as follows : SSW (Katz, 1998); Pitch Pattern Sequence test (Pinheiro, 1977), PST (Katz, 1998), Duration Pattern Sequence (Musiek, Baran & Pinheiro, 1990), Random Gap Detection Test (Keith, 2000), Auditory Continuous Performance Test (Keith, 1994), Dichotic Digits (Musiek,1983), Competing Environmental Sounds (Katz, 1998), W-22 Speech-in-Noise test (Katz, 1998). Using these data, additional Chi Square Goodness of Fit Tests were performed to determine whether children who scored at or below cutoff on Fisher's Checklist (Fisher, 1976) were more likely to obtain abnormal scores on each of the Buffalo Model auditory processing tests. Analyses showed that children identified by Fisher's Checklist (Fisher, 1976) as warranting further diagnostic testing were significantly more likely to have abnormal scores on the SSW ($X^2_1 = 6.4$, $p < 0.05$) but not on the PST or the W-22.

Discussion

Over one decade ago, ASHA's Task Force on (C)APD addressed the need for effective screening tools for children with (C)APD (1996); however, there remains little consensus on the topic. Although Fisher's Auditory Problems Checklist (Fisher, 1976) is being used clinically to screen for (C)APD, its usefulness as a screening instrument has not been empirically evaluated. Results from the current research indicate that children who score at or below the cut-off point on Fisher's checklist (Fisher, 1976) are significantly more likely to receive a diagnosis of (C)APD based on results from the Buffalo Model test battery.

In a discussion of the SSW, Katz (1998) reports a very high sensitivity and specificity in normal hearing listeners and that it provides information regarding each of the four types of (C)APD. It is reasonable to expect that children identified by Fisher's Checklist would be more likely to have abnormal scores on the SSW test. Results of the current study showed that the children identified by Fisher's Checklist as needing further diagnostic testing we significantly more likely to show abnormal scores on the SSW test.

Katz (1998) discussed the sensitivity of the SSW, reporting that it has a very high sensitivity and specificity in normal hearing listeners and that it provides information regarding each of the four types of (C)APD. It is reasonable to expect that children identified by Fisher's Checklist (Fisher, 1976) would be more likely to have abnormal scores on the SSW. The results showed that children identified by Fisher's Checklist (Fisher, 1976) as needing further diagnostic testing were significantly more likely to show abnormal scores on the SSW test.

The second test of the Buffalo Model test battery, the PST, is reportedly less sensitive than the SSW. In a study with 92 participants with a mean age of 8.5 years, 54% of the participants failed the PST test (Katz & Marasciulo, 2001). The PST has been found to be sensitive primarily in the diagnosis of decoding deficits (Katz, 2007b); however, Katz and Marascuilo (2001) noted that the 54% hit rate identified in the study is lower than previous studies had suggested. The authors attributed this finding to the increased emphasis on phonics, phonemic awareness, and auditory training in schools in recent years. Katz and Marascuilo (2001) also reported that many children with decoding issues may have been missed by the PST. This test identifies only one type of (C)APD which may have contributed to the lower sensitivity.

The final test of the battery, the W-22 Speech-in-

Noise test, is associated primarily with a deficit in the tolerance fading memory category (Katz, 2007b). This single indicator may be the reason it had a lower sensitivity rate when compared to Fisher's checklist (Fisher, 1976). The W-22 Speech-in-Noise test has been shown to relate well to findings obtained on the SSW in those with sensorineural hearing loss as well as a control group with normal hearing (Katz, Basil & Smith, 1963). Even though the PST and W-22 Speech-in-Noise test are not as sensitive as the SSW does not indicate they are not important to the diagnostic test battery.

Katz (2007b) reminds us that a battery of testing is required to diagnose and categorize (C)APD. The professional looks for a pattern of errors in which the specific category has two or more significant characteristics to identify the disorder. The test battery has a sensitivity of 96% when using one or more significant test findings as the diagnostic criterion (Katz & Marascuilo, 2001). The high sensitivity of the Buffalo Model test battery increased the importance of using Fisher's checklist (Fisher, 1976) as a screening tool for (C)APD.

In the current study, 75% of the participants were diagnosed with a Tolerance/Fading Memory deficit, 70% of the participants were diagnosed with a Decoding deficit, 52.5% of the participants were diagnosed with a deficit in Organization, and 30% of the participants were diagnosed with an Integration deficit. In agreement with previous estimates, results from the current study indicate deficits in Decoding and Tolerance/Fading Memory as the most common identified categories. The current findings differ from previous research that reported Decoding being identified 49% of the time, Tolerance/Fading Memory being reported 43% of the time, Organization reported 18% of the time and Integration identified in 8% of those with (C)APD. (Stecker, 1998).

Limitations of the Study

Several limitations surfaced in the current study. First, the sample size was limited to 40 participants selected from a database of charts at the Bloomsburg University Speech, Hearing and Language Clinic. A major limitation of the study was that it did not address the issues of sensitivity or specificity of Fisher's Checklist.

The current study examined the relationship of Fisher's checklist (Fisher, 1976) to the Buffalo Model diagnostic tests: SSW, PST, and W-22. Bloomsburg University of Pennsylvania's (C)APD test battery changes based on the outcomes of tests administered. All participants in the current research completed all of the tests within the Buffalo Model and were categorized based on its (C)APD classification system (decoding, tolerance fading memory, integration, and organization). However, tests outside the Buffalo battery were utilized to evaluate the individuals. For example, if a child was given the diagnosis of an integration deficit, the outcome may be based on the findings of the Buffalo Model as well as tests not part of this test battery. As illustrated in Table 2, some combinations of test results overlapped. For example, three children obtained normal results on both the SSW and the W-22 with abnormal results on the PST. Of these children, two did not receive a (C)APD diagnosis and one did.

Conclusions --

The reliability of (C)APD screening instruments have been questioned (Emanuel, 2002). Prior to the current study the only source of information regarding Fisher's Auditory Problems Checklist was a textbook chapter written by the author of the Tool. In this text, Fisher reviewed the development of the checklist as well as the establishment of normative data and the cutoff score. However, the data were not peer reviewed and it did not appear in a scholarly journal. Therefore, the credibility of the information is questionable.

The current study found that children identified by Fisher's checklist (Fisher, 1976) as needing further diagnostic testing were significantly more likely to show abnormal scores on the SSW test, but not on the other tests used in the Buffalo Battery. Consequently, it can be concluded that Fisher's Checklist (Fisher 1974) may have the potential to be a useful tool for screening children for (C)APD using diagnostic tests following the Buffalo Battery.

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