

Critical Review:

Is there evidence to support that FM listening devices benefit children with Learning Disabilities (LD) in the educational setting?

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This critical review examined, whether or not, children with learning disabilities receive benefit in an educational setting when wearing an FM device. Overall, research is limited in this area of interest, however, the present research findings suggest that children with learning disabilities may benefit from the use of FM devices within the classroom. However, in view of the limited data that are available, it is not possible to predict the amount of benefit a given child with learning disabilities might receive from this technology.

Introduction

According to Healy, the prevalence of learning disabilities (LD) is 5-10% in the school-aged population (as cited in Paul, 2001, p. 107). Kavanaugh and Truss define “learning disabilities as a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition of use of listening, speaking, reading, writing, reasoning, or mathematic abilities, or social skills” (as cited in Paul, 2001, p. 388).

Treatment and management options for this population is generally accomplished by a certified Speech-Language Pathologist (SLP), however, an Audiologist is another member of a multidisciplinary team of professionals that assists with classroom management options regarding increasing signal-to-noise ratio (SNR) provided by the amplification of the FM device.

FM systems are technological devices used to increase the signal-to-noise ratio in an environment where a microphone picks up an acoustic signal, converts the signal to electrical energy, and later transmits the

amplified signal by radio waves to a receiver, where the use of a loudspeaker, or earphones, produces the output to the user.

Objectives

The primary objective of this work was to critically evaluate existing literature regarding evidence suggesting that FM devices provide benefit to children with learning disabilities within an educational setting. The secondary objective was to propose evidence-based recommendations for scholars interested in further conducting research to answer, whether or not FM devices provide sufficient benefit for children labeled with learning disabilities.

Methods

Search Strategy

Computerized databases, including CINAHL, MEDLINE, COMDISDOME, SCOPUS, ASHA, CBCA EDUCATION, PROQUEST EDUCATION COMPLETE, and ERIC were searched using the following search strategy:

(CHILDREN) and (LEARNING
DISABILITY) and (FM SYSTEM)

Selection Criteria

The study selected for inclusion in this critical review paper was required to investigate the benefit provided to children with learning disabilities using FM systems within the classroom setting. The studies were limited to children with learning disabilities, however, no limits were placed on demographics or outcome measures.

Data Collection

Results of the literature search yielded the following article that is congruent with the aforementioned selection criteria: randomized control studies (1).

Results

Blake, Field, Foster, Platt, and Wertz (1991) used a randomized control design to look at whether personal FM trainers have an effect on attention behaviors in learning disabled (LD) children. Forty (40) participants were taken from a private school for children with learning disabilities defined by the Education of the Handicapped Regulation 300.5, 46 FR 3866, January 16, 1981. Specific inclusion criteria was enforced to preclude participants with visual impairments, physical disabilities, seizure disorders, psychological problems, and hearing impairments to ensure no interference with initiation and maintenance of attending behaviors. Participants also met the following criteria: chronological age between 5 and 10 years, and I.Q. scores at, or above, borderline range of intelligence on the Weschler Intelligence Scale for Children-Revised (WISC-R) (Blake, et al, 1991).

“Four attending behaviors were measured when the speech signal was present: (1) body turned towards the direct signal source,

(2) eyes turned towards signal source, (3) absence of extraneous body movement, (4) absence of extraneous vocal/verbal behaviors”. (Blake, et al, 1991, p. 112). Each participant’s attending behaviors were observed for one 15-minute interval before being randomly assigned to a group. Two trained SLP’s completed the measurements of attending behaviors throughout systematic observation for the entire 24-week study. Each of the four attending behaviors was judged simultaneously. Dividing the number of agreements for each attending behavior and multiplying, by 100, calculated inter-observer reliability, a range of 93.57% to 100% was calculated based on the mean percentage of agreement between the two observers. (Blake, et al, 1991).

Participants wore the personal FM systems for 2-hour instructional periods daily. Instructional periods were teacher-directed lessons. The observers quantified each attending behavior as one point at 15second intervals. All raw data was collected for statistical analysis. The results of analysis of variance (ANOVA) revealed that difference between condense attending behaviors between the control and experimental group was significant [$F(1,34) = 33.47; p < .01$] (Blake, et al, 1991). Overall, an effect was found in the attending behaviors of the participants, however, the effect was not constant across all attending behaviors. Eye contact was the most significant change across all attending behaviors. Pretest and post-test scores for condensed attending behaviors of the experimental group were statistically analyzed. Calculation of the z-statistic revealed a significant z value (6.13; $p > .001$) confirming that wearing an FM system made a difference in the attending behavior of students with learning disabilities.

Overall, the study statistically suggests a benefit is provided to learning disabled students using an FM device within the classroom, however, the overall amount of benefit is not strongly supported since there was a lack of consistent increase across attending behaviors.

Discussion

Appraisal of the results

The Blake, Field, Foster, Platt, and Wertz (1991) study appeared to have one major limitation. A systematic observation method was used to measure attending behaviors throughout the study. Although the observers remained the same throughout the study, an inference can be made regarding the subjectivity of the measured results, suggesting poor reliability. One cannot be sure that both observers' simultaneous examinations of the participant's behavior is not subject to bias, based on an individual difference among the observers' definition of what the expected attention behavior is. Also, one can speculate the chance of possible differences in each subject's attention behaviors, or the meaning behind the behaviors.

Recommendations

Although the available literature on the benefit provided from FM systems for children with learning disabilities is limited, some recommendation can be made regarding researchers interested in exploring the benefit of FM technology on children with LD, or any other types of disorders--precluding lack of success in an academic environment.

Every individual has differences in the manner in which he/she learns in a training environment. Some individuals may have a greater dependency on visual learning, or

kinesthetic learning, in contrast to auditory learning which would produce an effect in the measurement of data. Since all subjects may have variability, or a combination of each learning modality, the first recommendation is to consider conducting a repeated measure design where all subjects would serve as their own control. A repeated measure design is an effective way to control inter-subject differences.

Audiologists service a variety of individuals with hearing impairments, yet also assess individuals' with suspected/suggestive of having Auditory Processing Disorders (APD). Families of children who fall within the spectrum of APD are generally counseled to seek management of the disorder through use of FM devices in the school environment. A second recommendation to researchers interested in further developing answers for clinical purposes is to examine the benefit of FM devices on children with APD.

Conclusions

Although research is limited, the present research findings suggest that children with learning disabilities may benefit from the use of FM devices within the classroom, however, the overall amount of benefit is still unclear. Audiologists can and should recommend the use of FM devices to families, or school boards seeking a solution for any child with learning disabilities. However, the Audiologist should inform the patient/client that research suggests that some benefit is provided. To the contrary, the amount of benefit is not clear at this time. More research needs to be conducted to provide more accurate answers to the management of disorders/disabilities that require increased attention and SNR to succeed in an academic setting.

References

Blake, R., Field, B., Foster, C., Platt, F., & Wertz, P. 1991. Effect of FM Auditory Trainer on Attending Behavior of Learning-Disabled Children. *Language, Speech, and Hearing Services in Schools*, 22, 111-114.

Paul, Rhea. (2001). *Language Disorders: from Infancy through Adolescence: Assessment & Intervention* (2nd ed). St. Louis: Mosby Inc.