

Summary of Sound Field Amplification Research Studies

By Gail Gegg Rosenberg

Sound field amplification has been used effectively to enhance listening and learning environments for more than 20 years. The primary goals of sound field amplification are to: 1) improve the signal-to-noise ratio in the classroom, and 2) provide uniform amplification throughout the classroom. The efficacy of sound field classroom amplification has been documented through research studies, with the 3-year Mainstream Amplification Resource Room Study (MARRS) being the first study reported in the literature in 1981. Following is a retrospective summary of research on the applications and documented findings of sound field amplification for both students and teachers.

IMPROVEMENT IN ACADEMIC ACHIEVEMENT		
Investigators	Student Amplification	Results Obtained with Sound Field Amplification
Howell (1996)	15 normal hearing Regular ed 3rd graders	Significant improvement was noted in test scores when teachers used sound field to present new information.
Flexer (1989, 1992); Osborn, VonderEmbe & Graves (1989) MARCS project	(K-3rd graders in regular education classes) Higher scores in listening, vocabulary, math	Concepts, and math computation were achieved on the Iowa Test of Basic Skills by students in classes with sound field amplification, with greater gains made by younger students.
Ray (1992)	MARRS validation (4th-6th graders with minimal hearing loss & academic deficit)	Students with minimal hearing loss, who were instructed in un-amplified classrooms, performed academically at an average 0.4 SD below normal. Students with minimal hearing loss in amplified classrooms performed at or above average.
Schermer (1991)	First Grade students with normal hearing and minimal hearing loss	Higher reading test scores were attained by students with minimal/mild hearing loss in amplified classrooms and decreased post-test scores were identified for students with known minimal/mild hearing loss in un-amplified classrooms.
Sarff (1981); Ray, Sarff & Glassford (1984)	MARRS project (4th-6th grade students with minimal hearing loss, academic deficit & normal learning potential)	The MARRS project demonstrated that students with minimal hearing loss and learning disabilities in amplified classrooms made significant academic gains at a faster rate, to a higher level, and at one-tenth the cost of students in un-amplified resource room settings.
IMPROVEMENT IN SPEECH RECOGNITION SKILLS		
Poissant, Brackett & Maxon (1997)	10 normal hearing children using mild gain hearing aids and 10 children with multi-channel cochlear implants	Sound field amplification partially restored acoustical cues obliterated by distance and noise, making it easier for cochlear implant users in the mainstream to accurately perceive speech.
Crandell (1996)	20 non-native English speaking children	Improved speech perception scores were achieved by students at distances of 12 and 24 feet when using sound field amplification.
Crandell (1993)	20 students with normal hearing	Significantly higher word recognition scores were achieved by students at distances of 12 and 24 feet when using sound field amplification.
Zabel & Tabor (1993) ¹	45 regular education 3rd-5th grade students	Students achieved improved spelling test scores under sound field amplification in quiet and under degraded listening at a +12 dB S / N.
Neuss, Blair & Viehweg (1991)	Students with minimal hearing loss	Students with minimal hearing loss demonstrated improved word recognition scores in noise when using sound field amplification rather than personal hearing aids.
Flexer, Millin, and Brown (1990)	Primary age children with developmental disabilities	Improved word recognition scores were exhibited by developmentally disabled students with history of persistent conductive hearing loss.
Jones, Berg & Viehweg (1989)	Kindergarten students with normal hearing	Use of sound field amplification decreased student-teacher distance and produced word recognition scores comparable to close listening at four feet
Blair, Myrup & Viehweg (1989)	10 students (CA: 7-14 yrs.) with mild-moderate SNHL	Students with mild / moderate SNHL demonstrated an average 12% improvement in word recognition scores when using personal hearing aids with sound field over hearing aids alone. (n=18) and mild hearing loss (n=18)
Crandell & Bess (1987)	20 students with normal hearing Students showed	Significant improvement in sentence recognition ability under the amplified condition in typical classrooms (S/N = +6 dB, RT = 0.6 sec).

IMPROVEMENT IN STUDENTS' ATTENDING AND LEARNING BEHAVIORS

Investigators	Student Amplification	Results Obtained with Sound Field Amplification
Carlson-Smith & Nelson (1995)	244 1st grade students, low and high middle ear pathology (MEP) risk	Students with high middle ear pathology (MEP) risk in amplified classrooms were able to listen better in competing noise than peers with MEP in unamplified classes.
Rosenberg, Blake-Rahter & Heavner (1995)	ICA project (2054 K-2nd grade students in 94 regular education classes)	Significantly higher scores were obtained by students in amplified classes for listening behaviors, academic behaviors, and academic skills, with the greatest gains for amplified kindergartners. Teachers noted reduction in vocal strain and fatigue as the chief benefit of FM sound field.
Flexer, Richards & Buie (1993)	283 first grade students with and without known history of hearing problems	Higher S.I.F.T.E.R. scores were computed for "at risk" and "no risk" students in amplified classes and lowest scores were reported for "at risk" students in unamplified classes.
Benafield (1990)	4 and 5 year old preschoolers with speech-language delay	Preschoolers with severe language impairment in an amplified classroom showed increased attending behaviors and improvement in the use of appropriate comments.
Allen & Patton (1990)	1st and 2nd grade students with normal hearing	Student distractibility and request for repetitions decreased and on-task behavior increased significantly (17%) with sound field.
Berg, Bateman & Viehweg (1989)	Regular education junior high school students	Students and teachers preferred the use of sound field amplification. Students showed improved listening and understanding, and teachers noted ease of listening and teaching.
Gilman & Danzer (1989)	9 amplified and 9 control classes for 2nd and 4th grade regular education students	Student attentiveness to verbal instruction and activities, as well as ability to hear classroom instruction, improved when using sound field amplification.
Crandell & Bess (1987)	20 students with normal hearing Students showed	Significant improvement in sentence recognition ability under the amplified condition in typical classrooms (S/N = +6 dB, RT = 0.6 sec).

References:

- Allen, L. & Patton, D. (1990, November). *Effects of sound field amplification on student's on-task behavior*. Paper presented at the American Speech-Language-Hearing convention, Seattle, WA.
- Benafield, N. (1990). *The effects of sound field amplification on the attending behaviors of speech and language-delayed preschool children*. Unpublished master's thesis, University of Arkansas at Little Rock.
- Berg, F., Bateman, R. & Viehweg, S. (1989, November) *Sound field FM amplification in junior high school classrooms*. Paper presented at the American Speech-Language-Hearing Association convention, St. Louis, MO.
- Blair, J. Myrup, C. & Viehweg, S. (1989). *Comparison of the effectiveness of hard-hearing children using three types of amplification*. *Educational Audiology Monograph*, 1, 45-55.

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