

# Efficacy of School-Based Hearing Conservation Programs: A Systematic Review

Samantha Baker, B.A. Shauna Dool, B.S. Emily Spitzer, B.S.

Division of Speech and Hearing Sciences, University of North Carolina, Chapel Hill, NC



## INTRODUCTION

Noise-induced hearing loss (NIHL) is the result of exposure to sounds that are too loud in our environment, and it is entirely preventable. A CDC study in 2012 estimated that as many as 24 percent of adults have features of NIHL. Hearing conservation programs (HCPs) in workplace environments exist in order to protect workers and educate them on the effects of NIHL. These HCPs work to reduce worker's exposure to these loud sounds that can cause permanent hearing loss.

An estimated 5.2 million children have NIHL in one or both ears<sup>1</sup>. Increased mp3 player use has led to a growth in this population. NIHL can impact children in the same way that it impacts adults, but there is an additional concern of educational impact. The impact of hearing loss on academic performance is well documented and as there is rise in NIHL among school age children, there is a push to educate and protect this vulnerable population. When poor classroom acoustics are also taken in to consideration, the concern becomes even larger.

Previous research has demonstrated that adult HCPs are effective. Fewer hearing conservation programs exist for children, and the effectiveness of them is not well known. We conducted this systematic review to determine what research exists on school-based hearing conservation programs.

## METHODS

### Search strategy

- PICO question: How effective are school-based hearing conservation programs at preventing hearing loss, compared with no intervention?
- Search terms: ("hearing conservation" OR prevention) AND school

### Databases: CINAHL and PubMed

- Inclusion Criteria: randomized controlled trials, case controlled trials, and cohort intervention studies
- Exclusion Criteria: editorials, studies related to school screening programs, and studies related to agricultural programs. Non peer-reviewed studies.

### Procedures:

- Articles were independently reviewed by at least two different researchers, with the following levels of reliability:
  - Title and abstract – interrater reliability of 93%
  - Full-text – interrater reliability of 90%
  - Quality appraisals (using LEGEND checklists) – interrater reliability of 100%
- Methods and results were extracted from the 6 included articles and compiled into a table (Table 1) for analysis.

## RESULTS

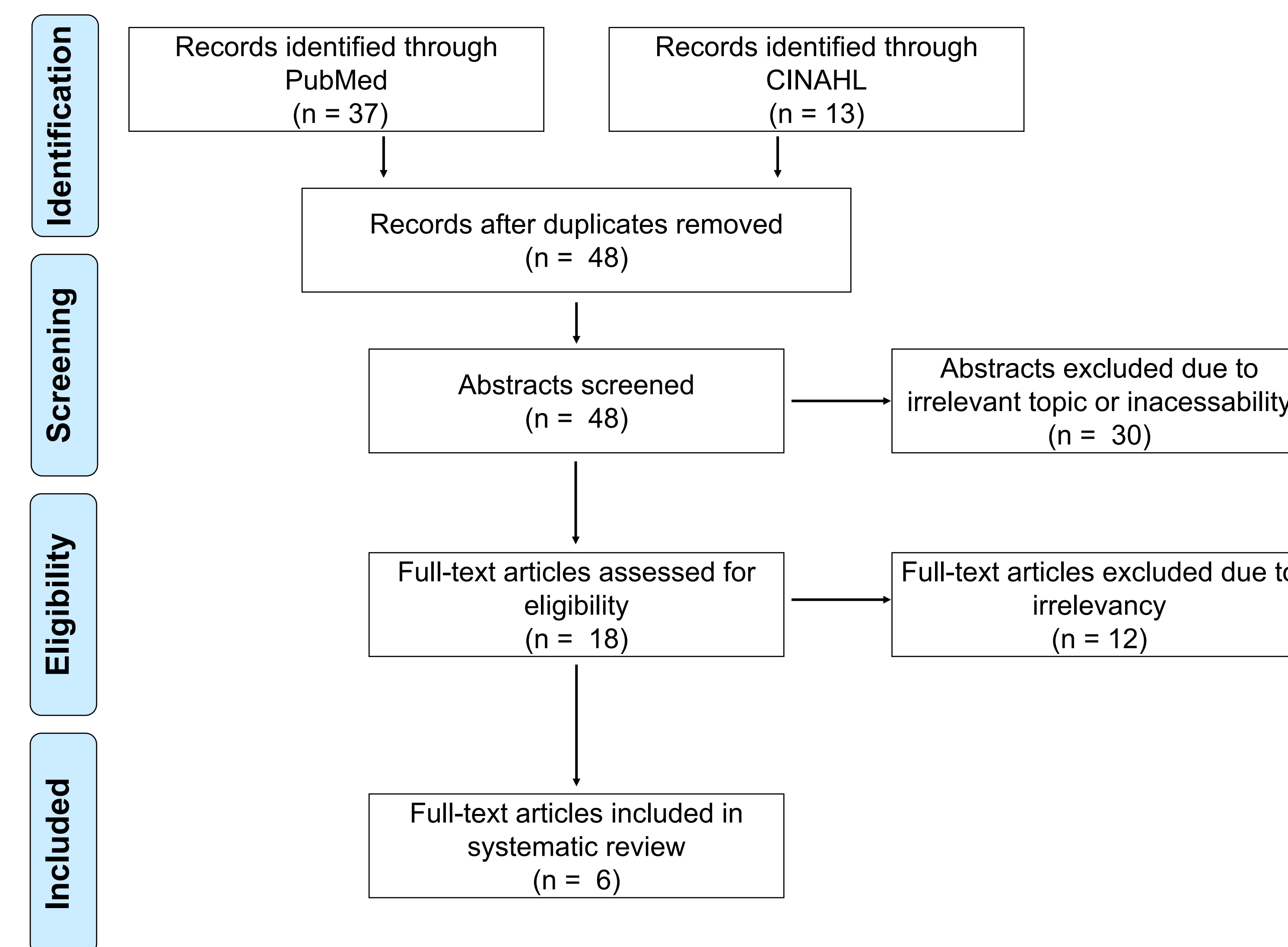


Figure 1. PRISMA diagram showing search results

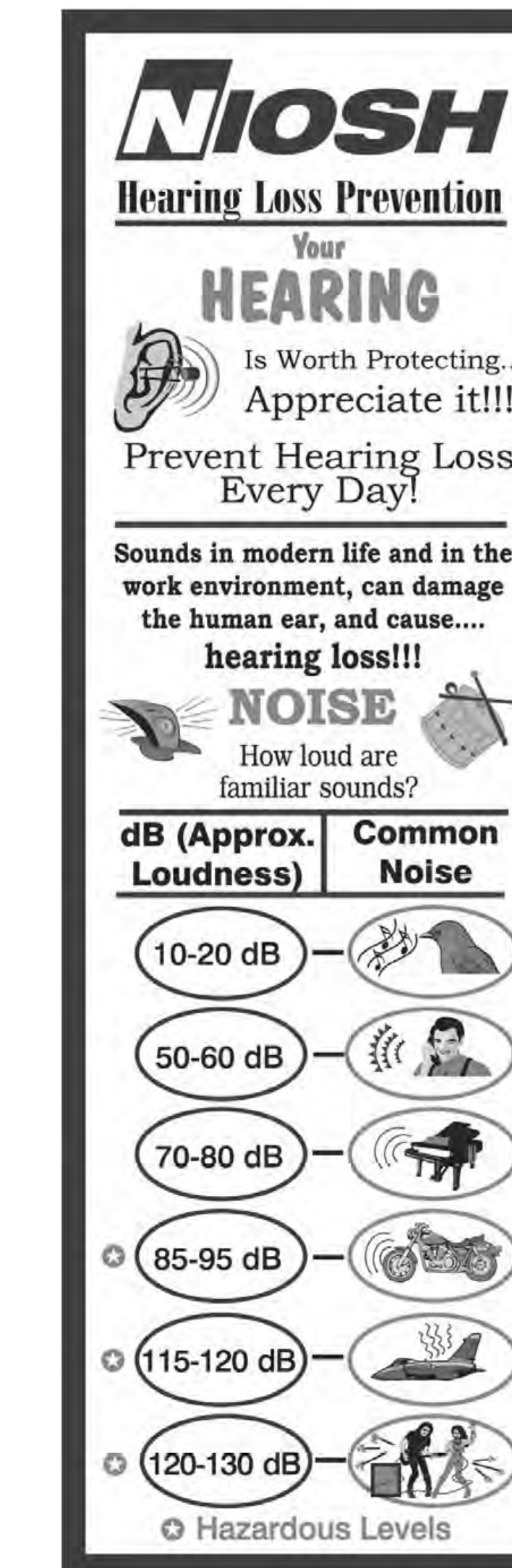


Figure 2. Informational handout given as part of an HCP<sup>2</sup>

Table 1. Overview of articles included in systematic review

Study Name	HCP Used	Age of subjects	Type of Study	Appraised Evidence Level	Results
Chermak (1996)	Original HCP	4 <sup>th</sup> grade, n=48	Cohort/ intervention	3b	(Questionnaires) non-significant increased knowledge post-intervention.
Dell (2012)	Dangerous Decibels	6-8 <sup>th</sup> grade, n=64	Cohort/ intervention	3a	(Questionnaires) Improved attitudes towards noise exposure.
Griest (2007)	Dangerous Decibels	4 <sup>th</sup> & 7 <sup>th</sup> grade, n=1028	CCT	3b	(Questionnaires) Increased knowledge, better attitudes, behavioral intent for 4 <sup>th</sup> graders receiving HCP. 3-mo post test shows regression.
Lukes (1999)	Hearsafe, Say What?	7-9 <sup>th</sup> grade, n=unknown	Cohort/ intervention	3b	(Questionnaires) 30-40% correct at pre-test, 70-80% correct at post-test. Behavioral intent indicated.
Randolph (2003)	NIOSH	Elementary, n=546	RCT	2b	(Questionnaires) Increased knowledge compared to control group at 6 weeks post-test.
Taljaard (2013)	Cheers for Ears	9-13 yrs, n=227	Cohort/ intervention	3a	(Questionnaires) Increased knowledge and behavioral intent to turn down volume post-test. No intent to change listening.

## CONCLUSIONS

The quality of evidence found in this review was low-to-adequate. None of the studies reported an effect size and only five of the six articles showed a statistically significant change. All studies used similar pre- and post-intervention surveys or questionnaires as outcome measures. In general, hearing conservation programs increase knowledge and awareness of noise-induced hearing loss for school-aged children. Some studies showed a statistical significant decrease in pro-noise attitudes and changes in listening behaviors. All studies, except one, showed a positive change in knowledge and/or behaviors despite not reaching statistical significance.

Successful outcomes fell into three categories:

- 1) increased knowledge of hearing loss, specifically NIHL
- 2) change in pro-noise attitudes, and
- 3) intent to change harmful listening behaviors.

## FUTURE DIRECTIONS

Now more than ever, children are exposed to sounds that reach dangerous levels. For instance, it has been estimated that about 100 million personal listening devices are sold every year<sup>3</sup> and Taljaard et al. (2013) found that 91.8% of their 318 participants, aged 9-13 years, owned or had access to a personal listening device. There is a clear need for intervention and the best way to reach large numbers of children is through school programs. However, there are a few reasons why HCPs are not widely implemented, such as a lack of public awareness, lack of effective distribution of established HCPs, and a lack of perpetuation of these programs<sup>4</sup>. One solution to address these problems is to have better quality research done to confidently demonstrate the effectiveness and the need for HCPs. Once this is achieved, school and community audiologist will have evidence to take to schools and promote the use of HCPs.

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