

## **School-Home Collaboration and Academic Achievement for Hearing Impairment Students: A Systematic Review and Meta-Analysis**

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**Abstract.** There has been a paucity of information on the relationship between school-home collaboration and hearing impairment as independent variables and academic achievement as the dependent variable. This study is therefore aimed at investigating the relationship between school-home collaboration and hearing impairment with academic achievement through a systematic review and meta-analysis. A total of 21 studies were selected using set criteria. Quantitative data was analyzed using MetaXL, an add-in to Microsoft Excel package. Results showed that the relationship between school-home collaboration and academic achievement, the overall effect size was a correlation of 0.86 (95% CI of 0.64 - 0.95). Similarly, the relationship between hearing impairment and academic achievement, the overall effect size was a correlation of 0.74 (95% CI of 0.65 - 0.80). Overall, the relationship between school-home collaboration and academic achievement of learners with hearing impairment was statistically significant ( $p < 0.05$ ) and school-home collaboration improved academic achievement. Findings also indicated that hearing impairment negatively affected academic achievement. As much as the effect sizes were large, publication bias was more pronounced in the studies on the relationship between school-home collaboration and academic achievement than in the studies on the relationship between hearing impairment and academic achievement.

**Keywords:** hearing impairment; school-home collaboration; academic achievement; systematic review; meta-analysis

### **Introduction**

There is substantial research evidence that when parents of hearing-impaired children collaborate with schools, the children's academic performance improves (Calderon, 2000; Cole, 2008; Dalun Zhang, Kwok, Benz & Bowman-Perrott, 2011; Epstein, Coates, Salinas, Sanders & Simon, 2005; Gonzalez-Dehass & Willems, 2003; Reed, Antia & Kreimeyer, 2008). However, findings have been inconsistent. For example, McNeal (2014) did not find a significant relationship. Such conflicting results call for further investigations in this area.

As much as previous studies have contributed immensely to the practice of school-home collaboration, the role of parents has not been adequately investigated (Sormunen, Tossavainen & Turunen, 2011). This is more particularly so for children with hearing impairment.

Epstein et al. (2002) proposed six types of parental involvement. These include health information for parents, communicating, volunteering, provision of funds, participating in decision-making, assisting children in their homework and making collaboration with the

members of the community. In line with this, Hirsto (2010) investigated the strategies used by teachers during collaboration. Findings indicate that the strategies included one-way communication to parents, two-way communication involving parents and schools, decision-making, volunteering, and elaborating learning. Whereas it is clear that collaboration was mainly initiated by schools rather than parents, identifying the most typical role(s) is something worth investigating.

In a recent study conducted in Uganda by Akellot and Bangirana (2019) on the relationship between the level of parent's involvement and academic achievement of their children. No statistically significant relationship was found. On the other hand, Taljaard, Olaithe, Brennan-Jones, Eikelboom and Bucks (2016) reported a significant association between the degree of the cognitive deficit with the degree of hearing impairment. It appears there is an element of inconsistency in findings across studies. Thus, presenting a need to carry out a systematic review and meta-analysis involving school-home collaboration and hearing impairment are considered as independent variables while academic achievement as a dependent variable. The following research questions are central in guiding the conduct of the present study:

- (1)What are the key themes in the selected studies involving the relationship between school-home collaboration and hearing impairment as independent variables and academic achievement as the dependent variable?
- (2)What is the effect size of the selected studies?
- (3)What is the extent of publication bias in the selected studies?

## **Method**

### **Data Sources**

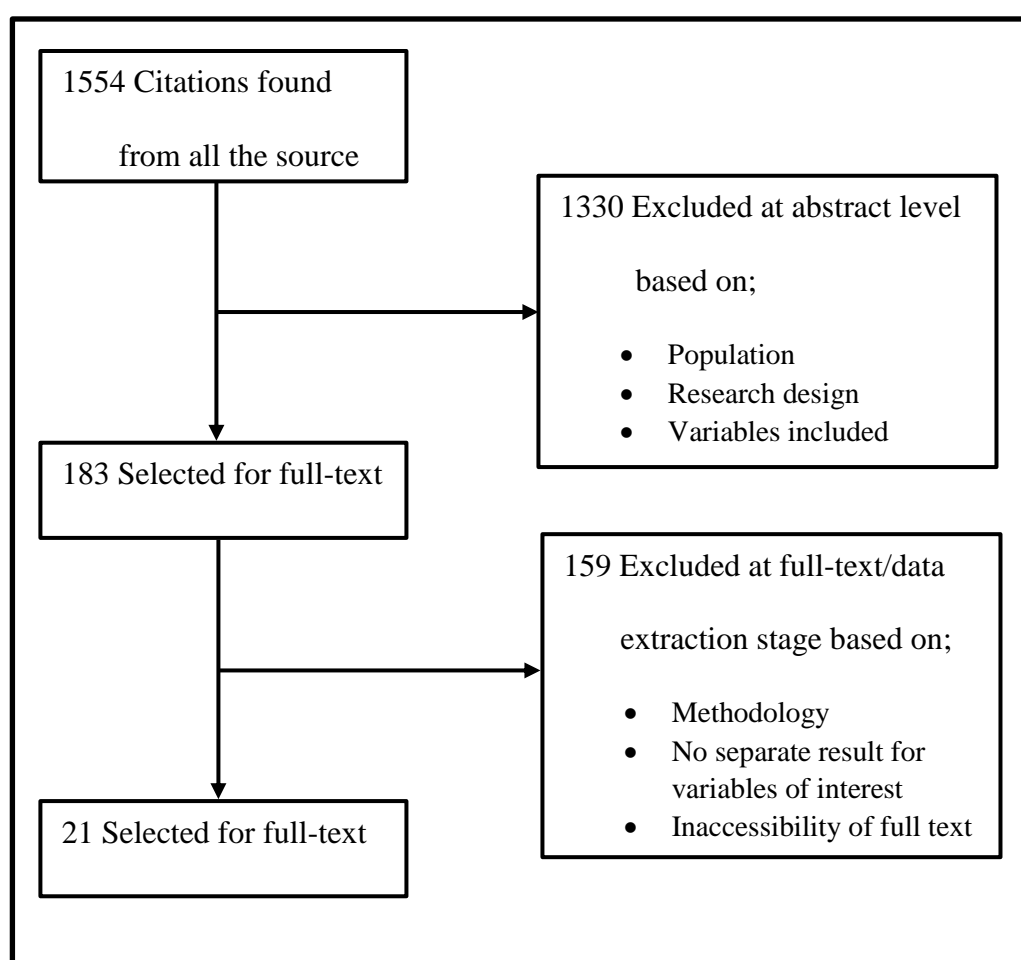
The data sources searched were Google, Google Scholar, World Cat, World Library, Cochrane Library, Biomed Central, Psyc INFO, PubMed, Web of Science, MEDLINE, EMBASE and Scopus. In addition, previous studies related to parent involvement in children's academics, school-home collaboration and hearing impairment of children from January 1, 1990, through March 27, 2020, were used for the meta-analysis. Search terms on parent involvement in children's academic programs, school-home collaboration influence on the academic program, hearing impairment on academic programs and deafness on academic programs of children were combined during the search. The search was limited to studies that concern academic programs and hearing impairment. All other disabilities were excluded from the systematic review. This review considered only articles available in the English language. Abstracts were screened and corresponding articles retrieved. The articles were then rescreened for possible inclusion.

### **Criteria for Study Selection**

Studies of children at school-going age at any stage of educational level (Elementary, Secondary and high school) were included. The selected studies were restricted to those that employed quantitative methods and must have met the initial criteria of educational programs

assessment. Studies with major concepts under consideration were eligible for inclusion. As per the requirements of the Technical Report alluded to earlier, articles were included only if the sample size was 45 or more. Studies involving academic programs in which data were not separately available for hearing impaired students only were excluded. Studies that concerned other forms of disability such as blindness, Down Syndrome and others without separate data for hearing impaired students were also excluded. However, studies about all forms of parent collaboration with school and school-home collaborations were included in the study.

Figure 1 is a summary of the procedure for study selection. Citations (n=1554) were identified through a search out of which 1,330 were excluded at the abstract level. Thus, a total of 180 full-text articles were evaluated according to the predefined inclusion criteria. However, only 21 articles were finally selected for analysis and reporting in this systematic review after 159 had been excluded for not meeting the criteria for study selection.



**Figure 1. Procedure for Study Selection**

### **Extraction of Data and Quality Assessment**

Data from each research were gathered by one researcher and independently affirmed by another researcher. Inconsistencies were talked about and settled by agreement. A customized

information extraction frame was utilized to extricate data on population characteristics, outcomes of interest, and study design.

### **Systematic Review and Meta-Analysis**

Approaches suggested by Campbell, Braspenning, Hutchinson and Marshall (2003) as well as Moher, Shamseer and Clarke et al. (2015) were adopted in this study. Basically, the systematic review involved five steps; finding good evidence by visiting relevant sites, doing a search using keywords, digging deeper, reading the forest and funnel plots and applying the evidence to address the research question.

The forest plot serves two purposes; [i] to determine the effect size and [ii] to assess the level of difference (or heterogeneity) among the different publications. The inverse heterogeneity (IVhet) model was used to produce the forest plot. This is due to the fact that IVhet model is a better model with respect to the validity compared to the traditional random effects model (Borenstein, Hedges, Higgins & Rothstein, 2009; Kelly & Kelly, 2017).

Funnel plots were used to discern bias in this study based on the recommendation by Light and Pillemer (1984) on the usage of funnel plot to estimate the risk of publication bias in meta-analyses. If there is no publication bias, the points representing the studies should be shaped like a funnel. Analyses were performed using freely available software (MetaXL) which is an Add-in to Microsoft Excel package.

### **Results**

#### **School-Home Collaboration and Academic Achievement: Key Themes**

A total of 9 out of 21 studies were identified. The outcomes were measured by different kinds of tools (e.g. British Ability Scales II, research questionnaires and students' past examination scores). The studies considered different roles played by those engaged in school-home collaboration. Whereas a number of roles featured in the studies, volunteering of parents to undertake activities that supported their children's academic achievement were the most prevalent.

Table 1 contains information on the scientometric analysis of key studies. There were a total of nine studies. The earliest study was published in 2013 and the most recent in 2019. This suggests that research in this area is a recent phenomenon considering that this meta-analysis captures studies that were conducted as far back as 1993. One study was from Asia, two from the US, four from Africa, one from Europe and one from South America. One-third of the studies employed correlation design. The remaining 6 employed different data analysis techniques. Only one study made use of quasi-experimental design.

#### **Table 1. Influence of School-Home Collaboration: Scientometric analysis of key studies [n=9]**

S/N	AUTHORS	COUNTRY OF STUDY	YEAR OF STUDY	TYPE OF STUDY
1.	Naheed, F., Dahar, M. A. & Lateef, A.	Pakistan	2016	Correlational
2.	McNeal, R. B.	United States of America	2014	Correlational
3.	Washington, L. V.	United States of America	2016	Quasi-experimental study
4.	Paul, M. & Ngirande, H.	South Africa	2014	Quantitative research
5.	Sormunen, M., Tossavainen, K. & Turunen, H.	Finland	2011	Mixed methods approach
6.	Lara, L. & Saracostti, M.	Chile	2019	Ex-post Facto
7.	Gikonyo, G. M.	Kenya	2013	Descriptive survey design
8.	Kimaro, A. R. & Machumu, H. J.	Tanzania	2015	Exploratory sequential mixed method
9.	Akellot, J., & Bangirana, P.	Uganda	2019	Correlation

Table 2 shows theme synthesis from the key studies. All the studies had academic achievement and school-home collaboration as key themes. All the 9 publications remained focused on the study topic. The sample size varied immensely with the lowest being 83 and the highest 12,101. Thus, no study employed a small sample size ( $n < 30$ ). All the studies involving learners whose parents were collaborating with schools reported statistically significant improvement in mean achievement levels. It is therefore implied that parents with children who suffer hearing impairment should collaborate with schools where their children learn as this is likely to improve academic achievement.

**Table 2. Influence of School-Home Collaboration: Theme synthesis from key studies (n=9)**

S/ N	Author(s)	Design and sample size	Findings	Implications	Synthesis
1	Naheed, F., Dahar, M. A. & Lateef, A.	Correlational n=120	Positive association found	The involvement of parents has a positive influence on the students' academic achievement.	Parents, parental involvement, academic achievement

<b>S/ N</b>	<b>Author(s)</b>	<b>Design and sample size</b>	<b>Findings</b>	<b>Implications</b>	<b>Synthesis</b>
2	McNeal, R. B.	Correlational n=12,101	Positive association found	Encouragement of parents to partake in their wards academic activities to achieve best result.	Parent Involvement, Academic achievement
3	Washington L. V.	Quasi-experimental study n=83	Limited positive association found	The research indicates administrators who look to raise the involvement of parents for the enhancement of children academic achievement and reduce the rate of drop-out of at-risk students in high schools.	Parent Involvement, academic achievement
4	Paul M. & Ngirande H.	Quantitative research n=150	Positive association found.	Parental involvement has positive impacts in children's educational achievement	Parent involvement, parenting, communication, home and family support, academic achievement
5	Sormunen M., Tossavainen K., and Turunen H.	Mixed method approach n=2,103	Positive association found.	Method of implementing school-home collaboration should be goal-oriented	Home-school collaboration, academic achievement
6	Lara L. & Saracostti M.	Ex-post Facto n=498	<ul style="list-style-type: none"> <li>• Positive association found.</li> <li>• Inadequate research in Latin America.</li> </ul>	There is a need for more research in Latin America.	There is a need for more research in Latin America.
7	Gikonyo G. M.	Descriptive survey design n=275	Positive association found.	Parents should be involved in decision making procedure on issues bordering the school matters in order to accounts for the students' achievement.	Involvement of parents and academic achievement

S/N	Author(s)	Design and sample size	Findings	Implications	Synthesis
8	Kimaro, A. R. & Machumu, H. J.	Exploratory sequential mixed method n=413	Positive association found	Conferences of teacher-parent and contacts between teacher-parent (face-to-face) which is regarded as suitable modes of conversation that affects academic achievement of students.	Parental involvement and academic achievement
9	Akellot, J., & Bangirana, P.	Correlation n=108	No association found	Should identify the elements that related to academic achievement to enhance deaf students' performance at school.	Involvement of parents and academic achievement of deaf students

The results of this study have indicated that the involvement of parents in school matters had played a pivotal role in children with hearing impairment academic achievement. The implication from the findings of the present study is that parents of learners with hearing impairment should collaborate with schools effectively as this would influence positively on academic achievement of their respective children.

#### **Effect Size for the Relationship between School-Home Collaboration and Academic Achievement (n=9)**

To determine the effect size for the 9 studies, use was made of a forest plot (Figure 2). It shows that the most reliable study was McNeal (2014) (Standardized Mean Difference [SMD] = 0.89). The least reliable was Gikonyo (2013) [SMD=0.58]. The average SMD was 0.87 with the 95% confidence interval ranging from 0.61 to 0.96. This is considered a large effect size.

For this work to determine the influence of individual studies on the overall meta-analysis for studies on school-home collaboration and academic achievement, respective weights for the studies were compared. The larger the weight, the greater the influence. From Figure 2, the study by McNeal (2014) had the greatest influence on the meta-analysis for the nine studies (Weight=86.2%), perhaps because of its very large sample size. This was followed by Sormumen et al. (2011) which had a meagre weight of 3.5%. The least influential study on the overall meta-analysis involving school-home collaboration was by Washington (2016) with a weight of only 0.6%.

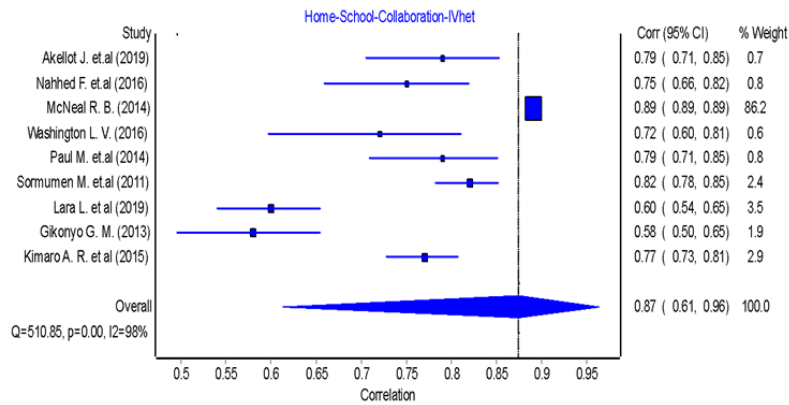


Figure 2. Effect sizes: School-home collaboration and academic achievement ( $n=9$  studies).

The  $I^2$  statistic was 98% and this is far above the recommended threshold of 50%. This implies that the papers lacked consistency. Except for the overall result, no study crosses the line of no effect and this illustrates that each of the 9 studies produced statistically significant results ( $p<.05$ ). Contrary to this, the diamond at the bottom of the plot crosses the vertical line. This implies that the combined result is potentially not significant from the statistics point of view.

**Publication Bias for the Influence of School-Home Collaboration**

Figure 3 is a funnel plot for the association between school-home collaboration and academic achievement. Noteworthy is the fact that all the points are outside the funnel plot. This is an indication of the publication bias likelihood. However, one limitation which could have led to this is that the sample size in the meta-analysis was rather small.

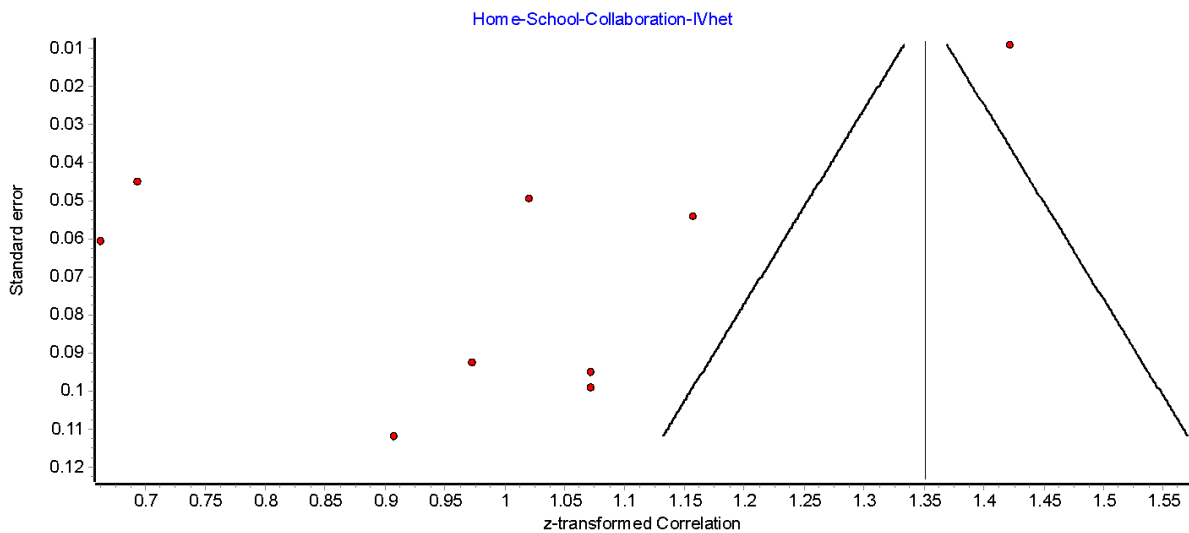


Figure 3. Funnel plot: Home-school collaboration and academic achievement

**Hearing Impairment and Academic Achievement: Key Themes**

A total of 12 studies were identified for purposes of assessing if hearing impairment affects students’ academic achievement. It was found that all but one study showed differential



achievement between children with hearing impairment and those without. As the severity of impairment increased, performance decreased. All the studies were quantitative in nature but there was variation in the methodology used. Some were cross-sectional studies and others were correlational or ex-post facto.

Table 3 presents a scientometric analysis of the influence of hearing impairment on academic achievement. A total of twelve studies were identified. Half of the studies were carried out in the United States of America. Three of the studies were conducted in Asia, two in Europe and 1 in Africa. It is evident that research involving the influence of hearing impairment on academic achievement was dominated by the United States of America.

**Table 3. Scientometric Analysis: Hearing Impairment and Academic Achievement**  
[n=12]

S/N	AUTHOR	COUNTRY OF STUDY	YEAR OF STUDY	TYPES OF STUDY
1.	Antia, S. D., Reed, S., & Kreimeyer, K. H.	United States of America	2005	Correlational
2.	Wasielewski, L. M.	United States of America	2016	Ex-Post Facto
3.	Hrastinki, I. & Wilbur, R. B.	Croatia	2016	Correlational
4.	Suman, S.	India	2019	Ex-Post Facto
5.	Mwanyuma	Kenya	2016	Mixed-method
6.	Seema Naz	India	2017	Ex-Post Facto
7.	Zahida Parveen	Pakistan	2017	Cross-sectional survey
8.	Kluwin, T. N.	United States of America	1993	Longitudinal
9.	Evangelos Groumpos & Venetta Lampropoulou	Greece	2008	Correlational
10.	Kyle, F. E & Harris, M.	United States of America	2006	Correlational
11.	Marschark M., Shaver D. M., Nagle, K. M. & Newman, L. A.	United States of America	2015	Correlational
12.	Antia, S. D., Jones, P. B., Reed, S., & Kreimeyer, K. H.	United States of America	2009	Longitudinal

Table 4 is a theme synthesis for the influence of hearing impairment on academic achievement where a total of 12 studies were identified for synthesis. The key themes synthesized included hearing impairment and academic achievement.

The sample size ranged from 34 to 500 which is considered to be adequate. Worth stressing is the fact that the study with the smallest sample size was the only one that made use of quasi-experimental research design. Such a sample size is acceptable for the type of design. A total of five studies employed correlation design with large sample sizes ( $n > 30$ ).

All the studies included academic achievement as the outcome variable and hearing impairment as the explanatory variable. The key findings across the studies is that students without hearing impairment tended to outperform those with hearing impairment. An important implication for curriculum developers is that they should pay attention to the needs as well as the peculiarities of learners with hearing impairment when designing and developing their curriculum. In doing so, the varying levels of hearing impairment even at a single grade level should be taken into account.

**Table 4. Theme synthesis: Hearing Impairment and Academic Achievement (n=12)**

S/N	Author(s)	Design and sample size	Findings	Implications	Synthesis
1.	Antia, S. D., Reed, S., & Kreimeyer, K. H.	Correlational N=110	Attention should be given to the instruction and writing ability of public-school learners irrespective of the degree of hearing loss	Accessibility to oral English through audition has implications of writing. Hence, a need for instructional support from the teachers of D/HH and public educators.	Hard-of-hearing, deaf, Writing and academic achievement
2.	Wasielowski, L. M.	Ex-Post Facto N=56	Grade score averages of regular students had significantly higher academic performances compared to students with disabilities.	The findings of this work can be utilized in curriculum planning and inform transition for students with disabilities.	Students with disabilities, academic performance, postsecondary education.
3.	Hrastinki, I. and	Correlational N=85	Learners highly proficient in ASL performed better	This research advocates for centring on	Deaf, hard-of-hearing and

S/N	Author(s)	Design and sample size	Findings	Implications	Synthesis
	Wilbur, R. B.		compared to less proficient peers in national standard measures of reading mathematics, use of English language and comprehension.	characteristics shared among successful deaf signing readers, particularly ASL fluency through a paradigm shift in thinking about deaf education.	academic achievement
4.	Suman, S.	Ex-Post Facto N=160	The result of this study indicated that the academic achievement of hearing impaired learners will be low due to the language barrier and other factors.	Language development of hearing-impaired students should be taken seriously at an early stage of their impairment.	Academic achievement, Hearing impaired students and normal students
5.	Renalda Mwanyuma	Mixed-method N=46	The research found that negative community and societal attitudes towards the Deaf affect their performance in Education	The Ministry of Education in conjunction with the Kenya Institute of Curriculum Development and other stakeholders should revise and simplify the curriculum used in examinations and textbooks to be in line with the needs of Deaf learners in order to improve their academic achievement.	Deaf and achievement
6.	Seema Naz	Ex-Post Facto N=240	The students with hearing impairments at high school have the lowest level of academic achievement. The hearing impaired and visually impaired students of	They should be provided financial aids to cater for their special needs. Reservation should be implemented in letter and spirit. Disability	Academic achievement and hearing impaired

S/ N	Author(s)	Design and sample size	Findings	Implications	Synthesis
			secondary school were compared on academic achievement and it was revealed that hearing-impaired secondary school students have a lower level of academic achievement as compared to visually impaired secondary school students.	awareness programs should be organized at block levels with some incentives. Freewheel chairs, hearing aids, free medical check-up and other assistive devices should be made available to the disabled students such that their enrolment and retention is facilitated.	
7.	Zahida Parveen	Quasi-experimental N=34	It was once concluded that kids with hearing impairments can have higher achievement in the field of science if taught through content that enhances the knowledge construction, typical of the one used in the 5E model.	This investigation has implications for educational programs designers in Pakistan to reorganize the choices of the subject available for the learners with hearing impairment at the post-elementary level, based on their learning ability.	Hearing impairment, scientific achievement, 5E model
8.	Kluwin, T. N.	Longitudinal N=451	Students who attend an additional number of classes, as well as classes with more academic demand, did have higher success levels across placement categories.	The clear cumulative impact of public placement may be as a consequence of different patterns of educational programming as of the advantage of specific placement.	Deaf, adolescent and achievement

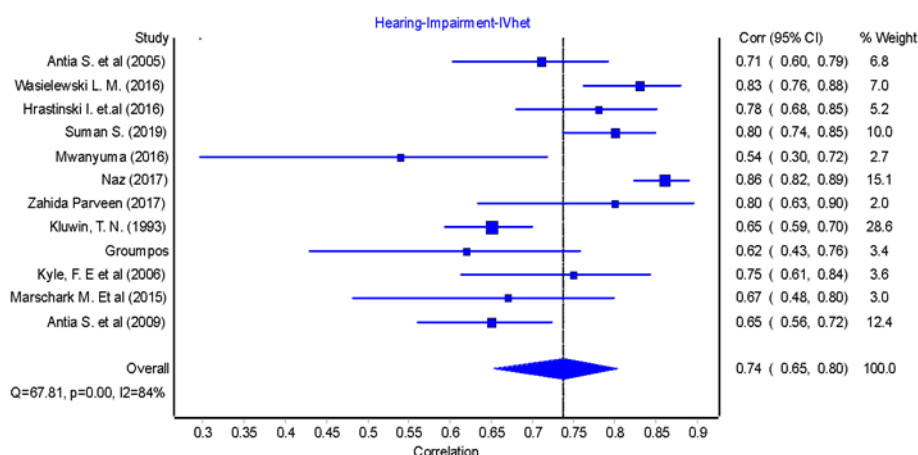
S/N	Author(s)	Design and sample size	Findings	Implications	Synthesis
9.	Evangelos Groupos & Venetta Lampropoulou	Correlational N=57	The result uncovered that full academic, as well as social inclusion, was not accomplished for the hearing impaired learners in secondary public schools. However, some elements, such as personal student characteristics (i.e. the level of hearing loss and onset of deafness) appear to influence the degree of both academic and social inclusion and identify success or failure.	The results of this research have direct implications for designing and implementing suitable programs for the instructions in schools of the hearing impaired learners.	Deaf, hard-of-hearing, academic achievement
10	Kyle, F. E and Harris M.	Correlational N=60	Productive vocabulary and speech reading was a critical indicator of reading after hearing loss by deaf students and nonverbal intelligence. Nevertheless, there is no relationship between spelling ability and other measures except reading. For children without hearing impairment, age is considered as the principal determinant of the child's ability to spell and read.	Spelling has no relationship with other variables measured except reading, recommending that reading and spelling ability are associated with deaf kids, they are also fairly disparate skills as they show diverse patterns of correlations.	
11.	Marschar K M., Shaver D. M., Nagle K. M. and	Correlational N=500	Being African American or Hispanic, mild hearing loss and an extra diagnosis of a learning disability were the negative indicators of	The result has significant effects for interpreting previous works and for practice and policy	Hearing impairment, hard-of-hearing and achievement

S/N	Author(s)	Design and sample size	Findings	Implications	Synthesis
	Newman L. A.		achievement. However, they varied by sort of subtest.	implementation in educating DHH students.	

### Effect Size for the Relationship between Hearing Impairment and Academic Achievement (n=12)

The selected studies were conducted from 1993 through 2019. This indicates that researches on hearing impairment and academic achievement and their relationship have been ongoing for quite some time. This is unlike the recent studies on the relationship between school-home collaboration and academic achievement of hearing impaired learners.

Similarly, to determine the effect size for the 12 studies, use was made of a forest plot (Figure 4). The figure shows that the most reliable study was Naz (2017) with SMD=0.86 and the least reliable was Mwanyuma (2016) with SMD=0.54. The average SMD was 0.74 with the 95% confidence interval ranging from 0.65 to 0.80. This is a large effect size.



**Figure 4. Forest Plot: Hearing impairment and academic achievement (n=12 studies).**

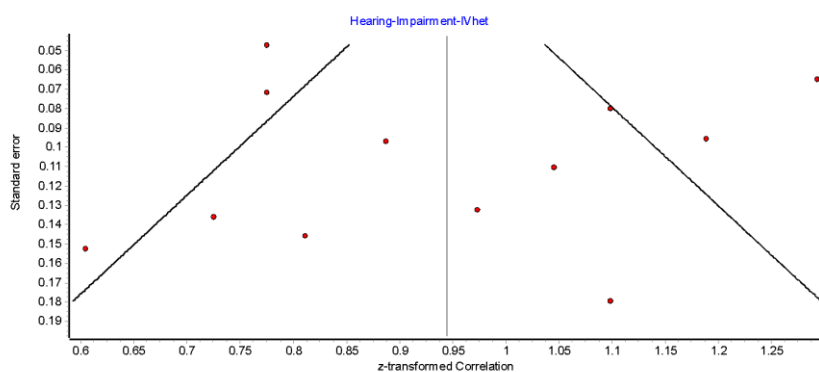
The influence of individual studies on the overall meta-analysis for studies on hearing impairment and academic achievement were determined through comparing their respective weights of individual studies. The larger the weight, the greater the influence. From Figure 4, the study by Kluwin (1993) had the greatest influence on the meta-analysis for the twelve studies (Weight=28.6%). This was followed by Naz (2017) which had a weight of 15.1%. The least influential study on the overall meta-analysis involving hearing impairment was by Parveen (2017) had a weight of only 2.0%.

The I<sup>2</sup> statistic was 84% and this is far above the recommended threshold of 50%. This implies that the papers lacked consistency. About half the studies cross the line of null effect and this

illustrates that about 50% of the studies produced statistically significant results ( $p < .05$ ). Nevertheless, the combined result is potentially not significantly different.

### Publication Bias for the Influence of Hearing Impairment

Figure 5 is a funnel plot for the relationship between hearing impairment and academic achievement. Seven studies fall inside the funnel and five outside it, suggesting that publication bias was not a serious issue. This is unlike the results in Figure 3 where no study was inside the funnel.



**Figure 5. Funnel plot: Hearing impairment and academic achievement**

### Discussion

The fact that all the studies involving learners whose parents were collaborating with schools reported statistically significant improvement in mean achievement levels was a positive outcome. This finding supports collaboration between parents and the schools in which their children learn.

One of the key findings is that volunteering of parents to support their children's academic achievement was prevalent across studies. Although Epstein et al., (2002), Hirsto (2010) and Sormunen, Tossavainen and Turunen (2011) also found that volunteering is among the support mechanisms for children's academic achievement, it was not the most prevalent in Finland. As a matter of fact, Hirsto (2010) found that parents as the recipients of information were the most typical strategy used in the school-home collaboration for learners with hearing impairment. This notwithstanding, Hirsto's study had volunteering of parents as the third strategy in the school-home collaboration for children with hearing impairment. Thus, volunteering of parents in schools where their children learn remains an important role for enhancing children with hearing impairment academic achievement.

Research design is an important element in the conduct of any scientific investigation. Whereas no single design may be strictly superior to another, some approaches are known to improve both internal and external validity. A typical example is an experimental design. It was rather surprising that the use of quasi-experimental and experimental designs was lacking in the reviewed studies. Only one study out of twenty-one made use of quasi-experimental design.

The effect size for studies on the relationship between school-home collaboration and academic achievement was found to be large. This underscores the importance of school-home collaboration for children with hearing impairment. However, the published papers on the relationship between school-home collaboration lacked consistency and were therefore not as reliable as would be expected. The same applies to the studies on the relationship between hearing impairment and academic achievement.

There was also an indication of publication bias in the school-home collaboration studies. However, the studies on the relationship between hearing impairment and academic achievement showed lower levels of publication bias. This is probably because compared to studies involving school-home collaboration, studies on the relationship between hearing impairment and academic achievement have been ongoing for relatively long periods. Whereas studies on school-home collaboration have been conducted all over the world but with a concentration in Finland, the USA has tended to dominate in the conduct of studies on the relationship between hearing impairment and academic achievement.

All but one study showed differential achievement between children with hearing impairment and those without. As the severity of impairment increased, performance decreased. It is therefore imperative that hearing impairment negatively influences academic achievement.

### **Conclusion**

This meta-analysis concludes that school-home collaboration is related with the academic achievement of learners with hearing impairment. The more parents of such children get involved in school activities, the higher the gains in the children's academic achievement. Two strategies for collaboration that stood out are volunteering by parents in school activities and attending to communication from schools.

This study also established that hearing impairment has contributed negatively to the academic achievement of learners. Because the impact increases with the severity of hearing damages, it is highly imperative that the health of children with hearing impairment be attended to.

### **Author Contributions**

Conceptualization, A.C.A. and L.W.L.; methodology, S.M.A; software, S.M.A.; formal analysis, S.M.A. investigation, S.M.A.; resources, S.M.A; data curation, S.M.A writing—original draft preparation, S.M.A writing—review and editing, S.M.A.; supervision, A.C.A. and L.W.L.; project administration, S.M.A. All authors have read and agreed to the published version of the manuscript.

### **Conflicts of Interest:**

The authors declare no conflict of interest.

### **Funding**

This research received no external funding.



## References

1. ARCHIVED - Individual with Disabilities Education Act (IDEA) (1997) Retrieved April 23rd 2020.
2. Akellot, J., & Bangirana, P. (2019). Association between parental involvement and academic achievement of deaf children at Mulago School for the Deaf, Kampala, Uganda. *African Health Sciences*, 19(2), 2270-2281. <https://doi.org/10.4314/ahs.v19i2.53>
3. Antia, S. D., Jones, P. B., Reed, S., & Kreimeyer, K. H. (2009). Academic status and progress of deaf and hard-of-hearing students in general education classrooms. *Journal of Deaf Studies and Deaf Education*, 14, 293–311. <https://doi.org/10.1093/deafed/enp009>
4. Antia, S. D., Reed, S., & Kreimeyer, K. H. (2005). Written language of Deaf and Hard-of-Hearing Students in Public Schools. *Journal of Deaf Studies and Deaf Education*, 10(3), 244-255. <https://doi.org/10.1093/deafed/eni026>
5. Barnard, W. M. (2004). Parent involvement in elementary school and educational attainment. *Children and Youth Services Review*, 26, 39-62.
6. Borenstein, M., Hedges, L. V., Higgins, J. P.T. & Rothstein, H. R. (2009). Introduction to Meta-Analysis. John Wiley & Sons, Ltd. ISBN: 978-0-470-05724-7
7. Calderon, R. (2000). Parental Involvement in Deaf Children's Education Programs as a Predictor of Child's Language, Early Reading, and Social-Emotional Development. *Journal of Deaf Studies & Deaf Education*, 5(2):140-155. doi:10.1093/deafed/5.2.140.
8. Campbell, S. M., Braspenning, J., Hutchinson, A., & Marshall, M. N. (2003). Research methods used in developing and applying quality indicators in primary care. *BMJ (Clinical research ed.)*, 326(7393), 816–819. <https://doi.org/10.1136/bmj.326.7393.816>
9. Caspe, M., Lopez, M. E., & Wolos, C. (2006/2007). Family involvement in elementary school children's education. Cambridge, MA: Harvard Family Research Project. Retrieved from <http://www.hfrp.org/content/download/1182/48686/file/elementary.pdf>
10. Cole, M. (2008). The Importance of Parental Involvement in Language Acquisition and Activities and Techniques to Enhance the Home-School Connection. Independent Studies and Capstones. Paper 347. Program in Audiology and Communication Sciences, Washington University School of Medicine.
11. [http://digitalcommons.wustl.edu/pacs\\_capstones/347](http://digitalcommons.wustl.edu/pacs_capstones/347)
12. Dalun Z. D., Hsu, H. Y., Kwok, O., Benz, M. & Bowman-Perrott, L. (2011). The Impact of Basic-Level Parent Engagements on Student Achievement: Patterns Associated with Race/Ethnicity and Socioeconomic Status (SES). *Journal of Disability Policy Studies*, 22(1), 28-39. doi:10.1177/1044207310394447.
13. Dickersin, K. (2005). Publication Bias: Recognizing the Problem, Understanding Its Origins and Scope, and Preventing Harm. In Hannah R. Rothstein, Alexander J. Sutton & Michael Borenstein (Eds). Wiley Online Library. <https://onlinelibrary.wiley.com/doi/10.1002/0470870168.ch2>
14. Epstein, J. K., Coates, L., Salinas, K., Sanders, M. & Simon, B. (2005). Epstein's Framework of Six Types of Involvement. [https://www.sps186.org/downloads/table/13040/6 Types J. Epstein. pdf](https://www.sps186.org/downloads/table/13040/6%20Types%20J.%20Epstein.%20pdf). Accessed May 7, 2019.
15. Epstein, J. L., Sanders, M. G., Simon, B. S., Salinas, K. C., Rodriguez Jansorn, N., & Van Voorhis, F. L. (2002). *School, family, and community partnerships: Your handbook for action* (2nd ed). Thousand Oaks, CA: Corwin.
16. Gikonyo, G. M. (2013). Influence of home-school collaboration on academic achievement of pre-schoolers in Kahuro district, Muranga County, Kenya. [Unpublished master's thesis] University of Nairobi (eRepository.uonbi.ac.ke).
17. Gonzalez-Dehass, A. R. & Willems, P. P. (2003). Examining the Underutilization of Parent Involvement in the Schools. *School Community Journal*, 13(1), 85-99. [http://www.adi.org/journal/ss03/gonzalez-dehass & willems.pdf](http://www.adi.org/journal/ss03/gonzalez-dehass%20&%20willems.pdf). Accessed May 7, 2019.
18. Groumpos, E., & Lampropoulou, V. (2015). The academic and social inclusion of deaf and hard-of-hearing students in mainstream secondary schools in Greece.
19. Harr, J. J. (2000). Relationships between parents of hearing-impaired children and teachers of the deaf. *Deafness & Education International*, 2(1), 12-25. <https://doi.org/10.1179/146431500790561279>

20. Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle-school: A meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology*, 45(3), 740–763.
21. Hirsto, L. (2001). Ensimmäistä luokkaa käyvien kotikasvatus: Kyselytutkimus vanhempien käyttämistä välittömistä kasvatustoimenpiteistä [Children in their learning environments: Theoretical perspectives] [Doctoral dissertation, University of Helsinki].
22. Hoover-Dempsey, K. V., Battiato, A. C., Walker, J. M. T., Reed, R. P., DeLong, J. M., & Jones, K. P. (2001). Parental involvement in homework. *Educational Psychologist*, 36, 195-210.
23. Hrastinki, I. & Wilbur, R. B. (2016). Academic achievement of Deaf and Hard-of-Hearing Students in as ASL/English Bilingual Program. *Journal of Deaf Studies and Deaf Education*, 21(2), 156-170. <https://doi.org/10.1093/deafed/env072>
24. Kelley, G. A. & Kelley, K. S. (2017). Aerobic Exercise and Cancer-Related Fatigue in Adults: A Reexamination Using the IVhet Model for Meta-analysis. *Cancer Epidemiology, Biomarkers & Prevention*, 26(2), 281-283. doi: 10.1158/1055-9965.EPI-16-0885. Epub 2016 Dec 1.
25. Kimaro A. R. & Machumu H. J. (2015). Impacts of parental involvement in school activities on academic achievement of primary school children. *International Journal of Education and Research*, 3(8), 483-494.
26. Kluwin, T. N. (1993). Cumulative effects of mainstreaming on the achievement of deaf adolescents. *Exceptional children*, 60, 73-81
27. Kyle, F. E & Harris M. (2006). Concurrent correlates and predictors of reading and spelling achievement in deaf and hearing school children. *The Journal of Deaf Studies and Deaf Education*, 11(3), 273-288.
28. Lara, L, & Saracostti. M. (2019). Effect of Parental involvement on Children’s Academic Achievement in Chile. *Frontiers in Psychology*, 10, 1464. <https://doi.org/10.3389/fpsyg.2019.01464>
29. Mäenpää, T., & Åstedt-Kurki, P. (2008). Cooperation between parents and school nurses in primary schools: Parents’ perceptions. *Scandinavian Journal of Caring Sciences*, 22, 86-92.
30. Majid, S. & Rehman, S. (2016). The effect of early diagnosis of hearing loss on school performance of children. *Sri Lanka Journal of Social Sciences*, 38, 107-115. 10.4038/sljss.v38i2.7396.
31. Marjorita S., Kerttu T., & Hannele T, (2011). Home–School Collaboration in the View of Fourth Grade Pupils, Parents, Teachers, and Principals in the Finnish Education System. *The School Community Journal*, 21(2): 185-211.
32. Marschark, M., Shaver. D. M., Nagle, K. M., & Newman, L. A. (2015). Predicting the Academic Achievement of Deaf and Hard-of-Hearing Students from Individual, Household, Communication, and Educational Factors. *Exceptional Children*, 81(3), 350-369. <https://doi.org/10.1177/0014402914563700>
33. Martin, A.J. (2013). *Family-school partnerships and academic achievement*. In J. Hattie & E. Anderman (Eds.). *International Guide to Student Achievement*. Oxford: Routledge.
34. McNeal, R. B. (2014). Parent Involvement, Academic Achievement and the Role of Student Attitudes and Behaviors as Mediators. *Universal Journal of Educational Research*, 2(8), 564-576. <https://dx.doi.org/10.13189/ujer.2014.020805>
35. Moher, D., Shamseer, L., Clarke, M. et al. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) statement. *Systematic Review*, 4(1). <https://doi.org/10.1186/2046-4053-4-1>
36. Mwanyuma, R. (2016) factors influencing the academic achievement of deaf learners in Kilifi Country, Kenya: A Case of Sahajanand School for the Deaf. [Unpublished master’s thesis]. University of Nairobi, Kenya.
37. Naheed, F., Dahar, M. A. & Lateef, A. (2016). Impact of parental involvement on academic achievement of the students at secondary level. *Sci.Int. (Lahore)*, 28(4), 213-216.
38. Naz, S. (2017). Academic achievement of hearing impaired, visually impaired and orthopedically impaired higher senior secondary school of Kashmir, J & K. *International Journal of Advanced Education and Research*, 2(6), 50-54.
39. Parveen, Z. (2017). Educational Effectiveness of the 5e Model of Scientific Achievement of Students with Hearing Impairment. *Journal of Baltic Science Education*, 16 (5), 723-732.
40. Paul, M. & Ngirande, H. (2014). The Impact of Parental Involvement on Student Performance: A Case Study of a South African Secondary School. *Mediterranean Journal of Social, Sciences*, 5(8), 279. <https://dx.doi.org/10.5901/mjss>.

41. Pavreen, Z. & Batool, B. (2017). Value priorities among deaf and hearing adolescents in Pakistan: a comparative study. *International Journal of Inclusive Education*, 24(1), 50-57.
42. Reed, S., Antia, S. D. & Kreimeyer, K. H. (2008). Academic status of deaf and hard-of-hearing students in public schools: student, home, and service facilitators and detractors. *Journal of Deaf Studies & Deaf Education*, 13(4), 485-502. doi:10.1093/deafed/enn006.
43. Rishaelly, C. E. (2017). Factors Influencing Academic Performance of Hearing Impaired Students in Inclusive Education: A Case of Moshi Technical Secondary School. [Doctoral dissertation, Open University of Tanzania].
44. Sarant, J. Z., Harris, D. C., & Bennet, L. A. (2015). Academic outcomes for School-Aged Children with Severe-Profound hearing loss and early Unilateral and Bilateral Cochlear Implant. *Journal of Speech, Language, and Hearing Research*, 58(3), 1017-1032. [https://doi.org/10.1044/2015\\_JSLHR-H-14-0075](https://doi.org/10.1044/2015_JSLHR-H-14-0075)
45. Sorajjakool, S. (2015). Strengthen the Home-School Collaboration for Student Achievement. *Apheit Journal*, 4(2), 139-147.
46. Sormunen M., Tossavainen K., & Turunen H. (2011). Home-School Collaboration in the View of Fourth Grade Pupils, Parents, Teachers, and Principals in the Finnish Education System. *The School Community Journal*, 21(2), 185-211.
47. Soubhi, Fatima zahra & Lima, Laurent & Touri, Bouzekri & Talbi, Mohammed & Nourddine, Knouzi. (2016). Impact of learning difficulties and communication disorders on Moroccan students' academic achievement. *International Journal of Learning and Teaching*, 8, 236-244. <https://dx.doi.org/10.18844/ijlt.v8i4.597>
48. Suman, S. (2019). A Comparative Study of Academic Achievement on Hearing Impaired and Normal Students. *International Journal of Scientific Research and Engineering Development*, 2(3), 105-113.
49. Taljaard, D. S., Olaithe, M., Brennan-Jones, C. G., Eikelboom, R. H. & Bucks, R. S. (2016). The relationship between hearing impairment and cognitive function: a meta-analysis in adults. *Clinical Otolaryngology*, 41(6), 718-729.
50. doi: 10.1111/coa.12607.
51. Torkkeli, M. (2001). Koulutulokkaiden isät lastensa koulunkäynnin tukena [The role of fathers in support of their children's education] [Doctoral dissertation, University of Helsinki].
52. Tossavainen, K., Turunen, H., Jakonen, S., & Vertio, H. (2004). Health promotional education: Differences between school nurses' health counselling and teachers' health instruction in the Finnish ENHPS. *Children and Society*, 18, 371-382.
53. Washington, L. V. (2016). *The Effects of Parent Involvement on Student Outcomes in a Minority-Serving Charter High School*. [Doctoral dissertation, Walden University].
54. Wasielewski, L. M. (2016). Academic Performance of Students with Disabilities in Higher Education: Insights from a Study of One Catholic College. *Journal of Catholic Education*, 20 (1), 136-151. <https://dx.doi.org/10.15365/joce.2001062016>
55. World Health Organization and the World Bank (2011). *World Report on Disability*. Retrieved from [https://www.who.int/disabilities/world\\_report/2011/report.pdf](https://www.who.int/disabilities/world_report/2011/report.pdf)