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RESEARCH PAPER

Confirmatory Factor Analysis of Perceived Educational Effectiveness Scale for Parents of Students with Hearing Impairment

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ABSTRACT

The purpose of this research was to develop an indigenous scale to determine the perception of the parents of students with hearing impairment regarding the educational effectiveness and to establish the psychometric properties of the effectiveness of educational services scale for parents of the students with hearing impairment. Quantitative paradigm was used to conduct this research. Parents of students with hearing impairment who were enrolled in Government special education institutions in Punjab Province were considered as a population of this study. Purposive sampling technique was used to select the sample for this study. 500 number of parents of students with hearing impairment were selected as a sample of this study. An indigenous scale was developed by the researchers. 40 statements were rated against five point likert scale. Confirmatory factor analysis was carried out through IBM SPSS AMOS (Analysis of moment structure) version 25.0 using structural equation modeling (SEM).

KEYWORDS Confirmatory Factor Analysis, Parents of Students With Hearing Impairment, Scale for Educational Effectiveness

Introduction

When a person is experiencing or is anticipated to face restrictions in daily functioning due to ageing or a health condition, such as chronic diseases or disorders, accidents or traumas, rehabilitation is a series of actions that is required (Cieza, 2019). The World Report on Disability states that rehabilitation is a series of actions that help people with disabilities attain and maintain their optimal functioning in interaction with their environments (WHO, 2011).

The need of providing access to education for historically underrepresented groups, such as girls and women, indigenous peoples and isolated rural groups, street children, is emphasized in Education for All (EFA, 2000). It also provides education coverage for migrant and nomadic groups, disabled individuals, members of linguistic and cultural minorities, and children with disabilities (EFA, 2000). The UNCRPD, or United Nations Convention on the Rights of Persons with Disabilities, supports education for people with impairments (UNCRPD, 2006).

Literature Review

There are several studies that support the usefulness of education in giving pupils a better education. A key component of practically all aspects of improvement planning and policy creation throughout any school board is Educational Effectiveness

Research (Sinay, 2016). Effectiveness is a crucial component of high-quality education, it is a truth (Scheerens, Luyten and Van Ravens, 2011).

The objective of the National Policy for Persons with Disabilities is to empower people with disabilities, regardless of caste, creed, religion, gender, or other concern, so that they can realize their full potential in all areas of life, particularly in the social, economic, personal, and political arenas (NPWD, 2002).

Cawthon, et al., (2014) reported that majority of parents of deaf or hard of hearing children said they were familiar with American Sign Language. The parents were mostly hearing European Americans (86.5%). Parents generally had favourable experiences with IEPs and had high hopes for the education of their deaf children. Checker, Remine and Brown (2009) reported in a study on parents views on educational services that more financial assistance for cochlear implant and mapping sessions, access to all forms of communication, and schools meeting at least twice a year to examine the child's entire course, including social skills, were indicated as areas for improvement.

The child's educational placement and peers, the school staff's attitudes towards American Sign Language and Deaf culture, the child's access to information, and the teachers' and peers' levels of American Sign Language proficiency were identified topics as a result of multi-year ethnographic study on deaf parents' perspectives on deaf education (Thumann-Prezioso 2005). Cawthon, et al., (2015) reported that a young person and his or her family may find the move from high school to post school settings to be challenging and new territory if they are deaf or hard of hearing. Additionally, a parent who does not also identify as deaf or hard of hearing may not have the necessary experience to advocate for or help their child through the intricacies of shifting eligibility for services or the range of possible role models for success. The likelihood that a child will live independently as a young adult, postsecondary education, work prospects, and other post school outcomes have all been demonstrated to be significantly influenced by parental expectations. These are all fundamental checkpoints on the path from high school to a career in the US.

Rodriguez and Allen (2020) explore Hispanic parents' beliefs and attitudes about deaf education compared to non-Hispanic parents. Hispanic parents' perspectives about deaf education lean more towards a medical than a cultural model due to their perceptions of impairment. The percentage of agreement with technological hearing restoration was higher among Hispanics. This is consistent with earlier research that showed Hispanic parents desire their kids to have as many characteristics of hearing kids as possible, including the capacity to communicate and participate in society. Moores (2018) claimed that we could only have oral-only schooling or manual communication, but not both, although the obvious solution was to support deaf children in fully developing both of their skills. Despite evidence to the contrary, this false dichotomy continues to exist today. Although signs and sign languages will continue to be used as long as there are deaf people, it is our job to make sure that deaf children have access to them from birth and throughout their whole school career.

Goker, Ozaydin and Tekedere (2016) reported that for the young children with impaired hearing, appropriate technology-based learning environments should be offered and made more widely known. In this project, instructional software has been created to teach young children with hearing impairments about emotions and opposing ideas. Marschark and Knoors (2012) presented that children with hearing loss and hearing children perform differently in areas like executive function, memory, and visual-spatial processing. It's important for educators and other professionals to understand that deaf children are not just hearing kids who can't hear. Only then can

instructional strategies and materials take full account of their preferences and demands. To determine the areas of deaf education research that are currently being prioritized, as well as any findings that could potentially have a big impact on how educational practice develops. The analysis first shows that there are several methodological and contextual issues in deaf education research that frequently make it difficult to directly apply findings to teaching and learning (Swanwick and Marschark, 2010).

Educational Effectiveness Scale for parents of students with hearing impairment was based and designed through the Dynamic Model of Educational Effectiveness by Bert P. M. Creemers and Leonidas Kyriakides.

Material and Methods

Quantitative research method was used to conduct this study along with descriptive research design.

Population and Sampling Strategy

Population of the study was parents of the students with hearing impairment enrolled in government special education institutions in Punjab Province. Random sampling technique was used to conduct this study. 500 number of parents of students with hearing impairment were selected as a sample of this study.

Development of scale for Parents of the Students with Hearing Impairment

The first part of the scale for the parents of the students with hearing impairment enrolled in government special education institutions in Punjab province was contained demographic information. This demographic information was divided into two parts. In first part, demographic information of the parents about their age, gender, marital status, qualification, income, city, district and language. In second part, demographic information of the students with hearing impairment was collected in which the age, gender, school, class, language, severity level of disability of the students with hearing impairment was collected. All those information regarding the demographics helped to define the demographics of the sample as well as the characteristics of sample. The scale was consisted on 40 statements. Each statement of the scale was constructed against five point Likert scale. This scale was dealing with the achievements of the students with hearing impairment enrolled in government special education institutions in Punjab province. Researcher recorded the responses of the parents of children with hearing impairment against five points.

Table 1
Descriptive Statistics of Parents Children with Hearing Impairment

Variables	*Parents (N = 500)*	
	f	%
Gender		
Men	323	64.6
Women	177	35.4
Education		
Uneducated	113	22.6
Primary	19	3.8
Middle	14	2.8
Matric	129	25.8
F.A	91	18.2

B.A	94	18.8
M.A	37	7.4
M.Phil	3	.6
Childs' Gender		
Boys	313	62.6
Girls	187	37.4
Child's Age		
5-10	1	.2
10-15	101	20.2
15-20	306	61.2
20-25	92	18.4
Child's Education		
5th	19	3.8
6th	47	9.4
7th	74	14.8
8th	76	15.2
9th	128	25.6
10th	60	12.0
11th	49	9.8
12th	47	9.4
Occupation		
Business	81	16.2
Govt. Job	55	11.0
Private Job	133	26.6
Labor	231	46.2
Divisions		
Bahawalpur	19	3.8
D.G.Khan	36	7.2
Faisalabad	81	16.2
Gujranwala	120	24.0
Lahore	174	34.8
Multan	34	6.8
Rawalpindi	18	3.6
Sargodha	18	3.6
Districts		
Bahawalpur	18	3.6
D.G.Khan	28	5.6
Rajanpur	8	1.6
Faisalabad	49	9.8
T.T.Singh	33	6.6
Gujrat	84	16.8
Hafizabad	25	5.0
Sialkot	11	2.2
Kasur	30	6.0
Lahore	144	28.8
Khanewal	10	2.0
Multan	24	4.8
Rawalpindi	18	3.6
Mian Wali	18	3.6
Institute		
Center	85	17.0

School	317	63.4
College	98	19.6

Data Collection from Parents

Data was collected for this study from 500 number of parents of the children with hearing impairment enrolled in Govt. special education institutions in Punjab Province. From Punjab Province, eight divisions were included while data collection. Those divisions were Bahawalpur, D.G.Khan, Faisalabaad, Gujranwala, Lahore, Multan, Rawalpindi and Sargodha. From these eight divisions, fourteen districts were included in the process of data collection, those were,

Bahawalpur, D. G. Khan, Rajan Pur, Faisalabad, T.T.Singh, Gujrat, Hafizabaad, Sialkot, Kasur, Lahore, Khanewal, Multan, Rawalpindi and Mian Wali. The data was collected from centers, schools and colleges of Govt. special education institutions of Punjab province. Age rang of the students with hearing impairment was between 5 years and 25 years. Data was collected from those parents whose children were enrolled from 5th grade to 12th grade.

Data Analysis

Confirmatory Factor Analysis of the educational effectiveness questionnaire (EEQ) for *parents*

To validate the factor structure of the educational effectiveness questionnaire (EEQ) for parents of students with hearing impairment, confirmatory factor analysis (CFA) was conducted on 40 items. Confirmatory factor analysis was carried out through IBM SPSS AMOS (Analysis of moment structure) version 25.0 using structural equation modeling (SEM). The EEQ consisted of five sub-factors, labeled as system, school, classroom, students and outcomes. The indices of the model fit are indicated in table 2

Table 2
Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Parents of Students with Hearing Impairment

Model	χ^2	*df*	χ^2/df	*GFI*	*CFI*	*NFI*	*RMSEA*	*SRMR*
Initial Model	2805.45	730	3.84	.78	.83	.78	.07	.07
Model Fit	2172.81	728	2.98	.94	.92	.91	.06	.05
$\Delta\chi^2$	632.64*							

Note. GFI= Goodness of fit index, CFI=comparative fit index, NNFI = non-normed fit index; RMSEA=root mean square error of approximation, SRMR=Standardized root means square, $\Delta\chi^2$ = chi-square change.

Table 2 displays the fit indices of the educational effectiveness questionnaire (EEQ) for both absolute and relative model fit. The first model's absolute fit index revealed that the estimations of the fit were subpar, reading as χ^2 (728) = 2172.81 $p < .05$. In a typical model, the sample size and the number of estimated parameters are thought to have a significant impact on the chi-square statistic, which is used to measure the absolute model fit (Hair et al. 2010). Therefore, in this perspective, researchers advised taking into account various relative fit indices, such as the Goodness of Fit Index (GFI), Cumulative Fit Index (CFI), Normative Fit Index (NFI), Root Mean Square Approximation Error (RMSEA), and Standardized Root Mean Square (SRMR).

Some guidelines were suggested to be followed in order to assess the model's fit; for instance, the χ^2/df should vary between 0 and 3. To be deemed excellent estimates

for the model, the RMSEA and SRMR estimates must be .08 or less, while the CFI, NNFI, and GFI estimates must be .90 or higher (Hu & Bentler, 1999). The fit indices of the initial model were observed and found that the χ^2/df was 3.84. Whereas the estimates of the RMSEA and SRMR were .070 and .07 while the CFI, NNFI, and GFI were .78, .83, .78 respectively. As a result, the specified criteria for model fit were not met by the present estimations of the relative fit.

Consequently, the model modification procedure was started in order to achieve the model fit. Therefore, only those covariances between the error terms that had contextual meaning were extracted from the indicators of the measurement model of the EEQ (Parents Version) (Kenny, 2011). Following the drawing of the covariances between the error components, the absolute and relative fit indices were once more compared. The GFI, CFI, and NNFI values were.94,.92, and.91, respectively, while the RMSEA and SRMR were.06 and.05, respectively. As a result, the model fit indices and criteria fell into the category of excellent model fit.

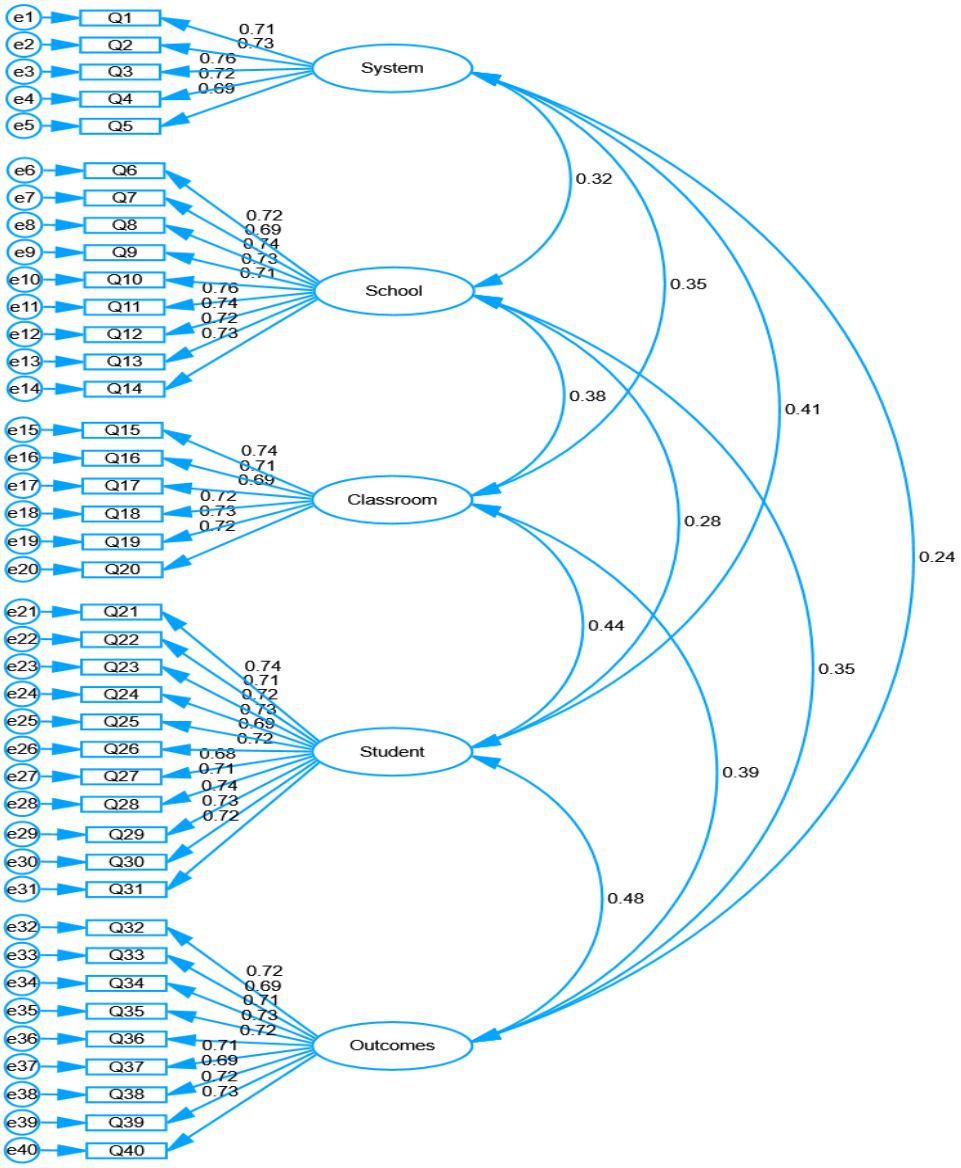

Figure 1 Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Parents of Students with Hearing Impairment

Table 3
Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Parents of Students with Hearing Impairment

Factors	α	*CR*	*AVE*	*MSV*	λ
System	.82	0.81	0.52	0.17	
1. Enough number of institutions for the students with hearing impairment.					0.71
2. The educational needs of students with hearing impairment are met by national policy for people with disabilities.					0.73
3. The school's structure was created with students with hearing impairments in mind.					0.76
4. You are pleased with the caliber of instruction provided to pupils who have hearing loss.					0.72
5. The current educational environment is ideal for providing hearing impaired pupils with an individualized education.					0.69
School	.90	0.910	0.528	0.13	
6. The number of teachers at the school is adequate for instructing the children with hearing impairment.					0.72
7. The hearing-impaired children in your care are doing well in school.					0.69
8. There are extracurricular activities available for your hearing-impaired youngsters.					0.74
9. The school provides children with hearing impairments with instruction in all topics.					0.73
10. You are happy with the caliber of the education you received at school.					0.71
11. You understand the aim and purpose of the school.					0.76
12. Regular reports on student performance are given to you.					0.74
13. Your children with hearing impairments can access the learning environment in educational facilities.					0.72
14. You participate in making decisions.					0.73
Classroom	.87	0.86	0.51	0.19	
15. Students receive homework on a daily basis.					0.74
16. It's beneficial to teach your hearing-impaired students in the classroom.					0.71
17. Your kids with hearing loss have access to co-curricular activities.					0.69
18. You are pleased with the performance of the teachers at your hearing-impaired child's school.					0.72
19. Your children with hearing impairment will receive a customized educational plan.					0.73
20. You receive instruction and training to help you give your children who have hearing impairments successful learning opportunities.					0.72
Students	.91	0.92	0.51	0.23	
21. Your hearing-impaired youngsters attend school with joy.					0.74
22. These educational services have helped your hearing-impaired youngster become a dedicated worker.					0.71
23. Due to this schooling, your child with hearing loss has a greater sense of discipline.					0.72
24. Your hearing-impaired children are provided the most learning possibilities possible.					0.73
25. There isn't any prejudice based on socioeconomic class.					0.69
26. The gender gap in education is reduced by this system.					0.72
27. On the basis of ethnicity, there is no discrimination.					0.68
28. Your hearing impaired youngster can converse effectively while receiving educational assistance.					0.71

29. Your hearing-impaired child is now able to enjoy a happy life thanks to this educational method.					0.74
30. Your child's critical thinking abilities have improved as a result of the availability of these educational resources.					0.73
31. Your child's abilities are further enhanced through schooling.					0.72
Outcomes	.89	0.90	0.50	0.23	
32. Your youngster with hearing loss has improved problem-solving skills with the aid of educational services.					0.72
33. Your youngster with hearing loss has enhanced social engagement with the aid of education.					0.69
34. Your hearing-impaired child has developed into a contributing member of society while receiving educational resources.					0.71
35. Students with hearing impairments gain new learning skills.					0.73
36. Students with hearing impairment feel accomplished as a result of this educational system.					0.72
37. Your child can find a rewarding position in society thanks to the educational programs offered to pupils with hearing impairment.					0.71
38. The students with hearing loss can live happy lives thanks to this educational system.					0.69
39. These educational services have helped pupils with hearing impairments make better decisions.					0.72
40. Your hearing-impaired child's moral values have improved as a result of these educational offerings.					0.73

Note. CR = Composite reliability, AVE = Average variance extracted, λ (lambda) = standardized factor loading

After achieving the stringent criteria of model fit, the factor structure of the educational effectiveness questionnaire (EEQ) was psychometrically evaluated and reliability and validity (convergent and discriminant) of the educational effectiveness questionnaire was determined. The investigators suggested that composite reliability and Cronbach's alpha reliability coefficients should be .70 or greater for the constancy of the factor structure while the index of average variance extracted (AVE) should be .50 or greater to claim the good convergence of the measurement (Hair et al. 2010; Henseler et al., 2016). The average variance extracted (AVE) is the average of the square root of the factor loading for the respective factor (Hair et al., 2010).

The percentage of the variance for the educational effectiveness questionnaire (EEQ) was 52, .52, .51, .51 and 50 for system, school, classroom, students and outcomes respectively. However, the reliability coefficients, including composite and Cronbach's alpha, ranged from .81 to .92 for the all five factors.

Table 4
Descriptive Statistic and Fornell-Larcker Criterion for the Educational Effectiveness Questionnaire for Parents of Students with Hearing Impairment

Factors	*M*	*SD*	MaxR(H)	Student	School	Classroom	System	Outcomes
Student			0.921	**0.718**				
School			0.910	0.280	**0.727**			
Classroom			0.865	0.440	0.360	**0.719**		
System			0.818	0.410	0.320	0.350	**0.725**	
Outcomes			0.903	0.480	0.350	0.390	0.240	**0.713**

Note. M = mean, SD = standard deviation,

To determine the discriminant validity, two distinctive ways were adapted (Henseler, Hubona, and Ray 2016; Voorhees et al., 2016). In the first method, the square root of average variance extracted AVE ratio of each factor was compared with proceeding correlations of the factors (Fornell and Larcker, 1981). The evidence showed that the square root of AVE is greater than the correlation. In the second method, the AVE was compared with the maximum shared variance MSV of each respective factor. Haire et al. (2010) suggested that the maximum shared variance should be less than the value of average variances extracted, which means the percentage of explained variance of the same factor should be greater than any other factor. Hence, the estimates showed that the average variance extracted was greater than the maximum shared variance of all respective factors.

Table 5
Descriptive Statistics and Cronbach's Alpha for System, School, Classroom, Student Levels and Outcomes for the Parents (N = 500) of the Students with Hearing Impairment.

Variables				*Ranges*		
	K	*M*	*SD*	*Actual*	*Potential*	α
System Level	5	18.57	4.03	6-25	5-25	.82
School Level	9	34.75	6.09	15-45	9-45	.90
Classroom Level	6	23.67	4.05	7-30	6-30	.87
Student Levels	11	44.21	6.58	17-55	11-55	.91
Outcome	9	35.78	5.81	13-45	9-45	.89

Note. K = number of items, α = Cronbach's Alpha.

The above table shows the descriptive statistics including (mean, standard deviation, actual and potential ranges) and internal consistency by using Cronbach's alpha reliability of system, school, classroom, student levels and outcomes for the parents of the students with hearing impairment. The reliability evaluation exhibited an excellent internal consistency ranging from .82-.93 for the constructs.

Conclusions

It was a valid and reliable scale. It was consistent with its subscales. It has the potential to reuse in the similar kind of field.

Implications

This scale can be used with slightly adaptations for knowing the educational effectiveness for other disabilities such as visual impairment, and physical handicap. This scale can be used in the other provinces of Pakistan for knowing educational effectiveness for parents of students with hearing impairment. This scale can also be used for private institutes as well as non-governmental institutes with the minor changes for knowing the perceived educational effectiveness.

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