VALIDATION OF THE ALLESS ; A BILINGUAL CHECKLIST FOR IDENTIFYING PEDIATRIC PATIENTS AT RISK OF HEARING AND AUDITORY PROCESSING DISORDERS

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INTRODUCTION

The World Health Organization (WHO) has endorsed a bio-psycho-social model where function and disability are seen as complex interactions between the health conditions of the individual, environmental factors and personal variables (WHO, 2001). Self-reported measures, as well as patient measures reported by significant others, provide an important dimension of functional disability under the WHO model because of the inclusion of personal, contextual and environmental factors. Under this model the self-reported health measures as well as the ones reported by family members or caregivers project an important dimension of the patient's perception of his handicap and the effect that ecological and individual factors have over the patient. These measures describe aspects associated to the patient's behavior and quality of life that otherwise will be overlooked.

INTRODUCTION

- Traditional diagnostic measures are usually not appropriate to determine the psychological effects and the participation restriction that a condition imposes on an individual. This is because they do not describe aspects associated to quality of life and performance on daily living.
- Measures reported by patients and significant others are becoming widely used in clinics, schools and corporations that serve the special education population given the shortage of resources and the need to allocate diagnostic protocols to cases that are identified as being at risk for a health condition. In Puerto Rico as well as in other states and territories of the U.S. and in other countries, there is large waiting list for special education services. The use of such tools will determine if referrals for specific diagnostic tests are warranted. This results in a better allocation of financial and profesional health resources.

APD AS A LEARNING DISABILITY

- Specific Learning Disabilities (SLD) are defined according to the *Individuals with Disabilities Education Improvement Act* (IDEIA), in 2004 as : "a disorder in which one or more of the psychological aspects that entiles the use of language, whether oral o written, may be manifested in an inability to hear, think, talk, read, write, spell or do mathematics."
- Parodi (2002) states that "these disorders are intrinsecal to the individual and presumably are due to central nervous system dysfuntions ." Therefore the individual with Learning disabilities can exhibit perceptual problems such as: difficulty to process information in an auditory, tactile, and/or, in a visual manner

APD AND ENVIROMENTAL FACTORS

- These disorders can become worse in environments where acoustic conditions are not favorable. A classic example is a noisy and reverberant classroom, which will cause students to experience greater difficulty completing assigned tasks. (Cañete 2006).

APD MANIFESTATIONS

- In the academic environment students with this condition manifest dificulty interpreting the auditory information received, understanding the speaker's intention and following instructions, and also in developing language, writing and reading skills (Dávila-Marrero, 2012).
- There are other indicators which aid in the detection of perceptual disorders in students. Indicators mentioned by López (2013) are difficulty to understand group conversations in class or among Friends and problems distinguishing among sounds that compound words. Also noted is dificulty in learning new vocabulary or a new language.

EFECTS ON QUALITY OF LIFE

- According to the American Academy of Audiology (AAA) there are manifestations of the disorder that will impact multiple areas in the life of patients with APD. This is caused by the effort that these individuals must invest in understanding what is said to them daily and to adapt to the different acoustic environments that can interfere with their auditory performance. Auditory fatigue, tension and frustration are very common.
- When these students are not identified early they do not have equal access to the appropriate educational and academic opportunies that their peers have. This is mainly due to the extra listening, mental effort and auditory fatigue enhanced by the lack of reasonable accomodations. .

ETHIOLOGY OF AUDITORY PROCESSING DISORDERS

- Varios authors agree that there is not a common origen for APD. Among them Maeda et al., (2016) state that it may be caused by a wide range of ethiologies that can vary from genetic factors, neuromorphological disorders and neurodevelopmental delays to other neurogenic factors. Orlando et al. (2014) agreed that the ethiology is heterogenic and multivariable. They propose also the possibility of developing APD by exposure to unknown exogenous factors during critical periods of neurological development that can influence the development of normal auditory processing. This in turn may cause adverse effects in anatomic loci or physiological connections of the auditory pathways from the brainslem to the auditory cortex, resulting in the possibility that individuals with this condition may present different etiologies and manifestations depending on extension of the lesión

AUDITORY PROCESSING SKILLS

- The American Speech-Language and Hearing Association [ASHA] (2005) and Orlando et al. (2014) proposes that key auditory processing skills are sound detection, auditory discrimination, lateralization, localization of the sound source, auditory pattern recognition, temporal processing of auditory signals (temporal resolution, masking, temporal integration, temporal ordering), temporal segregation and integration of signals, auditory comprehension of speech and other signals in background noise. In this framework, any deficiency observed in a patient in one or more of the above mentioned areas is considered to place him at risk of an auditory processing disorder (APD).

PREVALENCE OF APD

- Maeda et al. (2016) reports that APD affects between 2% to 5% of school age children. It is prevalent in 50% of children with learning disabilities. Moore (2010) informs that 5% of children referred for audiological services do not present hearing loss. Therefore it can be inferred that they may have auditory problemas of non-peripheral origin.
- On the other hand, Orlando et al. (2014) consider that APD prevalence is not clear in children because it will depend on associated comorbilities, pathologies and other ethiologic factores.

STATISTICS ASSOCIATED TO LEARNING DISABILITIES IN PUERTO RICO

- In Puerto Rico the average age to identify a student with learning disability is 6 years, while in the US some learning disorders can be identified as early as 3 years of age which signifies a health disparity. These result in late intervention and poor case management in crucial periods where writing and reading are developing and important academic content is given to further refine theses skills. This is associated to the delays and deficts that a learning disabled student presents during his academic life and reflects on his overall quality of life..
- Currently there are no studies or statistics providing specific evidence establishing a direct association between learning disabilities, APD or with any other auditory handicap. Nor with learning disabilities subgroups such as students with reading and writing problems or subgroups with deficits in related areas. This may be due to the fact that in PR the learning disability diagnosis is perform in a general manner, even when the disorder has different manifestations.

RESEARCH OBJECTIVE

The purpose of this research is to develop and validate a bilingual screening tool for the identification of Auditory Processing Disorders and for children with under-developed auditory skills to be used with the Pediatric Population.

In the case of pediatric patients, specifically younger children and children with learning disabilities, it is not uncommon that they lack the capacity of expressing their symptoms. This makes it difficult for the clinician to accurately determine the nature or severity of the problem. Therefore the interventionist needs to rely on caregiver reports. Parents and caregivers are an excellent source of information since they spend much of their time with the child.

RATIONALE: LACK OF IDENTIFICATION PROTOCOLS FOR APD

- There is no evidence that, as part of the current battery for the differential diagnosis for specific learning disabilities, the auditory perceptual area is tested, even when it is well established that the clinical entity of the auditory processing disorders spectrum is a component within the learning disability continuum.
- This creates the need to include instruments to identify pediatric patients at risk of auditory processing disorders .

INSTRUMENT DESCRIPTION

- The ALLES scale was developed based on reports from the literature, parents and providers of areas impacted by auditory problems. It consists of 21 items divided in four areas; auditory attention, auditory memory, auditory learning and communication. Items were evaluated for content validity by a panel of experts with more than 30 years of experience in their respective fields of Audiology and Speech-Language Pathology that spoke Spanish or English or both languages.
- Another expert panel was configured by two parents, a teacher, an audiologist and a speech-language pathologist attesting ALLESS format's user friendliness and comprehension.

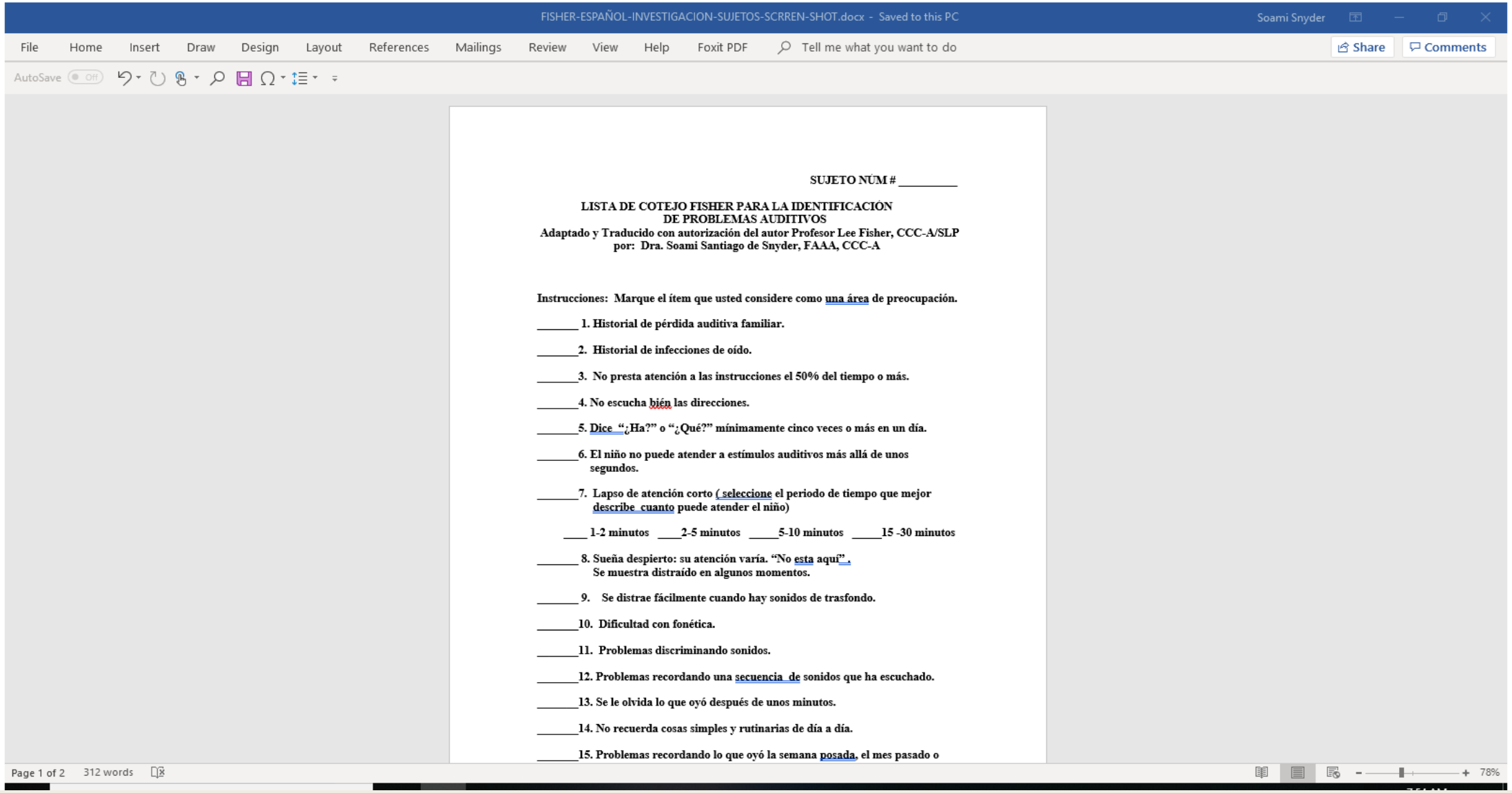
PARTICIPANTS

- Research participants were 40 parents and/or tutors of male and female school age students (pre-school to high school) from the Puerto Rico metropolitan area as well as subjects from the interior of the island. Parents were either English and Spanish speakers. The child may or not be registered in the Special Education Program of the PR Departament of Education with a formal diagnosis of Specific Learning Disability or underdeveloped auditory skills. The candidates and participants should not be parents of hearing impaired children.

PROCEDURES

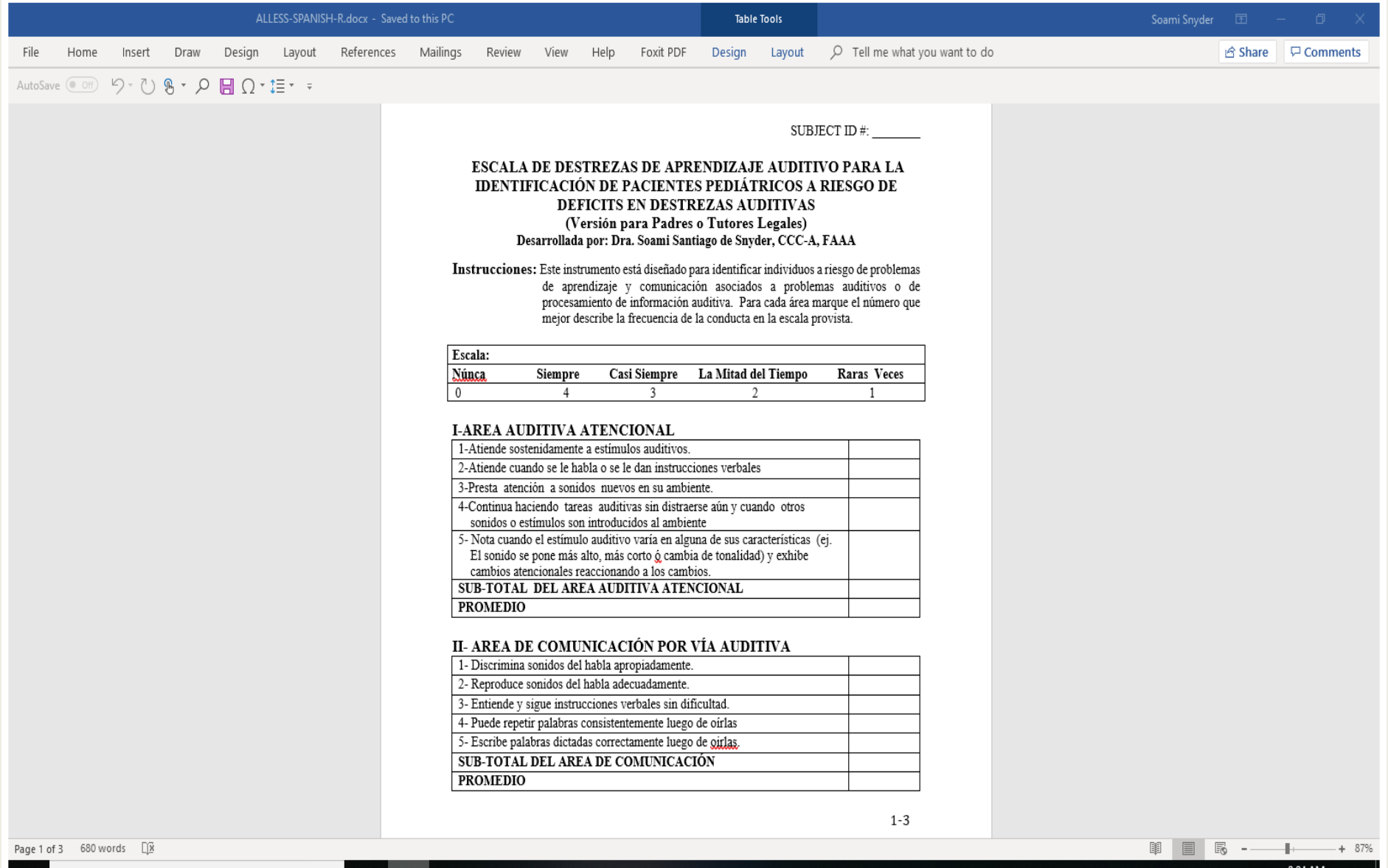
The ALLES is being validated externally using The Fisher Check list, developed by audiologist Lee Fisher. The Spanish version of the Fisher used was translated and culturally adapted by Dr. Soami Santiago de Snyder with permission of the author. A translation and back translation was performed by Professor Margarita González, a certified translator. Both the ALLESS scale and the Fisher Auditory Check list were administered to 44 parents of children or caregivers of children with specific learning disabilities and/or at risk of auditory skills problems. In the ALLES the responses were limited to a Liker scale format (from always=4 to never= 0). In terms of the Fisher Auditory Check list the caregiver was instructed to write a checkmark if he/she understand that the child exhibits the behavior mentioned on the premise. Both instruments were administered in a face to face format in a closed cubicle located at the RCM-Intramural Practice facility to safeguard and ensure

FISHER CHECK LIST FORMAT



ALLESS FORMAT

AUDITORY LISTENING AND LEARNING SKILLS SCALE



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ESCALA DE DESTREZAS DE APRENDIZAJE AUDITIVO PARA LA IDENTIFICACIÓN DE PACIENTES PEDIÁTRICOS A RIESGO DE DEFICITS EN DESTREZAS AUDITIVAS
(Versión para Padres o Tutores Legales)
Desarrollada por: Dra. Soami Santiago de Snyder, CCC-A, FAAA

Instrucciones: Este instrumento está diseñado para identificar individuos a riesgo de problemas de aprendizaje y comunicación asociados a problemas auditivos o de procesamiento de información auditiva. Para cada área marque el número que mejor describe la frecuencia de la conducta en la escala provista.

Escala:				
Núnca	**Siempre**	**Casi Siempre**	**La Mitad del Tiempo**	**Raras Veces**
0	4	3	2	1

I-AREA AUDITIVA ATENCIONAL

1-Atiende sostenidamente a estímulos auditivos.	
2-Atiende cuando se le habla o se le dan instrucciones verbales	
3-Presta atención a sonidos nuevos en su ambiente.	
4-Continua haciendo tareas auditivas sin distraerse aún y cuando otros sonidos o estímulos son introducidos al ambiente	
5- Nota cuando el estímulo auditivo varía en alguna de sus características (ej. El sonido se pone más alto, más corto ó cambia de tonalidad) y exhibe cambios atencionales reaccionando a los cambios.	
SUB-TOTAL DEL AREA AUDITIVA ATENCIONAL	
PROMEDIO	

II- AREA DE COMUNICACIÓN POR VÍA AUDITIVA

1- Discrimina sonidos del habla apropiadamente.	
2- Reproduce sonidos del habla adecuadamente.	
3- Entiende y sigue instrucciones verbales sin dificultad.	
4- Puede repetir palabras consistentemente luego de oírlas	
5- Escribe palabras dictadas correctamente luego de oirlas.	
SUB-TOTAL DEL AREA DE COMUNICACIÓN	
PROMEDIO	

1-3

Page 1 of 3 680 words 87%

RESULTS

PEARSON CORRELATION

- There is a significant positive correlation *(r value = 0.70)* between the *ALLESS* and the *Fisher checklist.*

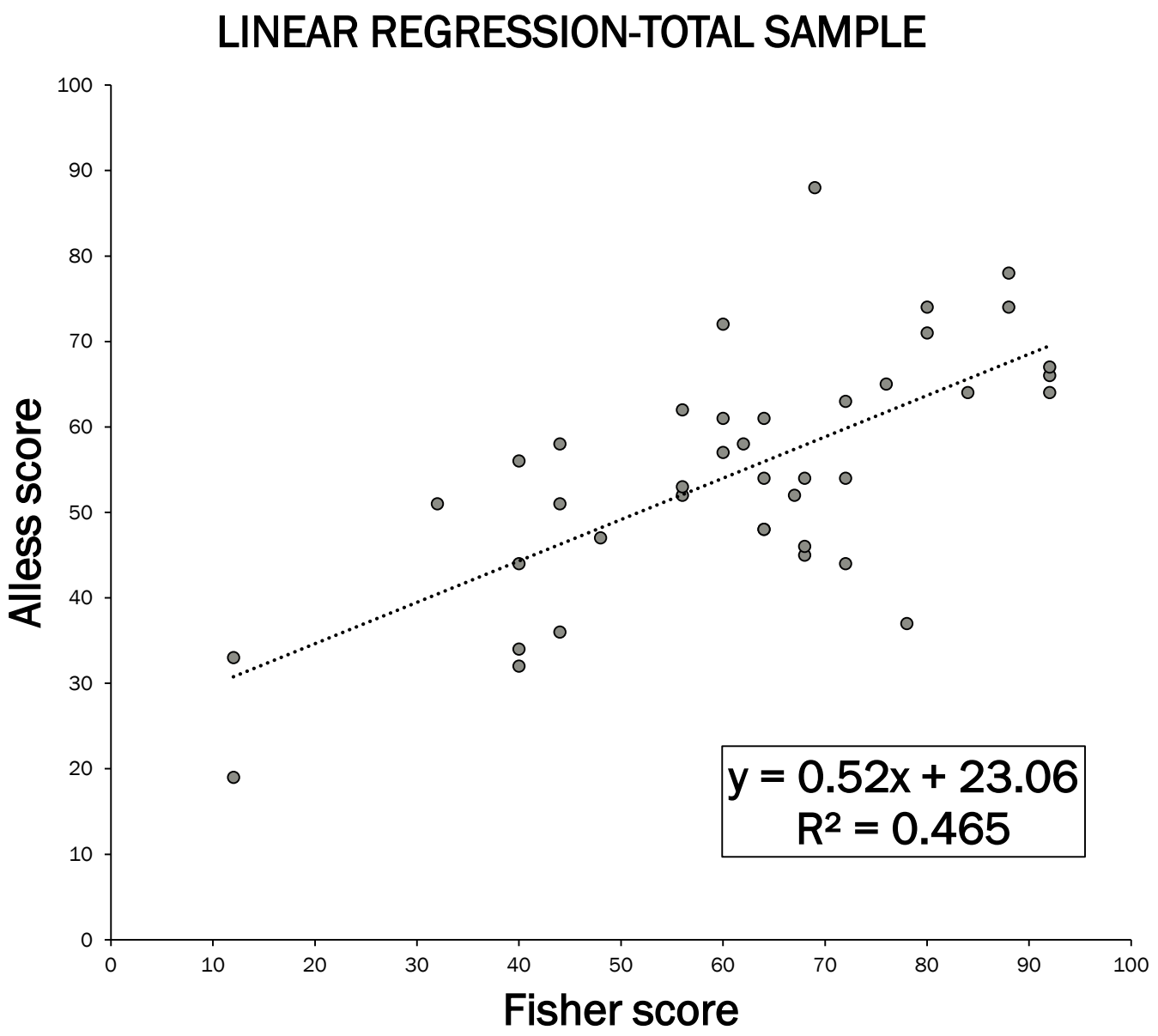
COEFFICIENT OF DSTERMINATION

- The coefficient of determination, with respect to correlation, is the proportion of the variance that is shared by both variables. It gives a measure of the amount of variation that can be explained by the correlation (model) between the two variables .
  The coefficient of determination, r^2, is the square of the Pearson correlation coefficient which for a of 0.7 would result in an average coefficient of determination ratio of of 0.47 or 47% meaning that approximately half of the variance can be adjudicated to the correlation between the two instruments.

Instrument		Correlation
ALLESS-1	FISHER-1	0.70

Socio-demographic distribution

Parental age distribution:	Mean parental age – 34.2 years
Standard deviation:	*5.09*
Gender:	100% females
Child's age	Mean children age- 8.8 years
Standard deviation:	3.82
Gender:	30% females / 70% males
Academic level (Grade):	(9^{th}, 7^{th}, 3^{rd}, 1^{st}, Kinder, 1^{st}, 4^{th}, 6^{th} ,11^{th}, 2^{nd})
Towns represented:	Bayamón, Santurce, San Juan, Cidra, San Juan, Caguas, Gurabo, Gurabo, San Juan, Naranjito
Parental main language:	Spanish
Special Education Status:	7/10 = 70% of the sample were participants of the PR Department of Education Special Education Program.
Hearing Test Status:	100% had normal hearing sensitivity.
Auditory Processing Evaluation:	None of them were evaluated to rule-out central auditory processing disorders.



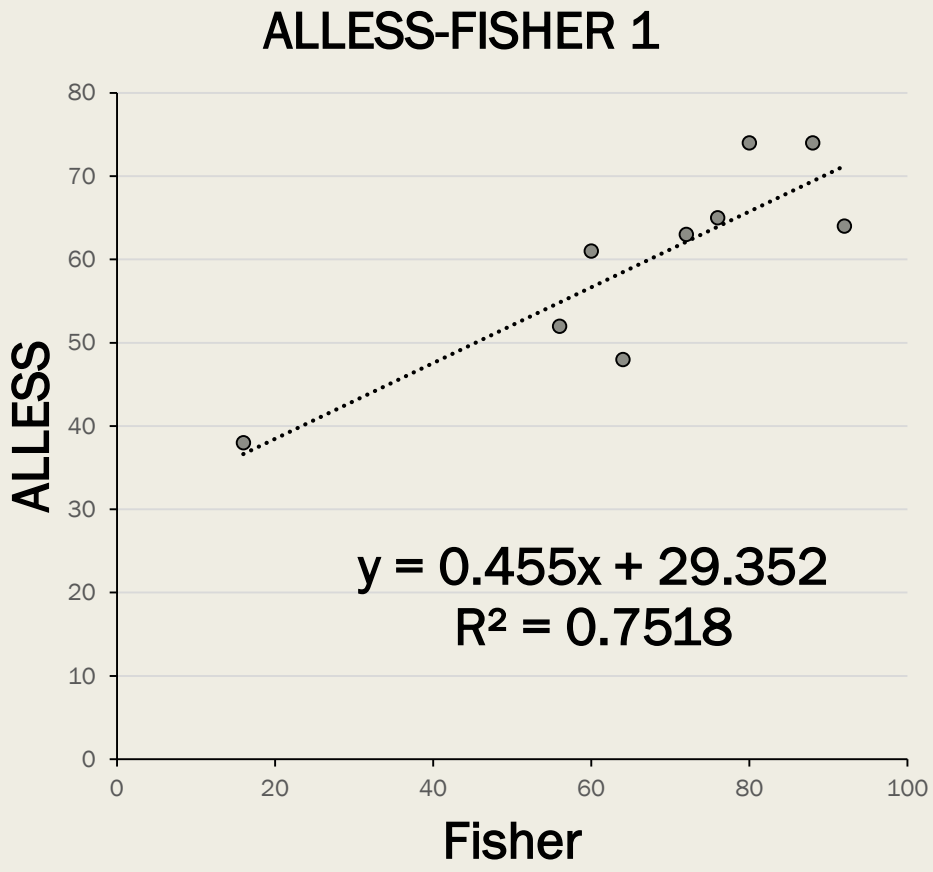
LINEAR REGRESSION

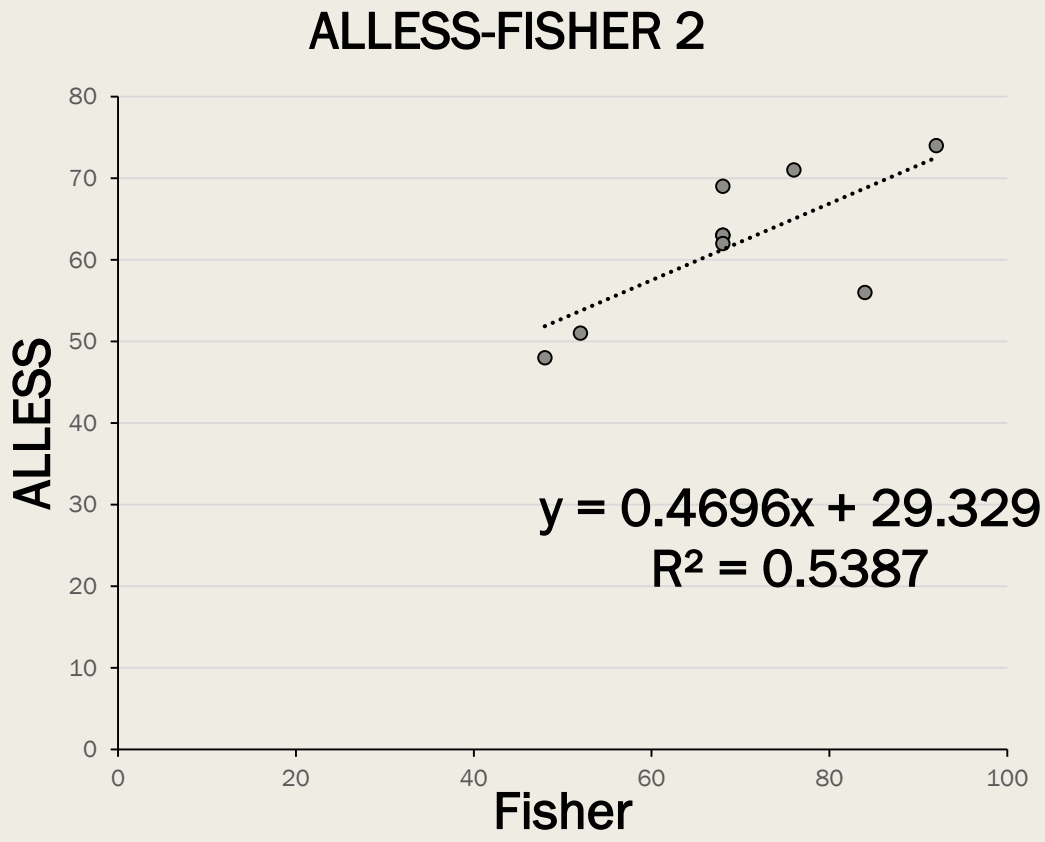
DISCUSSION SUMMARY

- The statistical results reflected that there is a large positive correlation in performance between the two instruments, which disproves the null Hypothesis that there was no correlation between them. This means that as the subject's rating on the ALLESS increases, so does the rating on the Fisher. The linear regression analysis also supports this premise. The correlation between both tests in both administrations was found to be positive and large according to the criteria and the correlation between the two administrations of each tests was classified as a strong positive relationship (test-1: *P =0.509 and test-2: P=0.506*).

Instrument		Correlation	Instrument		Correlation
ALLESS-1	FISHER-1	0.867	ALLESS-2	FISHER-2	0.733

LINEAR REGRESSION OF TEST-RETEST SUB-SAMPLE





CONCLUSION

- Results suggest that both the Fisher and ALLESS quality of life measures are comparatively effective in addressing the behavioral manifestations of auditory problems in the different auditory and learning contexts and dimensions addressed by the instruments. Both instruments can be used in clinical as well as educational settings to identify children with compromised auditory skills. A potential advantage of the ALLESS over the Fisher relays in categorization of the results by skill area and in providing an index of the frequency with which the subject manifests the behavior. This provides the interventionist with more specific information. Also the ALLESS as well the Fisher is simple to administer and time efficient which is of paramount importance in clinical and educational settings.

SUMMARY-REFERENCES

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QUESTIONS ???

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