

# FACTOR ANALYSIS OF A QUESTIONNAIRE FOR AUDITORY PROCESSING SKILLS

## Introduction

Between 0.5 to 5% of individuals complain of listening difficulties irrespective of normal audiometric results, suggesting a possible auditory processing disorder (APD). However, listening difficulties are also manifested in other recognised diagnoses such as language impairment, literacy difficulties and autism spectrum disorders, since sound processing sounds entails complex connections between auditory, language and cognitive structures.

Given these comorbidities it is of interest to evaluate the types and situations where listening difficulties emerge in these specific neurodevelopmental disorders.

## Aim

To assess the factors underlying listening difficulties through exploratory factor analysis of the Questionnaire of Central Auditory Processing (QCAP) and extract relationship patterns between them.

## Method

The questionnaire was given to the parents of 142 typically developing children (age range 7;00 - 9;11 years; 76 male, 95 female) and 29 children diagnosed with various diagnosed neurodevelopmental disorders including language impairment, dyslexia, dyspraxia, and attention deficit hyperactivity disorder (age range 7;00 - 9;11 years; 17 male, 12 female). All children with neurodevelopmental disorders were reported to exhibit listening difficulties and were therefore suspected of having auditory processing difficulties.

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Table 1 Component correlation Matrix of the QCAP

Component	1	2	3	4	5
1	1.000	-.281	.362	.258	.337
2		1.000	-.073	-.048	-.131
3			1.000	.210	.224
4				1.000	.159
5					1.000

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

The component correlation matrix displayed overall low correlations between components. Hence factor analysis was employed through orthogonal rotation.

## Results

Factor loadings of > 0.5 were considered for inclusion in a factor. Five factors were extracted:

- One clear strong factor displaying an Eigenvalue of 8.497 (auditory attention and memory). Accounts for 42.28%
- Four other factors of Eigenvalues just above 1 (following conversations, sensory stimulation, noisy situations, and social aspects).

The scree plot (figure 1) portrays clearly that there is one component present above the point of inflection.

### References

Ferguson, M. A., Hall, R. L., Riley, A., & Moore, D. R. (2011). Communication, listening, cognitive and speech perception skills in children with auditory processing disorder (APD) or specific language impairment (SLI). *Journal of Speech, Language, and Hearing Research*, 54(1), 211-227.  
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O'Connor, K. (2012). Auditory processing in autism spectrum disorder: a review. *Neuroscience & Biobehavioral Reviews*, 36(2), 836-854.  
Sharma, M., Purdy, S. C., & Kelly, A. S. (2009). Comorbidity of auditory processing, language, and reading disorders. *Journal of Speech, Language, and Hearing Research*, 52(3), 706-722.

Figure 1 Scree plot depicting the Eigenvalues of each component

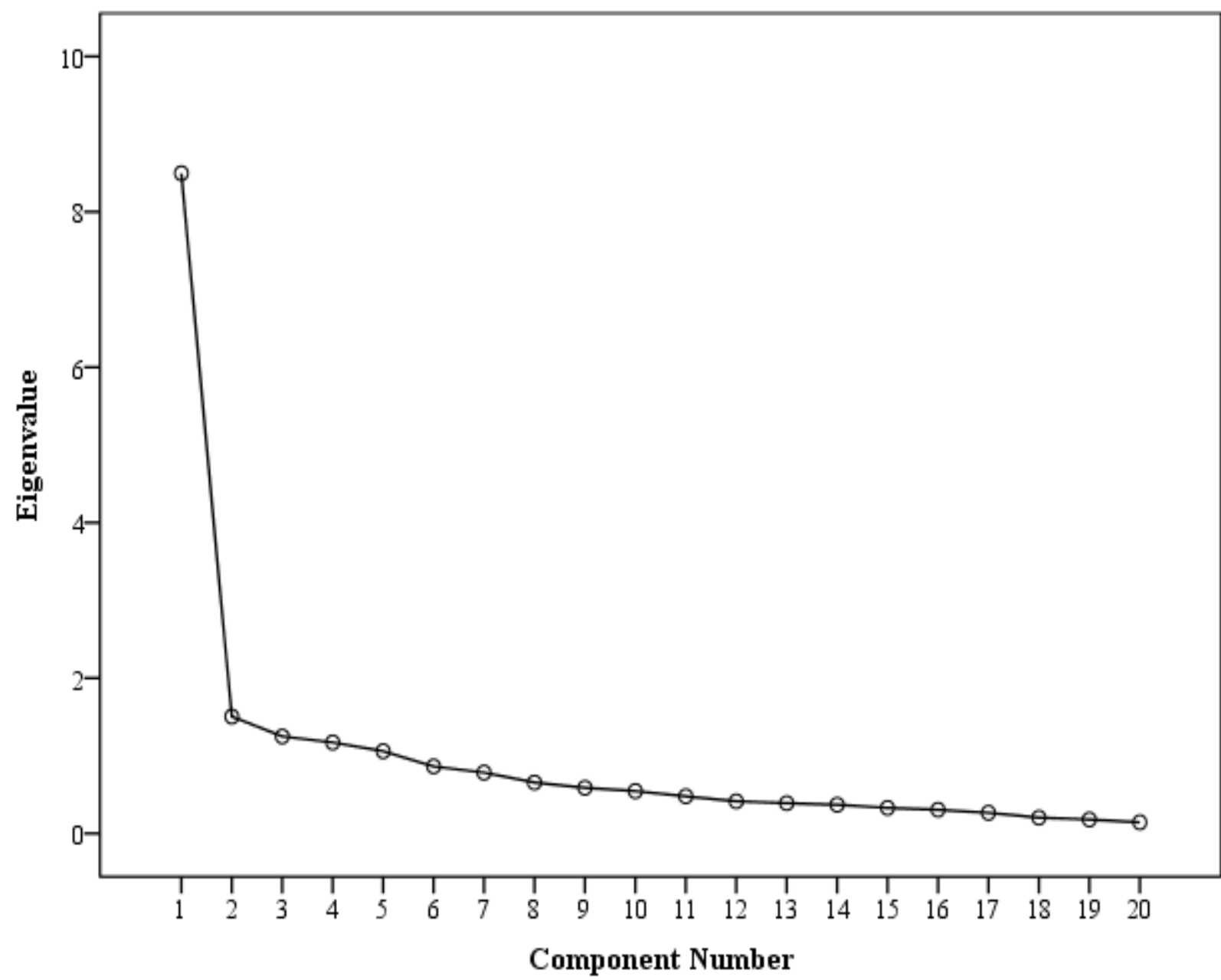


Table 2 Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.497	42.483	42.483	8.497	42.483	42.483	5.779	28.895	28.895
2	1.505	7.526	50.009	1.505	7.526	50.009	2.565	12.824	41.719
3	1.249	6.245	56.255	1.249	6.245	56.255	1.833	9.163	50.882
4	1.171	5.857	62.112	1.171	5.857	62.112	1.721	8.607	59.489
5	1.059	5.293	67.404	1.059	5.293	67.404	1.583	7.916	67.404
6	.863	4.314	71.718						
7	.783	3.916	75.635						
8	.657	3.283	78.918						
9	.589	2.943	81.861						
10	.546	2.729	84.589						
11	.478	2.391	86.980						
12	.414	2.069	89.049						
13	.390	1.949	90.998						
14	.370	1.852	92.850						
15	.330	1.648	94.498						
16	.306	1.528	96.026						
17	.266	1.330	97.356						
18	.204	1.021	98.377						
19	.180	.902	99.279						
20	.144	.721	100.000						

Extraction Method: Principal Component Analysis.

Table 3 Rotated Component Matrix of the QCAP

	Component				
	1 : auditory attention and memory	2 : following conversations	3 : sensory stimulation	4 : noisy situations	5 : social aspects
The child finds difficulty listening to speech and understanding it	.632				
The child finds difficulty in attending to a task	.721				
The child is easily distracted	.648				
The child can be forgetful. Specifically for spoken information	.717				
The child has organisational difficulties that cause problems	.674				
The child finds difficulty in following long conversations	.703				
The child finds difficulty in following directions with multiple steps	.757				
The child finds difficulty in taking notes in class	.779				
The child finds difficulty in dividing his/her attention	.689				
The child often finds him/herself unable to keep to task deadlines	.640				
In conversation, the child often asks people to repeat themselves		.576			
The child finds difficulty in following and/or understanding TV programs		.517			
In conversation, the child tends to tilt his/her head towards speakers		.750			
The child finds his/her telephone conversations frustrating		.800			
The child tends to increase the volume of television or audio equipment when listening			.847		
The child seems to be a restless person, who finds great difficulty in keeping still			.587		
The child is sensitive to loud sounds				.848	
The child gets distracted in noisy places	.506			.655	
The child prefers solitary activities to social activities					.822
The child tends to shy away from class discussions					.611

## Conclusion

One strong component of 10 questions related to *auditory attention and memory* emerged. The other components were less heavily loaded.

Further research: explore performance on each factor in children with varied neurodevelopmental disorders.