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# The International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) and Speech-language Pathology: associations with sociodemographic and health care variables

*Classificação Internacional de Funcionalidade, Incapacidade e Saúde para Crianças e Jovens (CIF-CJ) e Fonoaudiologia: associação com fatores sociodemográficos e clínico-assistenciais*

## Keywords

Speech  
Language and Hearing Sciences  
International Classification  
of Functioning, Disability and Health  
Delivery of Health Care  
Socioeconomic Factors  
Child  
Adolescent

## Descritores

Fonoaudiologia  
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Criança  
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## ABSTRACT

**Purpose:** Identify factors related to the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) representing more than one category and verify their association with sociodemographic and health care aspects in a speech-language pathology (SLP) outpatient clinic. **Method:** This is an observational, analytical, cross-sectional study based on a retrospective analysis of secondary data. One hundred eighty medical records of patients aged 5-16 years evaluated between 2010 and 2014 were included in the study. Sociodemographic and health care aspects were identified in these records, as well as presence of the ICF-CY Body Functions and Activities and Participation component categories. Analyses of the frequency distribution and measures of central tendency and dispersion of the variables, as well as Factor Analysis were carried out to create representative indicators of the ICF-CY categories identified. The Mann-Whitney and Kruskal-Wallis tests and the Spearman's correlation were used to analyze the associations, adopting a statistical significance level of 5%. **Results:** Two factors that presented statistically relevant associations with the sociodemographic and health care variables were identified for the Body Functions component. As for the Activities and Participation component, three factors predominantly associated with the health care variables were identified. **Conclusion:** Items representative of the ICF-CY Body Functions and Activities and Participation categories and their respective factorial loads were identified. Statistically significant associations were verified between them and the sociodemographic and health care variables analyzed.

## RESUMO

**Objetivo:** Identificar fatores relacionados à Classificação Internacional de Funcionalidade, Incapacidade e Saúde para Crianças e Jovens (CIF-CJ) representativos de mais de uma categoria e verificar sua associação com aspectos sociodemográficos e clínico-assistenciais em um ambulatório de avaliação fonoaudiológica. **Método:** Trata-se de estudo observacional, analítico e transversal, com base em análise retrospectiva de dados secundários. Foram incluídos 180 prontuários de pacientes entre 5 e 16 anos, avaliados de 2010 a 2014. Após a leitura desses prontuários, foram identificados os aspectos sociodemográficos e clínico-assistenciais, bem como a presença de categorias dos componentes Funções do Corpo e Atividades e Participação da CIF-CJ. Foram realizadas análises de distribuição de frequência e medidas de tendência central e dispersão das variáveis, além da análise fatorial, visando criar indicadores representativos das categorias da CIF-CJ identificadas. Para análise de associações, foram utilizados os testes Mann-Whitney e Kruskal-Wallis e a correlação de Spearman, adotando o nível de significância de 5%. **Resultados:** Foram identificados dois fatores para as Funções do Corpo que apresentaram associações de relevância estatística com as variáveis sociodemográficas e clínico-assistenciais. Para as Atividades e Participação, três fatores foram identificados, cujas associações se deram predominantemente com variáveis clínico-assistenciais. **Conclusão:** Foi possível a identificação de itens representativos e suas respectivas cargas fatoriais das categorias das Funções do Corpo e Atividades e Participação, sendo verificadas associações estatisticamente significativas entre eles e as variáveis sociodemográficas e clínico-assistenciais analisadas.

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## INTRODUCTION

The International Classification of Functioning, Disability and Health (ICF) and its derived version, the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY), were created from a biopsychosocial perspective, through which it can be understood that health conditions can be caused by changes in functionality, and are not only their cause<sup>(1)</sup>. This type of approach proposes that disabilities result from the interaction between biological issues external to the individual, as well as that a change in an organ or system will not determine alone the disabilities a person will have<sup>(1)</sup>.

As recommended by the World Health Organization (WHO), the ICF highlighted contextual factors of the individual in the analysis of deficiencies, limitations and restrictions. This context is formed by environmental and personal factors, demonstrating that disability is not only a biological attribute, but it comprises the circumstances that involve the individual<sup>(2)</sup>, and result from the interaction between health and environmental and personal conditions<sup>(3)</sup>.

In 2012, the Brazilian Health Council (CNS) determined the inclusion of the ICF within the scope of the Unified Health System (SUS), including in the Supplementary Health Program, which has been occurring gradually and in small experiences. The use of the ICF as a guide for population surveys<sup>(3)</sup> and other health information systems<sup>(4)</sup>, especially in Primary Health Care (PHC)<sup>(5)</sup>, has been increasingly stimulated, because it can contribute as a more comprehensive data collection tool<sup>(3)</sup>.

Among the issues related to the use of the ICF, there is a discussion about which other sociodemographic and assistance data, collected together with those used to establish the classification itself, would be relevant<sup>(4)</sup>. Given the interferences that context promotes in the individual's functionality issues, these data could assist with the construction of indicators in the health planning process<sup>(5)</sup>.

In relation to health care, due to the complexity that still involves the use of the ICF, the literature proposes the use of a summarized initial model that can be adopted by the entire health team<sup>(6)</sup>. Another possibility is the creation of core sets, reducing the number of categories to facilitate its use. Although core sets have been criticized based on existing health situations, the possibility of generating instruments according to the area or profession<sup>(1)</sup> is a possible way for greater dissemination, knowledge, and use of the classification. In Brazil, some professions have already introduced the ICF in their clinical routine of evaluation and follow-up. Speech-language Pathology (SLP), however, is only beginning this course<sup>(7,8)</sup>.

Therefore, new research associating the ICF with SLP issues is justified by the relevance of broadening its understanding and demonstrating the benefits of its clinical adoption. Moreover, these studies are fundamental because of the need to establish a more simplified assessment, but still sufficient to apprehend all the proposed constructs. It is also important to observe the associations between the ICF and its derived versions with the factors that compose the individual's life, with complaints and confirmed diagnoses of communication impairments. Therefore, this study aimed to identify, through psychometric analysis, factors

related to the ICF-CY that represent more than one category simultaneously and verify their association with sociodemographic and health care aspects in a SLP outpatient clinic.

## METHOD

This observational, analytical, cross-sectional study was conducted at a Speech-language Pathology (SLP) outpatient clinic - which is part of a public teaching hospital - that aims at evaluation and diagnosis. The survey was based on the retrospective analysis of secondary data collected from medical records.

One hundred eighty medical records of patients aged 5-16 years who underwent complete SLP evaluation between March 2010 and December 2014 were included in the study. All anamnesis and evaluation reports available in full for consultation in this period were analyzed. Medical records from patients who did not undergo the hearing assessment before or during the evaluation period and from those with suspicion or confirmation of diagnoses of hearing loss, intellectual disability, or Global Development Delay (GDD) were excluded, because they could contribute to excessive heterogeneity of the sample.

Data that structured the categorical sociodemographic explanatory variables regarding gender, patient and parental education level, and place of residence were collected, as well as others that structured the quantitative sociodemographic variables referring to age, number of rooms in the house, number people in the house, number of siblings, and family income (in minimum wages). Information that defined the categorical health care explanatory variables was also collected, namely, previous complications in childhood, person responsible for the complaint, professional who referred the patient, and the complaints, SLP diagnostic hypotheses, and possibilities of the adopted conducts. Analyses of frequency distribution for the categorical variables and of measures of central tendency and variability for the quantitative variables were performed.

For structuring the response variables, by means of previous reading of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY)<sup>(9)</sup> and by consensus among the authors, the Body Functions and Activities and Participation component categories were pre-selected so that they could be used to describe aspects of the functionality of health conditions in SLP. Contents compatible with these categories were identified in the reports. In this study, the use of qualifiers was restricted to .0 for absence of impairment and .8 for presence of impairment, without specification of degree. Data that were not described in the reports were excluded, as well as the categories that did not apply to the medical records analyzed. After this stage, 47 categories were identified: 13 of the Body Functions component and 34 of the Activities and Participation component. For the latter, a choice was made to maintain the possibility of using different qualifiers for Performance and Capacity. Descriptive analysis of the categories identified was performed through frequency distribution.

Factor analysis was performed with the objective of reducing the number of selected categories in factors that could validly represent more than one category simultaneously, in addition to defining the response variables. The number of factors selected

occurred according to the parallel analysis criterion, performed using Varimax rotation, and to the method of extracting the main components by the tetrachoric correlation matrix, which is suitable for categorical data. To analyze the quality and validity of the indicators, reliability and convergent validities were verified, considering Average Variance Extracted (AVE) >50%. Cronbach's Alpha (CA) and Composite Reliability (CR) >0.70 were used to measure construct reliability. Finally, a Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy  $\geq 0.50$  was applied, which indicates whether the proportion of data variance can be considered common to all variables. Each factor was composed of a score, standardized to range from 0 to 1, and able to evaluate whether the categories of the Body Functions and Activities and Participation components represented a disability or not, or a difficulty or not. The higher the score value, i.e., closer to 1, the greater the number of functions in which there is impairment, or the greater the existing difficulty. It is worth noting that the categories of the ICF-CY<sup>(9)</sup> that presented a percentage of missing data >10% in the frequency analysis were not used in the multivariate analyses.

In order to verify the existence of associations between response variables (factors created to represent the dimensions of the Body Functions and Activities and Participation components) and explanatory variables (sociodemographic and health care), the Mann-Whitney and Kruskal-Wallis statistical tests were used, in addition to the Spearman's correlation. A significance level of 5% was adopted for all statistical analyses.

All data were input in an Excel® spreadsheet created by the researchers and analyzed using the R 3.3.1 software. This study was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais (UFMG) under protocol no. 1.174.646, and the request for waiver of an Informed Consent Form (ICF) for its realization was also approved.

## RESULTS

The categories of the memory, perceptual and basic cognitive functions and of the language, hearing, voice, articulation, respiration and ingestion mental functions were used to construct the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) Body Functions component indicators, because the others presented >10% missing data. In addition, medical records with missing data were also removed from the sample. Thus, the medical records of 148 patients were analyzed.

For the ICF-CY Activities and Participation component, frequency distribution analysis was performed in categories that presented the Capacity and Performance qualifiers. For both qualifiers, the categories with >10% missing data, number of individuals with or without difficulty <5, that is, with very low variability, or with homogeneity among the participants, thus making the results unrealistic, were not used in the multivariate analyses. Therefore, the variables selected in the Capacity qualifier were acquiring concepts and managing one's own behavior. In the Performance qualifier, the following variables were selected: managing one's own behavior, complex interpersonal interactions, informal social relationships, family relationships, and school education. Thus, the sample for analysis consisted of 141 medical records.

According to the parallel analysis criterion, two dimensions in the Body Functions component were evidenced and two factors were retained in the factor analysis. Factor 1, named Language/Speech/Hearing, was formed by the memory, perceptual, articulation and basic cognitive functions and by the language and hearing mental functions. Factor 2, named Motricity/Voice, was formed by the voice, ingestion and respiration functions (Table 1).

**Table 1. Factor loadings and commonality for the ICF-CY Body Functions and Activities and Participation component categories**

	ICF-CY categories	Factor 1	Factor 2	Factor 3	Commonality
<b>Body Functions</b>					
<b>Factor 1 - Language/Speech/ Hearing</b>	Memory functions	0.71	0.08	x	0.51
	Perceptual functions	0.79	0.23	x	0.67
	Basic cognitive functions	0.87	-0.17	x	0.78
	Mental functions of Language	0.80	0.24	x	0.69
	Hearing	0.50	-0.30	x	0.34
<b>Factor 2 - Motricity/Voice</b>	Articulation	0.44	0.10	x	0.21
	Voice functions	0.18	0.53	x	0.32
	Respiration functions	-0.04	0.79	x	0.63
	Ingestion functions	0.05	0.82	x	0.67
<b>Activities and Participation</b>					
<b>Factor 1 - Socializing</b>	Managing one's own behavior				
	- Capacity	0.66	0.29	-0.12	0.53
	- Performance	0.85	0.06	0.06	0.74
<b>Factor 2 - Acquiring concepts</b>	Complex interpersonal interactions - Performance	0.79	-0.30	0.15	0.73
	Informal social relationships -	0.75	0.00	0.45	0.78
<b>Factor 3 - Family/Education</b>	Acquiring concepts - Capacity	0.00	0.90	-0.01	0.82
	Family relationships - Performance	0.20	0.40	0.73	0.73
	School education - Performance	0.00	-0.25	0.77	0.65

As for the Activities and Participation component, three factors were evidenced and retained. Factor 1, named Socializing, because of the development process by which children learn to obey the norms of society and behave in a socially acceptable manner<sup>(10)</sup>, was formed by managing one's own behavior (Capacity and Performance), complex interpersonal interactions (Performance), and informal social relationships (Performance). Factor 2 was formed only by the ability to acquire concepts, and its name remained as Acquiring concepts. Factor 3, Family/School, was formed by family relationships and school education (Performance) (Table 1).

Validation analyses were performed for all factors, except for Factor 2 of the Activities and Participation component,

because it was formed by only one category. Convergent validation was verified for the factors analyzed, because they presented values of average variance extracted (AVE) >0.40%, composite reliability (CR) >0.60 and Kaiser-Meyer-Olkin (KMO) >0.50, reaching the required levels of reliability and adequate adjustment. It is worth noting that the grouping of variables in each factor occurred because of the correlation existing between them, aiming to synthesize them in a single variable capable of representing the characteristics of all factors (Table 1).

Table 2 shows the results of the statistical association considering the two factors generated according to the Body Functions component and the sociodemographic explanatory variables.

**Table 2.** Comparison between the Language/Speech/Hearing and Motricity/Voice factors of the ICF-CY Body Functions component and the sociodemographic explanatory variables

Explanatory variables	Language/Speech/Hearing			Motricity/Voice		
	Mean	SE	p-value	Mean	SE	p-value
<b>Gender</b>						
Female	0.42	0.04	0.501 <sup>1</sup>	0.32	0.05	0.301 <sup>1</sup>
Male	0.38	0.03		0.38	0.03	
<b>Patient education level</b>						
Early childhood education	0.41	0.08	0.038 <sup>2</sup>	0.32	0.09	0.764 <sup>2</sup>
Incomplete elementary school	0.40	0.02		0.37	0.03	
Incomplete high school	0.04	0.04		0.42	0.11	
<b>Mother education level</b>						
No schooling/Elementary school	0.42	0.04	0.239 <sup>2</sup>	0.32	0.04	0.322 <sup>2</sup>
High school	0.41	0.04		0.35	0.04	
Higher education	0.29	0.05		0.48	0.10	
<b>Father education level</b>						
No schooling/Elementary school	0.39	0.03	0.744 <sup>2</sup>	0.28	0.04	0.039 <sup>2</sup>
High school	0.37	0.05		0.36	0.05	
Higher education	0.41	0.07		0.55	0.13	
<b>Place of residence</b>						
Belo Horizonte	0.36	0.03	0.389 <sup>2</sup>	0.35	0.04	0.368 <sup>2</sup>
Metropolitan region	0.42	0.04		0.35	0.04	
Others (interior of the state)	0.43	0.10		0.55	0.13	
<b>Age (in years)</b>						
r - p-value	-0.29		0.000 <sup>3</sup>	0.05		0.557 <sup>3</sup>
<b>N of siblings</b>						
r - p-value	0.18		0.030 <sup>3</sup>	-0.02		0.847 <sup>3</sup>
<b>N of rooms in the house</b>						
r - p-value	-0.23		0.006 <sup>3</sup>	-0.09		0.273 <sup>3</sup>
<b>N of people in the house</b>						
r - p-value	0.17		0.036 <sup>3</sup>	-0.14		0.097 <sup>3</sup>
<b>Family income (in minimum wages)</b>						
r - p-value	-0.16		0.068 <sup>3</sup>	-0.04		0.609 <sup>3</sup>

**Captions:** N = Number; SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation

Table 3 presents the statistical analysis results of the association between these indicators and the health care explanatory variables.

Statistically significant difference was observed between Factor 1 of the Body Functions component, Language/Speech/Hearing, and the sociodemographic variables patient education level, age, number of siblings, number of rooms in the house,

and number of people in the house. The more advanced the age ( $r=-0.29$ ) and the larger the number of rooms in the house ( $r=-0.23$ ), the smaller the number of functions with problem, with very weak correlations. The larger the number of siblings ( $r=0.18$ ) and the number of people in the house ( $r=0.17$ ), the higher the indicator score, i.e., the larger the number of altered functions, also with weak correlations (Table 2).

**Table 3.** Comparison between the Language/Speech/Hearing and Motricity/Voice factors of the ICF-CY Body Functions component and the health care explanatory variables

Explanatory variables	Language/Speech/Hearing			Motricity/Voice			
	Mean	SE	p-value	Mean	SE	p-value	
<b>Previous issues</b>							
Complications in childhood	Yes	0.44	0.04	0.233 <sup>1</sup>	0.41	0.05	0.624 <sup>1</sup>
	No	0.37	0.03		0.34	0.03	
<b>Complaints</b>							
Changes in oral language acquisition/development	Yes	0.42	0.08	0.520 <sup>1</sup>	0.33	0.11	0.871 <sup>1</sup>
	No	0.39	0.02		0.36	0.03	
Reading and writing changes/school difficulties	Yes	0.39	0.03	0.763 <sup>1</sup>	0.35	0.04	0.725 <sup>1</sup>
	No	0.41	0.04		0.36	0.04	
Speech changes	Yes	0.46	0.03	0.004 <sup>1</sup>	0.38	0.04	0.464 <sup>1</sup>
	No	0.32	0.03		0.33	0.04	
Fluency changes	Yes	0.37	0.08	0.666 <sup>1</sup>	0.46	0.10	0.281 <sup>1</sup>
	No	0.40	0.02		0.34	0.03	
Orofacial motricity changes	Yes	0.33	0.05	0.198 <sup>1</sup>	0.53	0.06	0.001 <sup>1</sup>
	No	0.41	0.03		0.31	0.03	
Swallowing changes/dysphagia	Yes	0.26	0.21	0.368 <sup>1</sup>	0.67	0.33	0.259 <sup>1</sup>
	No	0.40	0.02		0.35	0.03	
Voice changes	Yes	0.34	0.08	0.694 <sup>1</sup>	0.54	0.14	0.142 <sup>1</sup>
	No	0.40	0.02		0.34	0.03	
Hearing changes	Yes	0.37	0.08	0.574 <sup>1</sup>	0.37	0.11	0.830 <sup>1</sup>
	No	0.40	0.02		0.35	0.03	
Auditory processing changes	Yes	0.00	x	0.119 <sup>1</sup>	0.00	x	0.240 <sup>1</sup>
	No	0.40	0.02		0.36	0.03	
Social interaction issues	Yes	0.41	0.04	0.336 <sup>1</sup>	0.45	0.06	0.026 <sup>1</sup>
	No	0.39	0.03			0.03	
<b>Person responsible for the complaint</b>							
Parents or other family members		0.40	0.02		0.36	0.03	
Health professionals		0.33	0.09		0.42	0.11	0.386 <sup>2</sup>
School		0.25	0.07		0.5	0.13	
<b>Professional who referred the patient</b>							
Pediatrician		0.46	0.04		0.34	0.05	
Psychiatrist		0.37	0.05		0.37	0.07	0.780 <sup>2</sup>
Others		0.35	0.03		0.38	0.04	
<b>Diagnostic hypotheses</b>							
Changes in oral language acquisition/development	Yes	0.43	0.03	0.015 <sup>1</sup>	0.34	0.04	0.182 <sup>1</sup>
	No	0.33	0.03		0.40	0.04	
Changes in written language	Yes	0.39	0.03	0.708 <sup>1</sup>	0.37	0.03	0.888 <sup>1</sup>
	No	0.39	0.04		0.35	0.05	
Changes in cognitive aspects of language	Yes	0.55	0.03	0.000 <sup>1</sup>	0.42	0.04	0.111 <sup>1</sup>
	No	0.25	0.02		0.32	0.04	
Speech changes	Yes	0.54	0.04	0.000 <sup>1</sup>	0.42	0.05	0.169 <sup>1</sup>
	No	0.32	0.02		0.34	0.03	
Fluency changes	Yes	0.33	0.07	0.536 <sup>1</sup>	0.36	0.14	0.771 <sup>1</sup>
	No	0.40	0.02		0.36	0.03	
Orofacial motricity changes	Yes	0.41	0.03	0.410 <sup>1</sup>	0.51	0.04	0.000 <sup>1</sup>
	No	0.37	0.03		0.20	0.03	
Voice changes	Yes	0.43	0.04	0.235 <sup>1</sup>	0.57	0.04	0.000 <sup>1</sup>
	No	0.37	0.03		0.21	0.03	
Auditory processing changes	Yes	0.49	0.04	0.002 <sup>1</sup>	0.38	0.05	0.599 <sup>1</sup>
	No	0.35	0.03			0.03	

**Captions:** SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation

**Table 3.** Continuation...

Explanatory variables	Language/Speech/Hearing			Motricity/Voice		
	Mean	SE	p-value	Mean	SE	p-value
<b>Conduct</b>						
Reevaluation	Yes	0.14	0.03	0.120 <sup>1</sup>	0.13	0.13
	No	0.40	0.02			
Guidance to person responsible	Yes	0.29	0.05	0.055 <sup>1</sup>	0.47	0.08
	No	0.41	0.03			
Complete evaluation of auditory processing	Yes	0.48	0.04	0.007 <sup>1</sup>	0.37	0.05
	No	0.35	0.03			
Speech-language Pathology therapy	Yes	0.40	0.02	0.010 <sup>1</sup>	0.37	0.03
	No	0.12	0.06			
Referral to other professionals	Yes	0.38	0.03	0.884 <sup>1</sup>	0.43	0.04
	No	0.40	0.03			

**Captions:** SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation

Regarding the health care variables, statistically significant difference was verified in the analyses with the complaint of speech changes, the diagnostic hypotheses of changes in oral language acquisition/development, cognitive aspects of language, speech and auditory processing, and with the conducts of complete evaluation of auditory processing and Speech-language Pathology (SLP) therapy (Table 3). In the analyses performed with Factor 2, Motricity/Voice, statistically significant difference was found only in relation to the sociodemographic variable

father education level (Table 2). The health care variables were associated with the following indicators: the complaints of changes in orofacial motricity (OM) and social interaction issues, the diagnostic hypotheses of changes in OM and voice, and with the conduct referral to other professionals (Table 3).

Table 4 shows the results of the association analysis performed between the three indicators generated by the categories of the Activities and Participation component and the sociodemographic explanatory variables.

**Table 4.** Comparison between the Socializing, Acquiring concepts and Family/School factors of the ICF-CY Activities and Participation component and the sociodemographic explanatory variables

Explanatory variables	Socializing			Acquiring concepts			Family/School		
	Mean	SE	p-value	Mean	SE	p-value	Mean	SE	p-value
<b>Gender</b>									
Female	0.13	0.03	0.078 <sup>1</sup>	0.13	0.05	0.148 <sup>1</sup>	0.29	0.05	0.301 <sup>1</sup>
Male	0.22	0.03		0.24	0.04		0.33	0.03	
<b>Patient education level</b>									
Early childhood education	0.19	0.08	0.694 <sup>2</sup>	0.20	0.13	0.875 <sup>2</sup>	0.10	0.07	0.022 <sup>2</sup>
Incomplete elementary school	0.19	0.02		0.21	0.04		0.34	0.03	
Incomplete high school	0.00	x		0.00	x		0.00	x	
<b>Mother education level</b>									
No schooling/Elementary school	0.21	0.04	0.312 <sup>2</sup>	0.25	0.06	0.317 <sup>2</sup>	0.40	0.04	0.036 <sup>2</sup>
High school	0.18	0.03		0.18	0.05		0.28	0.04	
Higher education	0.10	0.06		0.08	0.08		0.19	0.07	
<b>Father education level</b>									
No schooling/Elementary school	0.20	0.03	0.470 <sup>2</sup>	0.19	0.05	0.957 <sup>2</sup>	0.40	0.04	0.000 <sup>2</sup>
High school	0.16	0.04		0.18	0.06		0.24	0.05	
Higher education	0.08	0.05		0.14	0.14		0.00	0.00	
<b>Place of residence</b>									
Belo Horizonte	0.20	0.03	0.368 <sup>2</sup>	0.16	0.04	0.2582	0.37	0.04	0.037 <sup>2</sup>
Metropolitan region	0.18	0.04		0.27	0.06		0.24	0.03	
Others (interior of the state)	0.10	0.05		0.13	0.13		0.44	0.15	
<b>Age (in years)</b>									
r - p-value	0.03		0.707 <sup>3</sup>	-0.13		0.2582	0.27		0.001 <sup>3</sup>
<b>N of siblings</b>									
r - p-value	0.02		0.778 <sup>3</sup>	0.08		0.847 <sup>3</sup>	0.12		0.162 <sup>3</sup>
<b>N of rooms in the house</b>									
r - p-value	-0.10		0.255 <sup>3</sup>	-0.11		0.355 <sup>3</sup>	0.00		0.970 <sup>3</sup>

**Captions:** N = Number; SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation

**Table 4.** Continuation...

Explanatory variables	Socializing			Acquiring concepts			Family/School		
	Mean	SE	p-value	Mean	SE	p-value	Mean	SE	p-value
<b>N of people in the house</b>									
r - p-value	0.04		0.626 <sup>3</sup>	0.05		0.542 <sup>3</sup>	-0.01		0.867 <sup>3</sup>
<b>Family income (in minimum wages)</b>									
r - p-value	0.17		0.054 <sup>3</sup>	-0.05		0.603 <sup>3</sup>	0.03		0.739 <sup>3</sup>

**Captions:** N = Number; SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation

Table 5 presents the analysis of the association between these indicators and the health care explanatory variables. The reassessment approach was not included in the multifactorial analysis because of the homogeneity of answers verified in the 141 medical records.

In the association analysis, statistically significant difference was observed between Factor 1 of the Activities and Participation component, Socializing, and the complaints of social interaction issues and the diagnostic hypothesis of changes in cognitive aspects of language. For Factor 2, Acquiring concepts, statistically significant difference was found for the complaints of changes in speech and social

interaction issues and the diagnostic hypotheses of changes in cognitive aspects of language and OM. Finally, for Factor 3, Family/School, statistically significant difference was verified for the variables patient education level, parental education level, place of residence, and age. The more advanced the age ( $r=0.27$ ), the higher the indicator score, with weak correlation (Table 4). Regarding the health care variables, there was statistically significant association with the complaints of changes in reading and writing/school difficulties, absence of speech changes and professional who referred the patient and the diagnostic hypotheses of changes in written language and absence of changes in OM (Table 5).

**Table 5.** Comparison between the Socializing, Acquiring concepts and Family/School factors of the ICF-CY Activities and Participation component and the health care explanatory variables

Explanatory variables		Socializing			Acquiring concepts			Family/School		
		Mean	SE	p-value	Mean	SE	p-value	Mean	SE	p-value
<b>Previous issues</b>										
Complications in childhood	Yes	0.21	0.04	0.599 <sup>1</sup>	0.23	0.06	0.664 <sup>1</sup>	0.36	0.04	0.242 <sup>1</sup>
	No	0.17	0.03		0.20	0.04		0.30	0.03	
<b>Complaints</b>										
Changes in oral language acquisition/development	Yes	0.13	0.08	0.395 <sup>1</sup>	0.00	0.00	0.144 <sup>1</sup>	0.19	0.09	0.167 <sup>1</sup>
	No	0.20	0.02		0.22	0.04		0.34	0.03	
Reading and writing changes/school difficulties	Yes	0.21	0.03	0.362 <sup>1</sup>	0.19	0.04	0.709 <sup>1</sup>	0.42	0.03	0.000 <sup>1</sup>
	No	0.16	0.04		0.22	0.06		0.18	0.04	
Speech changes	Yes	0.17	0.03	0.435 <sup>1</sup>	0.31	0.06	0.001 <sup>1</sup>	0.28	0.04	0.027 <sup>1</sup>
	No	0.22	0.04		0.08	0.03		0.39	0.04	
Fluency changes	Yes	0.07	0.05	0.098 <sup>1</sup>	0.27	0.14	0.554 <sup>1</sup>	0.18	0.08	0.087 <sup>1</sup>
	No	0.20	0.02		0.20	0.04		0.34	0.03	
Orofacial motricity changes	Yes	0.20	0.04	0.436 <sup>1</sup>	0.18	0.07	0.721 <sup>1</sup>	0.23	0.05	0.062 <sup>1</sup>
	No	0.19	0.03		0.21	0.04		0.36	0.03	
Swallowing changes/dysphagia	Yes	0.27	0.01	0.409 <sup>1</sup>	0.00	0.00	0.482 <sup>1</sup>	0.25	0.25	0.731 <sup>1</sup>
	No	0.19	0.02		0.21	0.04		0.33	0.03	
Voice changes	Yes	0.27	0.10	0.431 <sup>1</sup>	0.00	0.00	0.144 <sup>1</sup>	0.38	0.08	0.554 <sup>1</sup>
	No	0.19	0.02		0.22	0.04		0.33	0.03	
Hearing changes	Yes	0.22	0.08	0.710 <sup>1</sup>	0.25	0.13	0.677 <sup>1</sup>	0.38	0.09	0.589 <sup>1</sup>
	No	0.19	0.02		0.20	0.04		0.33	0.03	
Auditory processing changes	Yes	0.74	x	0.111 <sup>1</sup>	0.00	x	0.627 <sup>1</sup>	0.50	x	0.518 <sup>1</sup>
	No	0.19	0.02		0.21	0.04		0.33	0.03	

**Captions:** SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation.

**Table 5.** Continuation...

Explanatory variables		Socializing			Acquiring concepts			Family/School		
		Mean	SE	p-value	Mean	SE	p-value	Mean	SE	p-value
Social interaction issues	Yes	0.30	0.04	0.000 <sup>1</sup>	0.37	0.08	0.003 <sup>1</sup>	0.37	0.05	0.417 <sup>1</sup>
	No	0.15	0.03		0.14	0.04		0.32	0.03	
<b>Person responsible for the complaint</b>										
Parents or other family members		0.19	0.02		0.21	0.04		0.33	0.03	
Health professionals		0.19	0.09	0.942 <sup>2</sup>	0.20	0.13	0.769 <sup>2</sup>	0.15	0.08	0.112 <sup>2</sup>
School		0.14	0.14		0.00	0.00		0.50	0.00	
<b>Professional who referred the patient</b>										
Pediatrician		0.19	0.04		0.22	0.06		0.23	0.05	
Psychiatrist		0.22	0.05	0.523 <sup>2</sup>	0.19	0.07	0.875 <sup>2</sup>	0.50	0.05	0.000 <sup>2</sup>
Others		0.17	0.03		0.18	0.05		0.50	0.04	
<b>Diagnostic hypotheses</b>										
Changes in oral language acquisition/development	Yes	0.20	0.03	0.650 <sup>1</sup>	0.25	0.05	0.080 <sup>1</sup>	0.32	0.03	0.922 <sup>1</sup>
	No	0.18	0.04		0.13	0.05		0.32	0.04	
Changes in written language	Yes	0.20	0.03	0.354 <sup>1</sup>	0.20	0.04	0.903 <sup>1</sup>	0.36	0.03	0.001 <sup>1</sup>
	No	0.14	0.04		0.21	0.08		0.16	0.05	
Changes in cognitive aspects of language	Yes	0.24	0.03	0.021 <sup>1</sup>	0.36	0.06	0.000 <sup>1</sup>	0.33	0.04	0.771 <sup>1</sup>
	No	0.15	0.03		0.07	0.03		0.31	0.04	
Speech changes	Yes	0.20	0.04	0.996 <sup>1</sup>	0.30	0.07	0.061 <sup>1</sup>	0.26	0.05	0.087 <sup>1</sup>
	No	0.18	0.03		0.16	0.04		0.35	0.03	
Fluency changes	Yes	0.23	0.12	0.744 <sup>1</sup>	0.29	0.18	0.597 <sup>1</sup>	0.14	0.09	0.107 <sup>1</sup>
	No	0.19	0.02		0.20	0.04		0.33	0.03	
Orofacial motricity changes	Yes	0.17	0.03	0.502 <sup>1</sup>	0.27	0.05	0.039 <sup>1</sup>	0.27	0.04	0.039 <sup>1</sup>
	No	0.21	0.03		0.13	0.04		0.37	0.03	
Voice changes	Yes	0.23	0.04	0.079 <sup>1</sup>	0.24	0.06	0.474 <sup>1</sup>	0.29	0.04	0.362 <sup>1</sup>
	No	0.16	0.03		0.19	0.04		0.34	0.03	
Auditory processing changes	Yes	0.23	0.04	0.177 <sup>1</sup>	0.21	0.06	0.946 <sup>1</sup>	0.30	0.04	0.702 <sup>1</sup>
	No	0.17	0.03		0.20	0.04		0.33	0.03	
<b>Conduct</b>										
Guidance to the person responsible	Yes	0.27	0.09	0.415 <sup>1</sup>	0.07	0.07	0.194 <sup>1</sup>	0.39	0.08	0.302 <sup>1</sup>
	No	0.18	0.02		0.22	0.04		0.31	0.03	
Complete evaluation of auditory processing	Yes	0.19	0.04	0.550 <sup>1</sup>	0.27	0.07	0.187 <sup>1</sup>	0.30	0.05	0.477 <sup>1</sup>
	No	0.19	0.03		0.18	0.04		0.33	0.03	
Speech-language Pathology therapy	Yes	0.19	0.02	0.699 <sup>1</sup>	0.21	0.04	0.478 <sup>1</sup>	0.31	0.03	0.074 <sup>1</sup>
	No	0.10	0.10		0.00	0.00		0.75	0.25	
Referral to other professionals	Yes	0.21	0.04	0.351 <sup>1</sup>	0.28	0.06	0.130 <sup>1</sup>	0.34	0.04	0.493 <sup>1</sup>
	No	0.18	0.03		0.17	0.04		0.31	0.03	

**Captions:** SE = Standard Error; <sup>1</sup> - Mann-Whitney test; <sup>2</sup> - Kruskal-Wallis test; <sup>3</sup> - Spearman's Correlation.

## DISCUSSION

Speech-language Pathology (SLP) evaluation processes should include the association analysis between communication functionality and sociodemographic and health care aspects, promoting more comprehensive knowledge from a biopsychosocial perspective. Among the analyses performed in this study, there were associations of statistical relevance for the factors related to the Body Functions component, both for sociodemographic and health care variables. Regarding the Activities and Participation component, only Factor 3, School/Family, was associated with sociodemographic variables. This result may be justified by the greater influence that education level, both of the parents and the individual, associated with family and educational contexts, exerted on the categories of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY).

The structuring of Factor 1, Language/Speech/Hearing, of the Body Functions component is justified by the fact that communication disorders can be characterized as a deficit in the ability to acquire or organize symbols at the levels of hearing, language and speech, or in any processes involving them<sup>(11)</sup>.

In the association analysis with the sociodemographic variables, higher scores of Factor 1 were observed among patients with early childhood and incomplete elementary school education levels. These results may be related to the greater attention given to language and speech development during the first years of formal education and to the investigation of possible hearing difficulties<sup>(12)</sup> (Table 2). It was also verified that the more advanced the age and the larger the number of rooms in the house, the lower the indicator score, or the lower the number of altered functions. Previous studies have shown that younger children are more likely to present speech disorders<sup>(13)</sup> and oral language changes compared with older children<sup>(14)</sup>. Studies on Public Health indicated that the number of rooms in the house is closely linked to socio-environmental and socioeconomic family issues<sup>(15)</sup>, and that it is associated with a larger number of available resources.

Results show that the larger the number of siblings and people in the house, the higher the Factor 1 score (Table 2). A similar result for the variable number of children was observed in a study that found higher average scores of family stimulation for the first, or even second, child born and among those who did not share the family environment with children under five years old<sup>(16)</sup>. It can be inferred that less attention is given to children and adolescents when there are a large number of people in the home environment.

Concerning the health care variables, Factor 1, which is formed by categories related to Language/Speech/Hearing, presented associations with complaints and diagnostic hypotheses similar to them: the complaints of speech changes and the hypotheses of changes in oral language acquisition/development, cognitive aspects of language, and speech. Language is the effective exchange of information (reception and emission), whereas speech refers to the articulation of sounds, including aspects of vocal production and fluency. In order to occur, both processes need a healthy hearing function that enables access to oral language<sup>(11)</sup>. That result reflects the interrelation between the aspects of language, speech, hearing, cognition and others,

aiming at effective communication (Table 3). It was also verified an association of Factor 1 with the existence of the diagnostic hypothesis of changes in auditory processing and the conduct of complete SLP evaluation. A systematic literature review conducted in 2016 observed that the analyzed studies showed the existence of links between auditory and language processing impairments<sup>(17)</sup>. In view of these findings, the complete SLP evaluation of auditory processing is justified (Table 3). As a conduct, SLP therapy is also valid in cases in which the communication function is impaired, with great benefits when individuals are compared pre- and post-intervention<sup>(18)</sup>.

In relation to Factor 2 of the Body Functions component, Motricity/Voice, association was verified with parental education level in higher education, which is justified by the fact that parents with a higher schooling level can seek evaluation for specific changes in orofacial motricity (OM) and voice, which may stand out less to the detriment of others, such as speech or language. A different result was verified in a study that found no association between these factors, although its sample also showed the highest percentage of patients with changes in Motricity in children of parents with higher education. These authors reported that this result may have occurred because of the homogeneity of their sample<sup>(19)</sup>. The higher scores associated with individuals with the complaint of social interaction issues reflect the influence that changes in Motricity/Voice, or others related to communication, can exert on relations with the environment, influencing aspects such as social inclusion and ascension<sup>(13)</sup>. The association between the Motricity/Voice factor and complaints and diagnostic hypotheses of Motricity/Voice is justified by the complementarity of these areas<sup>(20)</sup> (Table 5). The sounds produced by the vocal folds are articulated by the articulatory organs within a source and filter process<sup>(20)</sup>, providing effective communication<sup>(14)</sup>. Regarding changes, studies have addressed the associations between oral breathing and cases of dysphonia<sup>(21)</sup>, considering that an inadequate breathing pattern can cause laryngeal compensation, such as exertion<sup>(20)</sup>. Given the direct relationship between OM and voice and changes that affect both, the association with the conduct of referral to other professionals is plausible due to a demand, for example, for ear, nose and throat (ENT) evaluation.

As for Factor 1 of the Activities and Participation component, Socializing, the highest scores occurred among patients with the complaint of social interaction issues and the diagnostic hypothesis of changes in cognitive aspects of language (Table 5). With respect to social interaction, scholars of human development have reported that the socialization process occurs from the age of two years, and that character will be a decisive factor for community living skills. Introverted and shy children will have processes of socialization and social interaction different from those with an extroverted personality<sup>(10)</sup>. The cognitive aspects of language, in turn, may be altered in patients with issues associated with Socializing due to the influence of the environment, especially the family. The family is responsible for mediating between children and society, enabling their integration, which is essential for their cognitive development<sup>(16)</sup>.

With regards to Factor 2, Acquiring concepts, the analyses showed higher scores among patients with the complaints of

changes in speech and social interaction issues, in addition to the diagnostic hypotheses of changes in cognitive aspects of language and OM (Table 5). In fact, the development of speech within communication development demands the acquisition of concepts related to the form and structure of spoken language, which may be altered together with other concepts not properly acquired. The occurrence of breaks in social interaction can also be detrimental to the acquisition of concepts, because the processes that constitute this interaction contribute so that children can develop their perception and guide and control their behavior<sup>(16)</sup>. Finally, cognitive skills are factors that can interfere with processes of acquiring concepts or functions such as language. The pre-, peri- and post-natal history and the social and familial contexts of the individual also stand out as intervening factors<sup>(11)</sup>.

The influence that the school and family environments have on the life of developing individuals is described in the literature<sup>(22)</sup>, justifying the occurrence of categories more related to both environments, such as those that generated the last factor of the Activities and Participation component.

Family/School presented higher scores among older patients who attended elementary school, lived in the interior of the state, and with parents without inclusion in formal education, or with elementary school level (Table 4). The associations with the variables education level and age can be explained by the fact that individuals with elementary school level or older individuals present greater school demands related to reading and formal teaching of written language and its rules. No studies justifying the higher scores verified for patients living in the interior of the state were found in the literature. However, it is believed that greater knowledge about the environment in which the patient is inserted, covering issues of technological, geographic, social and political influence, would enable the understanding of the possible causes of activity limitations and social participation restrictions<sup>(3)</sup>.

Parental education level is a variable often researched because children can receive protection or live with risks for their development within the family environment, generating losses in aspects of language, memory and social skills<sup>(16)</sup>. A study observed that having mothers with >5 years of education was positively associated with better organization of the child's physical and temporal environment and availability of appropriate materials and games, providing greater variation in daily stimulation<sup>(16)</sup>. In another study, an inversely proportional relationship was observed between parental education level and the occurrence of speech disorders in children<sup>(13)</sup>. Results of the present study corroborate these findings.

Regarding the health care variables, the Family/School dyad was associated not only with the complaints of changes in reading and writing/school difficulties, but also with the diagnostic hypothesis of changes in written language (Table 5). The role played by the family in the processes of meaning of functions and uses of written language indicates the need to have interventions aimed at the relatives of schoolchildren<sup>(23)</sup>. In a study conducted with relatives of children referred by educators to evaluation, almost 1/3 of the complaints were related to writing and approximately 1/4 were relative to reading and cognitive aspects; conversely,

issues associated with school performance and psychological/behavioral aspects were less frequently mentioned. When asked about the cause of the difficulties, nearly half of the family members focused on the child, and only one interviewee mentioned aspects related to school<sup>(23)</sup>.

In contrast, the largest number of referrals from psychiatrists to evaluation (Table 5) is justified by the fact that the outpatient clinic where this study was conducted receives patients who tend to present a larger number of complaints and more complex issues, or that were not solved in Primary Health Care (PHC). Differently from the results of this study, a survey conducted with children aged 6-12 years with school complaints and who attended at a child psychology outpatient clinic showed that of the 103 participants, only 1% had been referred to the service by psychiatrists, although 11% of them were undergoing psychiatric treatment<sup>(24)</sup>. The existence of a school complaint may be associated with mental health problems, and in order for problems be correctly identified and treated, it is necessary to prepare health professionals to distinguish between them<sup>(24)</sup>. It is essential to build a safe and inter-relating system between family, school and health care in a comprehensive view also on personal factors that can influence functionality and communication skills.

Higher scores of the Family/School factor were also observed with respect to associations with absence of the complaint speech changes in the anamnesis description and absence of the hypothesis of changes in OM (Table 5). A study conducted with 1,810 first-grade students aged 5-12 years found changes in speech in 1,167 of them<sup>(13)</sup>. The results of the present study are in disagreement with this finding, because the absence of speech changes was a factor that negatively influenced the indicator score. The absence of the hypothesis of changes in OM also generated higher scores in this indicator, but no studies that could justify this fact have been found.

As advances, this study proposes the use of the ICF-CY to describe the functionality of aspects directly linked to SLP in children and youth, as well as the contextual factors that can interfere with them. In addition, the use of factor analysis was proposed in order to understand the applicability of the ICF in the context studied. Collection based on secondary data, in which losses in information and sample are inevitable, is a limitation to this study. It is worth noting that this survey used the ICF-CY published in Portuguese in 2011<sup>(9)</sup>, because its updated version (ICF 2015) was not available during the structuring period of this research.

## CONCLUSION

Through factor analysis, it was possible to construct two representative factors for the Body Functions component - referring to Language/Speech/Hearing and Motricity/Voice, and three representative factors for the Activities and Participation component - related to Socializing, Acquiring concepts and School/Family, of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY).

Statistically significant associations were found between sociodemographic and health care variables and the factors

constructed. These findings reinforce the need for a comprehensive look at both biological and physical aspects and environmental, social, family and personal issues. Among the health care variables, the results showed association between the indicators and the variables built with Speech-language Pathology (SLP) data, such as the type of complaint, the diagnostic hypotheses verified, and the conducts of choice, demonstrating not only the possibility of using the ICF and ICF-CY in SLP care, but also their importance. Moreover, at the authors' choice, because of the large volume of data analyzed, the categories related to the ICF-CY Environmental Factors were not included in the study. However, a similar study using factor analysis with variables associated with this component should be conducted, because it may provide relevant complementary information.

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## Authors contributions

*MGSB: literature review, collection and analysis of data, and writing, correction, formatting and approval of the manuscript; AMM and SMAL: study design and orientation, project construction, data analysis, and approval of the manuscript.*