Brazilian adaptation of the dizziness handicap inventory for the pediatric population: reliability of the results

Adaptação brasileira do *dizziness handicap inventory* para a população infantil: confiabilidade dos resultados

Maria da Glória Canto de Sousa[1], Orlanda Cruz[2], Amanda Nery Santos[3], Cristina Ganança[4], Leandro Almeida[5], Eduardo Pondé de Sena[1]

ABSTRACT

Purpose: To evaluate the reliability of the results in an adapted version of the Brazilian Dizziness Handicap Inventory (DHI) adapted for children. **Methods:** 1) semantic adaptation of DHI, first version, for child population; 2) appreciation of DHI by speech therapy judges for semantic appropriateness of the adapted version; application of the adapted version of DHI in 119 children with dizziness report; 4) application of DHI, adapted version, in 119 children suffering from dizziness symptoms; 5) test/re-test of 34 children. **Results:** In the group, there were higher average total scores in girls. There was no association between the scores of the Dizziness Handicap Inventory-Child/Adolescent (DHI-CA) and the age of the children. Adequate levels of internal consistency and stability of the results were verified in the full scale and the three subscales. **Conclusion:** DHI-CA appeared to be capable of reliably quantifying the impact of dizziness on quality of life of school-age children and adolescents, and the reliability of results is a first contribution to the validation of this instrument.

Keywords: Child; Questionnaire; Dizziness; Quality of life; Reproducibility

RESUMO

Objetivo: Avaliar a confiabilidade dos resultados numa versão adaptada do *Dizziness Handicap Inventory* (DHI) brasileiro para crianças. **Métodos:** (1) adaptação semântica do DHI, primeira versão, para população infantil; (2) apreciação do DHI por juízes fonoaudiólogos, para adequação semântica da versão adaptada; (3) aplicação do piloto em 15 indivíduos para ajustes semânticos; (4) aplicação da versão adaptada do DHI, em 119 crianças com relato de tontura; (5) teste-reteste de 34 crianças. **Resultados:** Com relação ao gênero, verificou-se médias mais elevadas do escore total nas crianças do gênero feminino. Não houve associação entre os escores do *Dizziness Handicap Inventory-Child/Adolescent* (DHI-CA) e a idade das crianças. Foram constatados índices adequados de consistência interna e estabilidade dos resultados na escala total e nas três subescalas. **Conclusão:** O *Dizziness Handicap Inventory-Child/Adolescent* mostrou-se confiável para quantificação do impacto da tontura na qualidade de vida das crianças e adolescentes em fase escolar, sendo a confiabilidade dos resultados uma primeira contribuição para a validação desse instrumento.

Descritores: Criança; Questionário; Tontura; Qualidade de vida; Reprodutibilidade

Study conducted at Universidade do Estado da Bahia – UNEB – Salvador (BA), Brazil, as part of the first author's thesis.
(1) Postgraduate Program in Interactive Processes of Agencies and Systems, Universidade Federal da Bahia – UFBA – Salvador (BA), Brazil.
(2) Faculty of Psychology and Educational Sciences, Universidade do Porto – FPCEUP – Porto (PT), Portugal.
(3) Universidade de Estado da Bahia – UNEB – Salvador (BA), Brazil.
(4) Universidade Federal de São Paulo – UNIFESP – São Paulo (SP), Brazil.
(5) Faculty of Education, Universidade do Minho – UMINHO – Braga (PT), Portugal.
Funding: Scholarship to support Doctoral studies, by means of *Programa de Apoio* à *Capacitação Docente (PAC),* Universidade do Estado da Bahia – UNEB; Scholarship of the Sandwich Doctoral Program, granted by the *Programa Ciências Sem Fronteiras*.
Conflict of interests: No
Authors' contribution: *MGCS* responsible for data collection, tabulation and analysis, and for review of the literature and writing the article; OC contributed to construction and review of the article, data analysis and treatment, in addition to helping with the discussion of the results; ANS responsible for data collection and tabulation; *CFG* cooperated with writing and reviewing the article; *LA* guided data analysis, construction and review of the article; *EPS* responsible for the study design, writing and review of the article.
Correspondence address: Maria da Glória Canto de Sousa. Universidade do Estado da Bahia, Clínica Jurandy Gomes do Aragão. R. Silveira Martins, 2555, Cabula, Salvador (BA), Brazil, CEP: 41150-000. E-mail: gcanto@uneb.br
Received on: 7/24/2015; **Accepted on:** 12/7/2015

INTRODUCTION

The balance of the body depends on information from the vestibular, visual and stomatosensory systems. It is a motor-sensory function, regulated by the central nervous system (CNS), that includes this information, coordinating eye and head movements to maintain a sharp image[1]. These functions are fundamental for increasing motor skills, enabling children to have full command of their body in different activities, such as jumping, running balancing on one leg, and writing, among others. Similarly, with children's learning and cognitive development being related to exploring the world around them, motor activity assumes particular relevance, and is associated with the awareness of themselves, perception of the body and objects, of space and time[2].

Imbalance and vertigo are the symptoms that most negatively affect the well-being of patients of both genders and different age-ranges[3]. Epidemiological studies with school-age children have shown that around 15% had experienced at least one episode of dizziness during the period of one year[1]. Various clinical studies about vestibulopathy in children have demonstrated agreement with regard to their primary causes. Nevertheless, the number of published investigations concerning children is a good deal lower than the number of publications about adults, revealing a certain negligence of the suffering caused by dizziness in the child population[4].

Vestibulopathy is a disorder that causes a series of signs and symptoms, such as lack of balance, changes in body posture and in motor coordination, dizziness, vertigo, nauseas and vomiting. It may affect children and adolescents[4] and interfere in psychological behavior and performance at school[1].

The incapacity caused by dizziness, whether in the emotional, functional, or physical domains, is most important in the social and personal context of patients, irrespective of its etiology, since it considerably affects their quality of life[5].

The self-reported measurements of the impact of symptoms on the quality of life offer advantage and may be an alternative to traditional measures based on symptoms. In clinical practice, the use of self-reported measurement assures that the evaluation and treatment are focused on the patient and not on the symptoms[6], pointing towards greater concern about quality of life.

With the concern about quantifying the interference of dizziness in the emotional, functional and physical domains that have repercussions on day to day activities, researchers[7] have drawn up the Dizziness Handicap Inventory (DHI). This is a self-report questionnaire with the purpose of measuring the incapacitating effects imposed by dizziness on quality of life. The purpose of using it is not only to diagnose but also to evaluate the effects of treatment[8]. The DHI was drawn up from the Hearing Handicap Inventory for Elderly (HHIE), an inventory designed for measuring the benefits derived from sound amplification by means of fitting older persons with hearing aids[7].

The DHI was developed in response to the lack o instruments for identifying functional, emotional and physical problems associated with compromised balance. Functional incapacity is manifested as the impossibility of performing basic tasks related to daily life in the professional, occupational and recreational fields. Emotional incapacity includes the psychological and/or psychiatric consequences resulting from organic problems, such as anxiety, depression or panic that alter the development of day to day activities. In turn, physical incapacity is defined as a set of disadvantages experienced by individuals as a functional and/or organic deterioration of one or more systems[5].

The original American version of the DHI[7] has been translated and adapted to various cultures, such as Persia[8], and countries such as Argentina[9], Brazil[10], Portugal[11], Bulgaria[12], Japan[13], Israel[14], Germany[15], Italy[16], France[17], Spain[18], China[19], Norway[20], Holland[21], Colombia[22], making it a widely accepted instrument[3]. However, there are no publications of the DHI in a version directed towards children, limiting its applicability by researchers in the child population.

Signs of vestibulopathy in childhood may manifest in the school environment, affecting children's performance, their ability to communicate, and psychological state in general. Similarly, it causes a series of changes ranging from lack of balance, changes in body posture and motor coordination, inability to perform coordinated movements, imprecise conception of their own spatial position, lack of ability to practice physical exercises, distorted feelings about their own body and surrounding objects, nauseas, vomiting and frequent falls during games involving movements, particularly the rotating type. Therefore, children with vestibular disturbance have greater difficulty in maintaining postural stability during reading, as this is a complex task requiring skills such as perception, eye movements, in addition to linguistic and semantic capacities[3].

Having assured the metric quality of the inventory, it may serve the objectives of evaluation and intervention in eventual interferences due to the presence of dizziness in children's processes of learning and performance at school, in addition to being useful for specialized diagnosis and therapies.

The aim of this study was to evaluate the reliability of the results of a Brazilian version adapted from the DHI , in school-age children, with the complaint of dizziness.

METHODS

A cross-sectional, descriptive study of an exploratory nature, developed in a Speech-Language Pathology and Audiology school-clinic, in the city of Salvador, Bahia, that was approved by the Research Ethics Committee of the *Universidade do Estado da Bahia*, Protocol No.179.799/2013. The authors committed themselves to using the information collected for scientific purposes only, keeping the patients' data confidential, in accordance with the rules of Resolution 466/12.

To conduct the study, authorization of the author of the original instrument, the Dizziness Handicap Inventory (DHI) was requested, and this was granted.

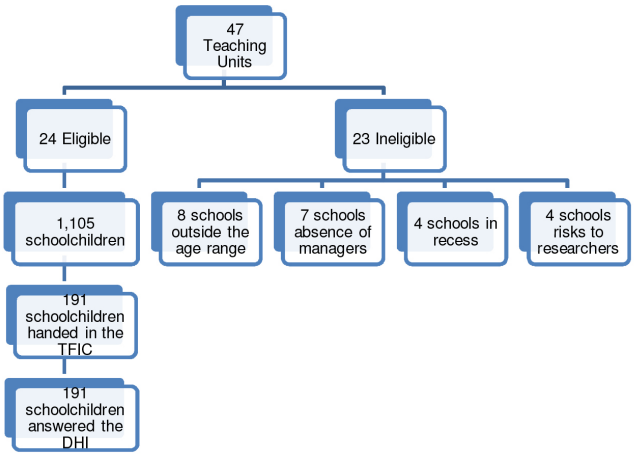
Based on consultation of the data of the Municipal Secretary of Education of the city of Salvador (BA), 47 school units were identified in the District of Cabula-Beiru, with schoolchildren in the age range from 6 to 14 years. The total number of children regularly enrolled in the teaching units during the study was 11,212. Formal authorization was obtained from the Coordinating Body for Teaching and Pedagogical Support [*Coordenadoria de Ensino e Apoio Pedagógico* (CENAP)] responsible for authorizing studies and researches within the scope of municipal education. After obtaining authorization, the directors of the school units were contacted in order to explain the purposes and objectives of the research, and signature of the Term of Institutional Authorization. Afterwards, the classrooms were visited to identify schoolchildren with dizziness. During the visits, the Term of Free and Informed Consent (TFIC) was delivered, addressed to the parents or guardians, for signature by those who agreed to their children's participation in the research. In addition, an explanatory leaflet was delivered, informing about dizziness and its repercussion on learning at school.

To participate in the study, the schoolchild had to present a report of dizziness of any type, whether it was a sensation of rotary movement, or not, and that accompanied the child from day to day irrespective of the frequency and intensity of episodes. At time of visits to the classrooms, the schoolchildren were asked about their knowledge of the symptom of dizziness, and explanations were given about its various possible manifestations and presence. Once the schoolchildren who presented the symptom were identified, they received the TFIC and explanatory leaflet to take to their parents or guardians to obtain the due authorization. It is emphasized that reports of dizziness of schoolchildren with isolated episodes were not considered. Thus, the TFICs were delivered to 1,105 schoolchildren with reports of dizziness, of whom 119 returned the signed term. Of the 47 teaching units in the Cabula-Beiru District, 24 participated in the study. The remainder were not visited for various reasons, namely: Absence of the managers from the unit; age-range lower than that of the study; or schools situated in very violent suburbs, making the visit unfeasible, and school in recess (Figure 1).

Once construction of the Dizziness Handicap Inventory-Child/Adolescent (DHI-CA) (Appendix 1) was concluded, the instrument was applied to each of the individuals by two duly trained scientific initiation scholarship holders, taking ten minutes, on an average. Data collection lasted eight months, and the re-test was performed with an interval of seven days after the first collection, in order to avoid changes in the general state of health of the individuals.

The methodological procedure consisted of five stages, namely:

1. Semantic adaptation of the DHI, first version, for the child population: the inventory adaptation study for this population began with suiting the items of vocabulary to those of school-age children and adolescents, from the version of DHI for adults, already translated into Brazilian Portuguese[10], thus dispensing with the process of retranslation, taken care of by the first author (MGCS). The concern was not to distort the meaning of the items, and at the same time, assure good understanding of the questions by the child population, from a semantic point of view.
2. Appreciation of the DHI by the speech-therapy audiology judges, for semantic suitability of the adapted version: after preparing the preliminary version, the questionnaire was sent to six speech-therapist audiologists, who performed the function of judges, with the purpose of verifying the interpretation and understanding by children and adolescents. Once agreement to participation in the study had been obtained, by means of signature of the TFIC, the speech-therapist audiologists analyzed the content of this preliminary version, evaluating understanding of the instrument as a whole and of each question separately. They had to answer the question: "Did you understand what was being asked?" by means of a Numerical Verbal Scale (NVS) that ranged between "0" ("I didn't understand anything") and "5" ("I understood perfectly and have no doubts"). It was established that responses 0, 1, 2 and 3 would be considered indicators of insufficient comprehension[23]. The mean result obtained was 4,8, corresponding to perfect understanding, and without doubts, so that it was only necessary to introduce a few alterations in the preliminary version. On conclusion, the authors approved this latter version.
3. Application of the pilot test fro semantic adjustments: the preliminary version was applied in a pilot test with 15 individuals with reports of dizziness, in order to assure equivalence to the original version with regard to metric aspects.



Note: TFIC = Term of Free and Informed Consent; DHI = Dizziness Handicap Inventory

Figure 1. Description of sample selection

4. Application of the adapted version of the DHI in children and adolescents with reports of dizziness: for the adequate evaluation of reliability, the adapted version of the DHI was applied in 119 individuals.
5. Application of the test-retest: the stability of scoring was evaluated by means of the test-retest method in 34 children and adolescents. For better analysis of the data, in the re-test the sample was stratified by age group. The retest was performed with 25 children from 6 to 10 years of age, and nine adolescents between 11 and 14 years of age.

Pilot study participants

The adapted version was applied in a pilot study composed of 15 individuals, with the aim of verifying whether the items were clear to the children. Of the research volunteers who returned the signed TFIC, the first 15 with reports of dizziness were selected. The researchers applied the DHI with the questions adapted to the child population, with the aim of verifying their understanding of the content of items. For this purpose, after each question read to the children and adolescents, the researcher broke down the question, in order to make sentences containing separate actions. Thus, the children and adolescents needed to understand each action, as well as the complete content and sense of the sentence. For example, there is the following question: Does lifting your head up worsen dizziness? From this question the following outcomes were obtained: Do you know what dizziness is? Do you know what lifting your head is? Do you know what up is? Do you know what worsen is? The individual had to respond "yes" or "no". Many did not understand what they were being asked, even with the use of metaphors to facilitate understanding of the questions. For example: "Because of the dizziness, do you have difficulty with getting up from the bed?" Some did not understand the word "difficulty", and it was necessary to use synonyms to achieve better understanding. After this strategy they were able to answer the due question. The same occurred in the question: "Because of dizziness, do you think you are unable to concentrate on your activities at school?" Some did not know exactly what the word "concentrate" meant. Therefore, it was necessary at time to use synonyms or paraphrase a question asked, in order to make each item understandable for some, particularly the younger children.

Thus, the Brazilian version of the DHI for children, adapted version, denominated Dizziness Handicap Inventory-Child/Adolescent (DHI-CA), was finalized (Appendix 1). In addition the authors developed a guiding script, to help with application of the instrument, facilitating the use of strategies for understanding the questions.

The Dizziness Handicap Inventory (DHI) instrument

The DHI is an instrument composed of 25 questions, organized into three subscales: Functional (nine items); Emotional (nine items); and Physical (seven items). The response scale varies between 0 ("no") and 4 ("yes"), in addition, contemplating the intermediate value 2 ("sometimes"). The maximum score for the physical subscale is 28 points; for Emotional, 36 points; and for Functional, 36 points, totaling 100 points[10]. Considering the total score, the degree of incapacity may be slight (0 to 30 points); moderate (30 to 60 points); or severe (over 60 points)[24]. Considering the emotional and functional subscales, the degree of incapacity may be nonexistent (0-14 points), reveal moderate deficiency (15 to 24 points), or severe deficiency (over 25 points). Considering the physical subscale, the degree of incapacity may be nonexistent (0-9 points), reveal moderate deficiency (10 to 16 points), or severe deficiency (over 17 points)[22]. Application of the instrument took about 10 to 15 minutes[7].

Statistical analysis

Descriptive statistical procedures were performed by means of central tendency measurements (mean) and dispersion (standard deviation, minimum and maximum), in addition to inferential, with a level of statistical significance of 5% ($p \leq 0.05$) being adopted.

For analysis of the internal consistency of the questions and reliability of the instrument, Chronbach Alpha statistics were used.

Reproducibility of the instrument was tested by means of the measurement of agreement of reapplication of the instrument. For this purpose, the correlation for the test-retest that occurred at two distinct times was calculated.

For analysis of the association between the scoring of the total scale and subscales, the Pearson correlation coefficient was calculated, and for analysis of the differences between the genders, the *t*-test was used.

For analysis of the results the program Statistical Package for the Social Sciences was used (SPSS) IBM® Statistics, version 21([Windows / MacOS] - Type of License: Campus/Site License - individual licenses - Authorization Code: 7469d1a2d9e2a1acd049).

RESULTS

As regards application of the questionnaire, the results corresponded to a total of 119 individuals, of whom 46 were of the male (38.7%) and 73 of the female gender (61.3%) The ages ranged from 6 to 14 years with a mean of 9.74 years (SD=1.70) (Table 1).

For the retest, a small group of these individuals (n=34) were selected, by convenience, of whom 14 were of the male (41%) and 20 of the female gender (59%), with ages ranging between 6 and 14 years (M=9.90, SD=1.70) (Table 2).

Statistical analysis of the results were indicated by

Table 1. Sample characterization, according to gender and age

Characteristics	n=119
Age	
Min-max	6 -14
Mean	9.74
Standard deviation	1.70
Gender - n (%)	
Male	46 (38.7%)
Female	73 (61.3%)

Note: Mín = minimum value; Max = maximum value

evaluation of reliability, in the first place always resorting to the study of internal consistency of the items (Chronbach Alpha). The indices obtained were shown to be adequate both in terms of the alpha for the total scale (α=0.84), and for each of the three subscales; although they were lower (α=0.70 for the emotional subscale; α=0.66 for the functional subscale; and α=0.62 for the physical subscale). These values were repeated in the stability study by means of the scores, by the rest-retest method, in an interval of seven days between the two applications. The stability study revealed moderate and elevated correlation values, with differences in the test-retest correlations, more concretely: r=0.72, p=0.000 for the total scale; r=0.50, p=0.003 or the functional subscale; r=0.52, p=0.002 or the emotional subscale; and r=0.69, p=0.000 or the physical subscale (Table 2).

Furthermore, as may be observed the mean total score was 54.34 points (SD=20.43), corresponding to a moderate level of incapacity. The emotional and functional subscales presented a mean score of 16.54 (SD=8.36) and 20.17 (SD=7.98) points,respectively, corresponding to a moderate degree of incapacity. Finally, the physical subscale presented a mean score of 13.85 (SD=6.53) points, corresponding to a severe degree of incapacity[23].

For appreciation of the differences in the means, according to gender, the t-test calculation for independent groups was made. Analysis of the results revealed that individuals of the female gender had higher values in the total scores, when compared with those of the male gender. Relative to the functional, emotional and physical subscales, the children of the female gender also presented higher values than those of the male gender, however, there was difference only in the emotional dimension (Table 2).

Lastly, in view of the study objectives, association was analyzed between the score of the total scale and in the subscales, and the age of the individuals. For the effect, the Pearson correlation coefficient was calculated, verifying the absence of association: r=0.01, p=0.90; r=0.04, p=0.71; r=0.04, p=0.70; r=-0.02, p=0.87, for the total score and functional, emotional and physical subscales, respectively.

To minimize the interference of the older adolescents of the female gender, who possibly were at the stage of puberty, the sample was stratified into two groups, namely: from 6 to 10 years and from 11 to 14 years. In the analysis of the results, of the 78 children that were in the age range from 6 to 10 years, 51 were of the female and 27 of the male gender. No difference was found between the genders as regards the subscale scores, even when the subscale scores were higher in children of the female gender. The sample of 39 children that were in the older age range from 11 to 14 years, was composed of 20 adolescents of the female and 19 of the male gender. Analysis of the results pointed towards similarities as regards the lower age-range, with respect to the scores in the subscales and total score of the instrument. However, a difference was observed in the emotional subscale scores, resulting from the higher mean in the subgroup of the female gender (Table 3).

Retest of the sample stratified by age was performed with 25 children in the age range from 6 to 10 years and nine adolescents aged from 11 to 14 years. The correlations were higher and favorable to reliability of the results of the instrument in younger children. The test-retest coefficients of correlation in the group of children between 11 and 14 year were lower, this may be explained by the lower heterogeneity of the group, by virtue of its reduced size (n=9).

DISCUSSION

The quality of life measurements are increasingly being recognized as important indicators of health, when evaluation the self-perception of the individual. Studies have revealed

Table 2. Distribution of DHI-CA Scores according to children's' gender

Subscales	Test				Reliability	Test-retest
	Female (n=73)	Male (n=46)		Total (n=119)	α (n=119)	*rest* (n=25)
	M (SD)	M (SD)	T (117)	M (SD)		
Emotional	17.92 (8.09)	14.35 (8.41)	2.31*	16.54 (8.36)	0.70	0.52*
Functional	20.99 (7.72)	18.87 (8.29)	1.42	20.17 (7.98)	0.66	0.50*
Physical	14.68 (6.61)	12.52 (0.97)	1.77	13.85 (6.53)	0.62	0.69*
Total	57.92 (19.86)	48.65 (0.81)	2.46*	54.34(20.43)	0.84	0.72*

*Significant values (p<0.05) Pearson Correlation Coefficient

Note: rest = test-retest coefficient of correlation; α = Cronbach's alpha

Table 3. Distribution of DHI-CA scores, according to gender and age groups from 6 t 10 years, and from 11 to 14 years

Subscales	Group of children from 6 to 10 years of age			
	Test			Test-retest
	Female (n=51)	Male (n=27)		rest (n=25)
	M (SD)	M (SD)	t (76)	
Emotional	17.76 (8.74)	14.81 (7.49)	1.49	0.70
Functional	21.25 (7.96)	18.81 (7.81)	1.30	0.60
Physical	15.06 (7.35)	12.74 (5.58)	1.43	0.70
Total	58.39 (21.56)	48.81 (17.70)	2.46	0.79
Subscales	Group of children from 11 to 14 years of age			
	Test			Test-retest
	Female (n=20)	Male (n=19)		rest (n=9)
	M (SD)	M (SD)	t (37)	
Emotional	18.50 (6.65)	13.68 (9.76)	1.81	0.63
Functional	20.40 (7.18)	18.95 (9.15)	.55	0.57
Physical	14.40 (4.28)	12.21 (7.21)	1.16	0.63
Total	57.50 (15.60)	48.42 (23.91)	1.41	0.62

Pearson's coefficient of correlation ($p<0.05$)
Note: rest = test-retest coefficient of correlation

that the DHI is an instrument that is easy to apply, reliable and valid with regard to self-perception of dizziness by adults[3,5].

Moreover, the DHI has extra advantages that include its simplicity, relevance of its items, in addition to considering the various components of health described by the International Classification of Functionality, Incapacity and Health of the World Health Organization[25]. Not only is the DHI clinically useful for evaluating the disadvantage of dizziness self-perceived by the patient[5], but also for demonstrating the functional results of patients during[13-16] and after treatment[8,26].

The internal consistency of the results obtained with the DHI-CA was shown to be adequate and close to the values of the original DHI, developed for the adult population[7], and of the data found in the international literature[8,9,11-16,19,20,27]. The internal consistency values were lower in the subscales, taking as reference the Brazilian version of the DHI for adults, and this may be associated with the children's difficulty in precisely describing the symptoms of dizziness in their self-reports, considering the diversity of symptoms present[4]. Furthermore, it is known that younger children do not develop the language necessary for expressing the nature of their dizziness, which may make it difficult for the specialist to investigate the symptoms.

The results obtained in a second application of the instrument showed adequate stability of the measures obtained in the two applications; that is, the retest confirmed the stability of the instrument with regard to the internal consistency of the items. In turn, the correlations obtained between the scores in the test and retest ratified the stability of the measure; that is, a new indicator in favor of the reliability of the results of the inventory[8,9,15,20].

The functional domain of the DHI-CA evaluates the interference of dizziness in performing certain movements of the eyes, head and body, with focus on the capacity to perform social and leisure activities, and on the independence to perform tasks. In the study in question, it was the functional subscale that presented the highest score, when compared with the other subscales with adult individuals[10,17,28], a result confirming that of another study[8] about a clinical case that presented a more compromised functional domain. This datum reflects the greater limitation of children with regard to restriction of the activities evaluated by this subscale, with the intention of reducing the risk for the appearance of dizziness. Moreover, the study showed proximity to the scores of the physical and functional subscales that may be due to the fact of being similar domains, with regard to daily life activities.

The emotional domain evaluated by the DHI-CA was the one least affected, confirming the results found in adult patients studied by various researchers[5,10,28]. In this subscale, when the aspects investigated were compromised, they demonstrated possible harm to the quality of life, generating frustration, fear of leaving the house unaccompanied, or even staying at home alone, and shame about clinical manifestations. The concerns with changes in concentration, feeling of incapacity, changes in family or social relationship and depression also interfere in daily life activities.

The physical subscale of DHI-CA presented intermediate scores, when compared with the other subscales, a result that is also in agreement with some studies with adult individuals[10,28], who found that the performance of physical functions were compromised in patients with vertigo. Nevertheless, authors[10,16] made reference to the physical aspects evaluated

in adult individuals as being the most compromised, being in disagreement with the present study. The physical aspects investigated by the DHI-CA were evaluated by means of the relationship between the appearance and/or aggravation of dizziness when body movements were made[5].

As regards the degree of incapacity presented by the individuals, the mean score of the DHI-CA as well as the emotional and functional subscales, corresponded to a moderate degree, while the score in the physical subscale corresponded to a severe degree[24,28]. These data are in agreement with the results observed in another study with adult individuals[5], with respect to emotional incapacity, because it was the least compromised domain. In turn, in the patients with benign paroxysmal postural vertigo, the emotional subscale presented a moderate, and the functional and physical subscales, a severe degree, the latter confirming the results of the present study.

As regards gender, the study revealed that individuals of the female gender presented higher values in the three subscales of DHI-CA, and in the total score, when compared with the male gender. These data are in agreement with those of other studies with adult individuals[28], in which the patients of the female gender had higher scores in all the subscales. It should be mentioned that some studies[10,29] found no association whatever between gender and the DHI scores, justifying the need for further investigation into this difference in the results, according to gender, and elucidating its significance.

When proceeding with stratification of the age range into two groups, from 6 to 10 years and from 11 to 14 years, no change in the general result was verified. In studies[28,29] with adults, the fact of subjects of the female gender being more affected by dizziness, having greater perception of the disadvantage and with higher score in the DHI than the male gender, is justified because they seek medical care more frequently.

Lastly, the patterns of correlation between the scores and age of individuals point towards absence of association. The same occurred in previous studies[8,10,28], conducted with apopulation of adults.

The present study presented to main limitations. The first is with respect to the lack of criteria for evaluating the degree of incapacity for dizziness in children and adolescents, and therefore, the criteria for adults were used. Itis important to point out the need for making use of the script, to facilitate the application of the instrument in younger children, because the questionnaire was better understood by the children in the older age group.

The second limitation was the absence of a measure that would allow the external validity of the DHI-CA to be analyzed. The authors hope that in future studies, these limitations may be overcome, and at the same time, being able to use a more robust sample of children and adolescents.

The authors believe that this measurement instrument directed toward the child population will help to quantify the impact dizziness might have on the life of a child or adolescent. Furthermore, it is known that conventional diagnostic tests of the vestibular system are insufficient for evaluating the incapacitating and/or limiting effects imposed by dizziness. In addition, frequently, the fact that small children have not developed a language necessary to express the nature of their dizziness may make it difficult for the specialist to precisely determine the symptoms of this child and the severity of the problem.

The authors also hope that the DHI-CA, from the clinical point of view, may be used as an instrument of evaluation and monitoring of the therapeutic effect, assuming its place as a questionnaire that is easy to apply in the age range studied, by professionals working in the area of otoneurology and vestibular rehabilitation, in the same way as happens with the DHI for adults.

Moreover, it is pointed out that the use of this instrument may be a large contribution to making professionals aware of the possible interference of dizziness in learning at school; thus, the recommendation for the use of the DHI-CA in the evaluation of the quality of life of the child population with dizziness is considered appropriate.

CONCLUSION

The DHI-CA was shown to be reliable for quantifying the impact of dizziness on the quality of life of school-age children and adolescents, and the reliability of the results is a first contribution to validation of this instrument.

ACKNOWLEDGEMENTS

To Gary P. Jacobson, Ph.D., (Department of Hearing and Speech Sciences Vanderbilt University - Nashville, Tennessee, United States), author of the Dizziness Handicap Inventory (DHI), for authorizing the adaptation of the instrument for the child population.

REFERENCES

1. Tomaz A, Ganança MM, Garcia AP, Kessler N, Caovilla HH. Controle postural de escolares com baixo rendimento escolar. Braz J Otorhinolaryngol. 2014;80(2):105-10. http://dx.doi.org/10.5935/1808-8694.20140024
2. Rosa Neto F, Santos APM, Xavier RFC, Amaro KN. A importância da avaliação motora em escolares: análise da confiabilidade da escala de desenvolvimento motor. Rev Bras Cineantropom Desempenho Hum. 2010;12(6):422-7. http://dx.doi.org/10.5007/1980-0037.2010v12n6p422
3. Mutlu B, Serbetcioglu B. Discussion of the dizziness handicap inventory. J Vestib Res. 2013;23(1):271-7. http://dx.doi.org/10.3233/VES-130488
4. Valent M, McCaslin DL. Vestibular disorders and evaluation of the pediatric patient. Rockville: The ASHA Leader; 2011 [citado em 6 ago 2014]. Disponível em: http://www.asha.org/Publications/

leader/2011/110315/Vestibular-Disorders-and-Evaluation-of-the-Pediatric-Patient.htm

5. Ayala LLM, Velásquez MIC. Evaluación de los pacientes con vértigo mediante el cuestionario de discapacidad por vértigo (DHI). An Otorrinolaringol Mexicana. 2014;59(1):59-65.
6. Kendall PC, Grove W. Normative comparisons in therapy outcome. Behav Assess. 1988;10:147-58.
7. Jacobson GP, Newman CW. The development of the Dizziness Handicap Inventory. Arch Otolaryngol Head Neck Surg. 1990;116(4):424-7. http://dx.doi.org/10.1001/archotol.1990.01870040046011
8. Jafarzadeh S, Bahrami E, Pourbakht A, Jalaie S, Daneshi A. Validity and reliability of the Persian version of the dizziness handicap inventory. J Res Med Sci. 2014;19(8):769-75.
9. Caldara B, Asenzo AI, Paglia GB, Ferreri E, Gomez RS, Laiz MM et al. Cross-cultural adaptation and validation of the Dizziness Handicap Inventory: Argentine version. Acta Otorrinolaringol. 2012;63(2):106-14. http://dx.doi.org/10.1016/j.otoeng.2012.03.007
10. Castro ASO, Gazzola JM, Natour J, Ganança FF. Versão brasileira do Dizziness Handicap Inventory. Pro Fono. 2007;19(1):97-104. http://dx.doi.org/10.1590/S0104-56872007000100011
11. Garcia FMV, Luzio CS, Benzinho TA, Veiga GB. Validação e adaptação do dizziness handicap inventory para a língua e população portuguesa de Portugal. Acta ORL. 2008;26(2):128-32.
12. Georgieva-Zhostova S, Kolev OI, Stambolieva K. Translation, adaptation and validation of the bulgarian version of the dizziness handicap cross-cultural. Qual Life Res. 2014;23(7):2103-7. http://dx.doi.org/10.1007/s11136-014-0660-5
13. Goto F, Tsutsumi T, Ogawa K. The Japanese version of the Dizziness Handicap Inventory as an index of treatment success: exploratory factor analysis. Acta Otolaryngol. 2011;131(8):817-25. http://dx.doi.org/10.3109/00016489.2011.565423
14. Kaplan DM, Friger M, Racover NK, Peleg A, Kraus M, Puterman M. The hebrew dizziness inventory impairment. Harefuah. 2010;149(11):697-700.
15. Kurre A, Gool CJ, Bastiaenen CH, Gloor-Juzi T, Straumann D, Bruin ED. Translation, cross-cultural adaptation and reliability of the german version of the dizziness handicap inventory. Otol Neurotol. 2009;30(3):359-67. http://dx.doi.org/10.1097/MAO.0b013e3181977e09
16. Nola G, Mastardini C, Salvi V, Hercolani AP, Ralli G. Validity of italian adaptation of the dizziness handicap inventory (DHI) and evaluation of the quality of life in patients with acute dizziness. Acta Otorhinolaryngol Ital. 2010;30(4):190-7.
17. Nyabenda A, Briart C, Deggouj N, Gersdorff M. Normative study and reliability of french version of the dizziness handicap inventory. Ann Readapt Med Phys. 2004;47(3):105-13.
18. Pérez N, Garmendia I, Martín E, García-Tapia R. [Cultural adaptation of 2 questionnaires for health measurement in patients with vertigo]. Acta Otorrinolaringol Esp. 2000;51(7):572-80. Spanish.
19. Poon DMY, Chow LCK, Au DKK, Hui Y, Leung MC. Translation of the dizziness handicap inventory into chinese, validation of it, and evaluation of the quality of life of patients with chronic dizziness. Ann Otol Rhinol Laryngol. 2004;113(12):1006-11.
20. Tamber AL, Wilhelmsen KT, Strand LI. Measurement properties of the dizziness handicap inventory by cross-sectional and longitudinal designs. Health Quality Life Outcomes. 2009;7:101. http://dx.doi.org/10.1186/1477-7525-7-101
21. Vereeck L, Truijen S, Wuyts F, Van de Heyning PH. The test-retest reliability of the dutch version of the dizziness handicap inventory. B-ENT. 2006;2(2):75-80.
22. Walteros D, Bernal E, Pineda AM, Oliveros JC, Guerrero AS. Validez y confiabilidad del DHI versión colombiana. Corp Univ Iberoam. 2009;9(1):122-39.
23. Grassi-Oliveira R, Stein LM, Pezzi JC. Tradução e validação de conteúdo da versão em português do Childhood Trauma Questionnaire. Rev Saúde Pública. 2006;40(2):249-55. http://dx.doi.org/10.1590/S0034-89102006000200010
24. Fisioterapia Sin Red. Dizziness Handicap Inventory. 2015 [citado em 26 set 2014]. Disponível em: http://fisioterapiasinred.com/dizzinness-handicap-inventory/
25. World Health Organization. International classification of impairments, disabilities and handicaps: a manual of classification relating to the consequences of disease. Geneva: World Health Organization; 1976.
26. Cordeiro FC, Melo JJ, Marchiori LLM, Bondezan DC. Interferência da tontura na qualidade de vida da criança: relato de caso. In: In: Relação dos Trabalhos Apresentados no IV Congresso Brasileiro Multidisciplinar de Educação Especial; 29-31 out 2007; Londrina. Londrina: Universidade Estadual de Londrina; 2007.
27. Vereeck L, Truijen S, Wuyts FL, Van De Heyning PH. Internal consistency and factor analysis of the dutch version of the dizziness handicap inventory. Acta Otolaryngol. 2007;127(8):788-95.
28. Ten Voorde M, Zaag-Loonen HJ, Leeuwen RB. Dizziness impairs health-related quality of life. Quali Life Res. 2012;21(6):961-6. http://dx.doi.org/10.1007/s11136-011-0001-x
29. Kurre A, Straumann D, Gool CJ, Gloor-Juzi T, Bastiaenen CH. Gender differences in patients with dizziness and unsteadiness regarding self-perceived disability, anxiety, depression, and its associations. BMC Ear Nose Throat Disord. 2012;12:2. http://dx.doi.org/10.1186/1472-6815-12-2

Appendix 1. Proposal of DHI for child population

Subscales	Questions	Replies		
		Yes	Sometimes	No
1 - Physical	Does lifting your head up worsen dizziness?			
2 - Emotional	Because of the dizziness, do you feel frustrated (a)?			
3 - Functional	Because of the dizziness, do you stay away from school?			
4 - Physical	Does walking around the supermarket looking at the shelves worsen the dizziness?			
5 - Functional	Because of the dizziness, do you have difficulty with getting up from the bed?			
6 - Functional	Do you stay away from birthdays, parties, movies, video game arcades because of the dizziness.			
7 - Functional	Because of the dizziness, do you have difficulty with reading?			
8 - Physical	Do games, sports, riding a bicycle, riding on roundabouts/merrygorounds worsen the dizziness?			
9 - Emotional	Because of the dizziness, are you afraid to leave the house?			
10 - Emotional	Because of the dizziness, do you feel ashamed (a) in front of others?			
11 - Physical	Do fast movements of the head worsen your dizziness?			
12 - Functional	Because of the dizziness, do you stay away high places?			
13 - Physical	If you turn in bed while you are lying down (a) does it worsen your dizziness?			
14 - Functional	Because of the dizziness, do you find it difficult to jump, run, play ball games, ride a bicycle?			
15 - Emotional	Because of the dizziness, are you afraid that people will think you are not well?			
16 - Functional	Because of the dizziness, it to difficult for you to walk about alone (a)?			
17 - Physical	Does walking on the sidewalk, passing or going over a ground full of holes worsen the dizziness?			
18 - Emotional	Because of the dizziness, do you have difficulty with concentrating on your school activities?			
19 - Functional	Because of the dizziness, are you unable to walk about in the dark?			
20 - Emotional	Because of the dizziness, are you afraid to stay at home alone?			
21 - Emotional	Because of the dizziness, do you feel harmed (a) in comparison with your colleagues?/ companions?			
22 - Emotional	Because of the dizziness, do you quarrel with your friends, companions or persons in your family?			
23 - Emotional	Because of the dizziness, do you feel sad, without wanting to do anything?			
24 - Functional	Does your dizziness hamper, interfere in your studies?			
25 - Physical	If you lower your head or body, does the dizziness worsen?			

Note: DHI = Dizziness Handicap Inventory