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Validity and Reliability of the Persian version of Buffalo Model Questionnaire (P-BMQ) among 7 to 12 year-old normal children

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Abstract

Background: The Buffalo Model Questionnaire (BMQ) is the only specialized Buffalo model questionnaire complementing the Buffalo Model diagnostic test battery that specifically assesses all the symptoms and problems potentially experienced by individuals with Auditory Processing Disorder (CAPD). The present study was conducted to translate BMQ into Persian and normalize it for an Iranian audience and also determine the validity and reliability of this version.

Objectives: The purpose of this research was to provide a Persian version of the BMQ (P-BMQ) and to determine its validity and reliability.

Methods: The original version of BMQ was translated into Persian considering the International Quality of Life Assessment (IQOLA) protocol. Its content validity was assessed, then, cultural normalization and face validity assessment were carried out among 60 normal children. To determine the reliability of the questionnaire 30 children's parents were asked to participate in the retest (three to seven days later).

Results: For face validity, 80% of the participants gave above 4 meaning that each question obtained the normal score. The CVR coefficient for all questions was higher than 66.66%, meaning all the items were relevant to the evaluated attribute. Considering that the alpha coefficient of the questionnaire was 0.986, the internal consistency was assessed to the optimal level. Interclass Correlation Coefficient (ICC) was significant in all components (p= 0.001).

Conclusion: The Persian version of the BMQ had a good quality translation according to the IQOLA protocol. This valid and reliable questionnaire could be used for 7 to12 year-old normal children.

Keywords: Buffalo Model Questionnaire, Central Auditory Processing Disorder, Reliability, Validity

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Introduction

Auditory processing (AP) is a condition based on which the central nervous system utilizes hearing information effectively and efficiently (1). AP consists of mechanisms and processes responsible for the following behavioral skills: localization and lateralization, discrimination, recognition, auditory pattern recognition, understanding the temporal characteristics of sound (temporal resolution, temporal masking, temporal integration, temporal ordering), auditory performance with competing acoustic signals, and auditory performance with degraded acoustic

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↑What is "already known" in this topic:
Diagnosis and rehabilitation of Central Auditory Processing Disorder (CAPD) are based on the most popular rehabilitation protocol, namely "Buffalo Model", which includes a series of tests and questionnaires. Among all CAPD questionnaires, BMQ is the only Buffalo Model questionnaire with 95% sensitivity and 85% specificity. (BMQ is the only screening tool designed to complement Buffalo Model diagnostic test battery).

→What this article adds:
The Persian version of CAPD is ready to use with the lowest cost and shortest screening time in the field of central auditory disorders.

signals (1, 2). Disrupti on to one or more of these tasks leads to a disorder called (Central) Auditory Processing Disorder ((C)APD) (1). (C)APD shows itself as a problem in the interpretation and summarizing hearing impulses (3).

Katz (2009) reported the prevalence of (C)APD about 20% in the American school population, though, Gefner reported this amount in the US population 2-3%. It is also estimated that approximately half of the children with learning disability also have (C)APD, including about 2 to 5% of the total child population (4). Another study estimated the disorder prevalence about 5% for the Iranian child population (5). (C)APD can occur independently or jointly with other neurodevelopmental problems such as Learning Disability (LD), Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and Speech-Language Disorder (SLD) (6).

(C)APD can lead to problems in learning, language, and communication in children (7); therefore, it interferes with one's effective communication and so it prevents timely academic success, thereby it decreases self-confidence and increases the feeling of inefficiency in the individual (8). Some of the problems of children with (C)APD include: difficulty in hearing a verbal message in a noisy or in an reverberant environment, and consequently distraction with these external stimuli, difficulty in fast speech processing, poor listening skills, weakness in following/performing sequenced instructions, requests for repetitions of content, delayed response to verbal stimuli that are asked or requested from them, weakness in performing phonetic and linguistic skills, also feebleness in pronunciation, reading, learning, and rapid fatigue during long term mental activity (1,7) The mentioned problems in these children mainly cause to educational problems. These conditions may lead to the confusion of educators and parents in correctly identifying and timely checking the students (9). The (C)APD may be comorbid with other disorders that may not be given enough attention during treatment interventionsTherefore, the use of a specialized screening tool can help to plan for a time and cost-effective diagnosis prodcedure. It can provide the families and coaches with a clear insight to direct the child to an appropriate and timely assessment and treatment (7). During the screening process, a set of tests and questionnaires are used (4).

Questionnaires include the key information, and audiologist can use the questionnaires to obtain information regarding other specializations, as well as other disorders comorbid with (C)APD during screening process. To avoid bias, we must categorize the behaviors in the questionnaire (8).

Some of the (C)APD checklists and screening questionnaires include: "Screening instrument for targeting educational risk" (FISHER), "Children's auditory processing performance" (CHAPS), "Fisher's auditory problem checklist" (SIFTER), "Children's home inventory for listening difficulties" (CHILD), "Evaluation of Classroom Listening Behavior" (ECLB), "Auditory processing domain questionnaire" (APDQ), and the "Buffalo Model Questionnaire" (BMQ) to examine auditory challenges (6). The BMQ was developed by Katz (2006-2008) on the basis of experimental, diagnostic and therapeutic work with people with (C)APD (13).

The BMQ is related to auditory processing disorder and includes 39 questions in various areas such as: decoding, integration, organization, various TFM (Tolerance-fading memory), and 9 general questions such as: excessive sensitivity to the touch, long-term memory, psychological problems, behavioral problems, coordination problems, allergies, math problems, hearing problems, autism disorder, and eye contact with the speaker. In addition to these 48 questions 6 more questions will be asked to see if the participants have rehabilitation experiences, such as: auditory training, speech therapy history, phonological awareness training, intensive phonics training, reading therapy/tutoring, and sensory-integration training (10, 11). The questionnaire was administered for three age-groups including less than 6 year-old, 6 to 18 year-old and older than 18 (11).

BMQ can be used before assessment of the (C)APD, following the assessment of (C)APD (in order to comply with the findings of diagnostic tests) before beginning the treatment of (C)APD and during the treatment (to confirm the progression of the treatment) (4). On the other hand, the BMQ is the only specific Buffalo model questionnaire and is complementary to the central auditory assessment set of tests, which evaluates all the symptoms and problems that can be seen in people with auditory processing disorder (13). This study was conducted because there was no valid and reliable Persian version of this questionnaire

Methods

This descriptive-analytic study was performed in 3 stages: translation of the questionnaire after obtaining permission from the original author, and checking content and face validities. The code of ethics for this article is IUMS.FMD.REC1396.9411301003 and participants' consent was obtained for all stages .

For translating BMQ, IQOLA (International quality of life assessment) protocol was used. In the first stage, the original BMQ was translated into Persian, and then the translation quality of the BMQ was examined. In the first stage of the translation process, two translators (translators 1 and 2) translated the questionnaire from English into Persian (the forward translation). The translators no prior knowledge about the content of the selected questionnaire.

Each translator provided a translation of the test items and a list of other possible alternatives. After finishing the initial translation of the questionnaire, translators considered the difficulty level of their translation for each item based on the visual analogical index. The purpose of this was to help the researcher to select translations with the same meaning as the original test.

To measure and interpret the difficulty level of translation for each item, a scale was used that ranged from 0 (easy) to 100 (extremely difficult) and it provided an appropriate interpretation .At this stage, the average difficulty level scores below 25 were considered as easy translations, the average difficulty level score of 25 to 30 as relatively easy translation, and the average difficulty level score above 35 was regarded as a difficult translation. After the completion of the initial translation stage, two bilingual

and native speakers of English (translators 3 and 4) with sufficient knowledge of Persian, translated the questionnaire back into its original language .These translators also estimated the quality of the initial translation on a scale of 0 (not optimal) to 100 (perfectly optimal), using three attributes (translation clarity (for example, the use of simple and understandable terms), the use of common language (For example, the avoidance of sophisticated and technical sentences), and conceptual equivalence (for example, use of corresponding expression in another language).

The standard scale for deciding on optimal translation quality was a minimum score of 90 in each of the questions; 80 to 90 as a relatively optimal quality, and scores below 80 as an undesirable quality (12). The quality gained in this way helped the researcher to correct the initial translations with the help of translators 1 and 2. Then, translators 3 and 4 translated the initial translations back to its original language (English). After translating the initial translation into English, the items that seemed to have no conceptual consistency with the original source were discussed item by item by the main researchers and some corrections were applied if needed. These considerations helped to take into account cultural equivalence and to standardize the test (12). Finally, an acceptable Persian translation of the BMQ was developed and later its validity and reliability were examined (10).

In order to determine the content validity, BMQ questionnaire was distributed to 12 expert audiologists in the field of (C)APD . The fitting of the items related to the evaluation of the desired attribute was examined using a three-choice scale (1: necessary, 2: useful but not necessary, 3: not necessary) and CVR coefficient.

In determining the face validity, the Persian translation of the BMQ questionnaire was reviwed by 12 audiologists and 30 parents of 7 to 12 year-old childeren. Participants scored each BMQ questions according to the both mentioned perspectives based on a scale of 6 points. If more than 80 percent of the participants gave each item a score of 4 or more, that question face validity was confirmed (13).

The Persian version of BMQ with an acceptable content and face vailidity was then distributed to the parents of normal children aged 7 to 12 randomly chosen from 1 to 6 districts' primary schools in Tehran .BMQ was administered to 209 parents of normal children aged 7 to 12 .Using convenience sampling method 209 parents of normal children (113 male (54%), 96 female (46%)) aged 7 to 12 years with an average age (SD) of 9.11±1.63, were randomly chosen from 1 to 6 districts' public elementary schools. After obtaining the consent form the parents,an initial interview was conducted to see whether they are eligible cases. The inclusion criteria included normal peripheral hearing, and not having ear infections, speech and language disorders, and learning disorder and neurological disorders (according to the relevant consultants) and being right-handed and monolingual. Exclusion criterion wasparents' lack of motivation to complete the questionnaire.

The BMQ questionnaire was distributed to parents and the necessary instructions to complete the questionnaire were provided, then, they filled out the questionnaire. Initially basic audiology assessments were performed for all the children.

Internal consistency of the questionnaire was verified using Cronbach's alpha. Three to seven days later the questionnaire was again distributed to 30 parents of children to examine the relaibility of the questionnair by test-retest.

Results

After the forward translation by the first and the second translators, they examined difficulty level of the translation. The average of both two translator's scores to each question showed that only questions 1, 31, 34, 44 had an average score over 30 (difficult) that were reviewd again and questions 8, 12 had the score of relatively difficult, and the rest of the questions had easy translation. Accordingly, level of all the questions reached the level of easy translation.

Based on the results obtained from measuring the quality of the questionnaire (same meaning with the original version, translation clarity, common language by translators 3 and 4), questions 46, 44, 40, 34, 33, 28, 14, 12, 11, 8 and 1 had a relatively optimal translation quality and the rest of the questions had an optimal quality of translation. After a double check by the translators and project administators, questions with translation quality average score between 80 and 90 (relatively optimal translation) in each of the three features were examinedto achieve the standard scale.

All the items were matched with the evaluated attribute in terms of content. CVR coefficient for all questions was above 66.66% (12, 14).

The face validity was conducted using the opinions of 12 audiologists and 30 parents of children. For confirmation of face validity, 80% of the participants should have given each question a score above 4. In the first and second stages of reliablity determination, 16.29% and 25.6% of the items (according to experts) and 27.8% and 12.5% of the items (according to parents) did not receive the required score in "being reasonable" in face validity. Also, 16.66% and 20.20% of items (according to experts) and 08.27% and 12.5% of items (according to parents) did not receive the required score in "cultural acceptance" in face validity. During the third review, all the items received an acceptable score in face validity.

BMQ was distributed to 209 parents of normal childeren aged 7 to 12. The mean and standard deviation was calculated. The results are shown in Table 1.

The internal consistency was examined using Cronbach's alpha coefficient. The alpha coefficients for sub-tests D, N, M, V, I, O, C, G, ΣAPD, TOTAL were 0.944, 0.85, 0.855, 0.901, 0.861, 0.866, 0.868, 0.832, 0.986, respectively. Considering that the obtained values were greater than 0.7, the internal consistency was considered as optimal.

The consistency in re-test was acceptable according to the results of Spearman Brown correlation and Interclass Correlation Coefficient (ICC) (p= 0.001) (Table 2).

Table 1. Mean (SD) scores of Buffalo Model Questionaire in parents with normal children (n=209)

Subscale	Mean	SD	Standard error
D	0.1000	0.30253	0.03906
N	0.1000	0.30253	0.03906
M	0.0500	0.21978	0.02837
V	0.0167	0.12910	0.01667
O	0.0333	0.18102	0.02337
C	0.0333	0.18102	0.02337
G	0.1667	0.45721	0.05903
∑CAP	0.4000	0.82749	0.10683
TOTAL	0.4833	0.96536	0.12463

Table 2. The results of variance analysis test and ICC coefficient

ICC coefficient	Variable	P
.667**	D	0.001
.720**	N	0.001
.736**	M	0.001
.735**	V	0.001
.631**	I	0.001
.476**	O	0.001
.787**	C	0.001
.667**	G	0.001
0.852**	TOTAL	0.001

** Level of Significance: 0.01

Discussion

To determine the validity and reliability of the questionnaire, content validity, face validity, internal consistency and consistency in re-test were performed.

The IQOLA protocol, as one of the most reliable translation protocols, was used to translate the questionnairein consistent with the Iranian culture. Therefore, by evaluating content validity, according to experts, CVR was 66.66, indicating the appropriate quality of the translation. In face validity, more than 80% of the experts scored all of the questions above 4; thus, this questionnaire is appropriate for the group that will use it.

So far, BMQ questionnaire has not been translated to other languages and there has been no study on validity and reliability of it. There was noresearch available in this regard even by the original writer of the questionnaire, Katz.

Considering the above reasons, the P-BMQ is a valid and reliable questionnaire for screening APD in Persian children aged 7 to 12 and it can be provided to parents, audiologists, speech therapists and teachers to identify this kind of childeren (Appendix 1). However, there was no comparable available study to compare the current results withThus, further studies are recommended in this regard.

Conclusion

Persian version of BMQ questionnaire (P-BMQ has an optimal quality translation and is a valid and reliable questionnaire for normal children aged 7 to 12 years old. The face validity, content validity, internal consistency and consistency in the re-test were in accordance with the relevant standards.

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Conflict of Interests

The authors declare that they have no competing interests.

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Appendix 1

کلینیک شنوایی شناسی   پرسشنامه مدل بوفالو BMQ

این ۸ ستون توسط شنوایی شناس تکمیل خواهد شد.								راهنما: اگر فکر می کنید هر یک از مشکلات ذکر شده در جدول، در مورد کودک شما صدق می کند دور "بله" دایره بکشید. اگر هر یک از این مشکلات وجود ندارد، لازم نیست دایره بکشید و سراغ مورد بعد بروید. در صورتی که هر کدام از گزینه ها در مورد کودکتان مصداق ندارد (مثلاً یادگیری زبان خارجی)، دور "NA" دایره بکشید.											
D	N	M	V	I	O	C	G		مشکل		#		مشکل		#		مشکل		#
								NA	فهمیدن گفتار در حضور سر و صدا N	بله	۳۳	NA	مسائل روانشناختی (مثل گوشه گیری، پرخاشگری، افسردگی ...) G	بله	۱۷	NA	بد فهمیدن (برای مثال، درک نکردن مکالمات علی رغم شنیدن) C	بله	۱
								NA	تلفیق حواس بینایی و شنوایی (برای مثال، با شنیدن نام حیوان قادر به نشان دادن کارت مرتبط با آن باشد) I	بله	۳۴	NA	توجه و تمرکز V	بله	۱۸	NA	تولید گفتار (برای مثال، مشکل در حرف زدن) D	بله	۲
								NA	اضطراب (مثلاً در مکان جدید) V	بله	۳۵	NA	رفتار (برای مثال، رفتار اجتماعی در برخوردهای با دیگران) G	بله	۱۹	NA	اختلال یادگیری C	بله	۳
								NA	حافظه کوتاه مدت (برای مثال، به خاطر سپردن ۴ عدد در آن لحظه) M	بله	۳۶	NA	استفاده از زبان (برای مثال، آیا جملات، به جا و در موقعیت مناسب استفاده می شود؟) V	بله	۲۰	NA	پاسخدهی سریع (برای مثال، قبل از شنیدن کامل جمله شروع به پاسخ دادن می کند) M	بله	۴
								NA	عفونت گوش یا ترشح مایع از گوش C	بله	۳۷	NA	روخوانی D	بله	۲۱	NA	بریده بریده صحبت کردن M	بله	۵
								NA	پاسخدهی با تاخیر/به کندی D	بله	۳۸	NA	هماهنگی حرکات (برای مثال، هماهنگی حرکات دست و پا) G	بله	۲۲	NA	حساسیت بیشتر/کمتر از حد به صدا N	بله	۶
								NA	یادگیری زبان خارجی D	بله	۳۹	NA	ضربه به سر C	بله	۲۳	NA	حساسیت بیشتر/کمتر از حد به لمس شدن G	بله	۷
								NA	اوتیسم G	بله	۴۰	NA	آلرژی (برای مثال، حساسیت های فصلی، پوستی و...) G	بله	۲۴	NA	فهم زبان (برای مثال، آیا حرف های دیگران را می فهمد؟) D	بله	۸
								NA	کند صحبت کردن D	بله	۴۱	NA	شناخت صداهای گفتاری (مثل توانایی تمایز "ب" از "پ") D	بله	۲۵	NA	اجرای دستورات C	بله	۹
								NA	مشکل شدید در خواندن یا تلفظ I	بله	۴۲	NA	هجی کردن (برای مثال، صداکشی) D	بله	۲۶	NA	به ترتیب قرار دادن اشیا (برای مثال، از کوتاه به بلند یا از کوچک به بزرگ) O	بله	۱۰
								NA	کودک پرسر و صدا N	بله	۴۳	NA	ریاضیات G	بله	۲۷	NA	درک مطلب از طریق خواندن M	بله	۱۱
								NA	مشکل شدید در ادراک بینایی I	بله	۴۴	NA	رعایت توالی منطقی کارها (برای مثال، انجام کارهای روزمره زندگی که نیاز به مرحله به مرحله انجام دادن دارند مثل: لباس پوشیدن، مسواک زدن) O	بله	۲۸	NA	حواسپرتی با سر و صدا N	بله	۱۲
								NA	برقراری تماس چشمی با مخاطب G	بله	۴۵	NA	شنوایی G	بله	۲۹	NA	دست خط بد I	بله	۱۳
								NA	بخاطر آوردن دستورات M	بله	۴۶	NA	نقص توجه/بیش فعالی V	بله	۳۰	NA	فهم دستورات کلامی (برای مثال: آیا می فهمد "توپ را بیاور" یعنی چه؟) D	بله	۱۴
								NA	گمشدگی/گم کردن وسایل O	بله	۴۷	NA	خواندن نوشتن I	بله	۳۱	NA	حافظه بلند مدت (برای مثال، یادآوری خاطرات گذشته) G	بله	۱۵
								NA	گاهی پاسخدهی خیلی کند I	بله	۴۸	NA	سریع صحبت کردن M	بله	۳۲	NA	کم توان ذهنی G	بله	۱۶
								جمع	14 APD=.................... TOT=....................										

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روایی و پایایی نسخه فارسی شده پرسشنامه مدل بوفالو در کودکان طبیعی ۱۲-۷ سال

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چکیده

مقدمه: پرسشنامه مدل بوفالو(*BMQ*) تنها پرسشنامه ی تخصصی مدل بوفالو می باشد، و مکمل مجموعه آزمون های ارزیابی شنوایی مرکزی است که به طور تخصصی تمام علایم و مشکلاتی را که در افراد با مشکل اختلال پردازش شنوایی (مرکزی) *((C)APD)* ممکن است دیده شود را مورد ارزیابی قرار می‌دهد. هدف از این پژوهش، تهیه‌ی نسخه‌ی فارسی پرسشنامه مدل بوفالو و تعیین روایی و پایایی آن بود. هدف از این مطالعه تهیه‌ی نسخه ی فارسی پرسش نامه مدل بوفالو و تعیین روایی و پایایی آن بود.

روش: ابتدا نسخه‌ی اصلی پرسشنامه *BMQ* طبق پروتکل پروژه بین المللی ابزار کیفیت زندگی[۱] *(IQOLA)* به زبان فارسی ترجمه شد، سپس روایی محتوایی و صوری آن بررسی شد. آنگاه به منظور تعیین پایایی پرسشنامه از ۳۰ والد کودکان خواسته شد تا در آزمون مجدد (۳ تا ۷ روز بعد) نیز شرکت کنند.

یافته‌ها: در روایی صوری، ۸۰ درصد شرکت‌کنندگان به هر سوال، امتیاز بالای ۴ را اختصاص دادند. ضریب نسبی روایی *CVR*[۱] برای تمامی سوالات بالاتر از ۶۶/۶۶ درصد محاسبه شد یعنی تمام آیتم ها از نظر محتوا با صفت مورد ارزیابی، تناسب داشتند. با توجه به اینکه ضریب آلفای پرسش نامه ۰/۹۸۶ محاسبه شد میزان پایایی درونی در حد مطلوب ارزیابی شد. طبق نتایج ضریب همبستگی درون‌گروهی *(ICC)*[۱]، همبستگی در کلیه مولفه ها معنادار بود (p =۰/۰۰۱).

نتیجه گیری: نسخه ی فارسی پرسشنامه *BMQ* از ترجمه با کیفیت مناسبی برخوردار می‌باشد. این پرسشنامه‌ی روا و پایا برای استفاده در گروه کودکان ۷ تا ۱۲ سال قابل استفاده می باشد.

کلیدواژه‌ها: پرسشنامه مدل بوفالو، پردازش شنوایی مرکزی، روایی، پایایی

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