

Buffalo Model Questionnaire – Revised Administration and Interpretation Manual

Jack Katz and Thomas Zalewski

Working with Auditory Processing Disorders (APDs)¹ is a fascinating and rewarding aspect of Audiology. The first step is to determine if a person is at risk for APD. If an individual is at risk, then a diagnostic evaluation should be carried out. When testing is completed, the next step is to determine the specific areas of deficit according to the APD categories (see Katz & Smith, 1991). This information is used to develop an effective therapeutic program (see Katz, 2009). When APD therapy is completed then the question arises, “How much progress has been achieved?”

The Buffalo Model Questionnaire-Revised (BMQ-R)² lists frequently exhibited characteristics of those identified with APD. However, the findings do not represent a diagnosis because some of them may be found with other disorders and the inherent limitations of questionnaires. In addition, a diagnosis must be based on hard data from sensitive tests. Importantly, the BMQ-R offers an independent analysis of the items that are closely associated with specific APD categories. The BMQ-R is made up of many questions that provide increased confidence in the test findings and it also connects the hard data to important real-life functions.

The BMQ-R can play an important role in each of the processes described in the first paragraph. The results of the questionnaire can be useful to professionals whether it is for a referral, to support APD evaluation results, post-therapy assessment, or all of the above. Although the BMQ-R provides very important information, there are also limitations to this tool. A limitation of all questionnaires concerns the reliability and validity of the information provided by the person completing the form. Another potential problem is that the person completing the form may not understand the terminology (especially the technical terms). The authors have revised the questionnaire to address this concern. Another concern is an individual or parent may not want to reveal if they or their child has been diagnosed with an ‘intellectual challenge’ or is on the Autism spectrum. However, the BMQ-R is a robust measure; so, not providing a few bits of information should not have a significant effect on the overall outcome because there are multiple questions representing each category. On the other hand, some individuals or parents, for a variety of reasons, may feel the need to seek assistance without indicating areas of weaknesses. In such rare cases, the BMQ-R results will not offer an accurate picture. For example, a parent wanted his child evaluated but drew a ruled line down the “N” column of the questionnaire and obviously marked over the line several times to indicate that his daughter did not have any of these problems. In another case, the BMQ-R appeared to be random and inconsistent with the case history. When the mother of the patient was asked about the inconsistencies she began to laugh and indicated that she completed the case history form and asked her husband, a physician, to complete the questionnaire, but she did not check what he wrote. Seeing the problem, the mother completed the questionnaire and the two versions had no resemblance to one another. It appeared the father randomly checked off boxes. Perhaps he does not read what his patients write on his forms, so he assumed it was unimportant. Fortunately, such cases are rare.

This Manual will describe the questionnaire, the instructions to the person completing the form, the scoring procedures, and the BMQ-R findings, using data from normal control and APD groups to assist in categorizing the outcomes. In addition, the limitations of this questionnaire, its various uses, and concluding remarks will be presented.

¹ Also known as Central Auditory Processing Disorder (CAPD) or (Central) Auditory Processing Disorder [(C)APD].

² No distinction is made in this manual between the original BMQ and the revised form BMQ-R since both contain the same 48 items (rephrased slightly for clarity) and the same 6 APD sub/categories.

The Buffalo Model Questionnaire - Revised (BMQ-R)

The BMQ-R is completed by the patient or the parent(s) and/or teacher(s) of a child. This questionnaire is made up of 48 items that have relevance to APD as well as 6 important therapies that can influence APD test performance and the responses to the BMQ-R questions. The questionnaire is a sensitive tool (Pavlick, Zalewski, González, and Duncan, 2010) to be used with the Buffalo Model diagnostic test battery (i.e., SSW, Phonemic Synthesis and Speech-in-Noise tests). When interpreting the results, it is important that the audiologist is aware of the 6 therapies (described below) because these may allow the individual to compensate for the disorder and minimize their apparent weakness. In those cases, the test norms may not be as sensitive to APD characteristics, if an individual has been exposed to one or more of these therapies. In such cases, greater significance can be placed on aspects of the Buffalo test battery that are less sensitive to the influence of those prior training procedures.

APD Categories

In the Characteristics section of the BMQ-R, three of the Buffalo Model categories are listed by name as well as the three separate components of the fourth category: Tolerance – Fading Memory (TFM). The characteristics that are strongly associated with more than one category are listed as “APD”. The “Gen” (General) group includes characteristics that may, or may not, be associated with APD. This score is not included in the CAP sum. The titles, symbols, and abbreviations, used in the BMQ-R, are all listed in Table 1. Abbreviations are used in the BMQ-R instead of the actual terms to avoid, if possible, influencing the rater or permitting them to form their own impression that may be incorrect.

Table 1

Key to abbreviations used on the BMQ-R

Abbreviation	Category, Subcategory, or Other
DEC	Decoding
(Noi)	<i>Difficulty in Noise</i>
(Mem)	<i>Short-term Auditory Memory</i>
(Var)	<i>Various other TFM characteristics</i>
TFM	Tolerance-Fading Memory
INT	Integration
ORG	Organization
APD	General APD characteristics/history (not specific to any one category)
(Gen)	General characteristic may/may not be specifically associated with APD
ΣCAP	Sum of the Categories, except (Gen)

BMQ-R Description, Explanations and Definitions

The BMQ-R form can be divided into five sections.

1. Identifying information

At the top of the form; below the title is the identifying information section. This contains spaces for five important factors: The patient’s name, age, and grade (if applicable), as well as the date the questionnaire was completed and the name of the individual completing the form. Children younger than 6-years-of-age with APD generally have fewer items circled on the BMQ-R, because it is likely they are not exposed to as many educational opportunities and the severity of the specific issues may not be apparent at this/that age. Grade is another important factor in interpreting the questionnaire. For example, a child of 7-years-of-age who is in kindergarten likely has not had the academic exposure of children of the same age in a higher grade. Knowing if the rater was the child’s teacher or parent can have implications as their perspectives may differ.

2. Prior therapies

Just below the identifying information is a table with six therapies. The BMQ-R, as well as the diagnostic battery, may be influenced if a person has been exposed to one or more of the therapies listed. If the individual under examination has been exposed to one of the therapies, the rater circles the “Y” and indicates the number of years the therapy was received. It is clear that prior auditory training, speech therapy, phonological awareness, phonics, reading, and/or sensory-integration can provide a distinct advantage over the normative population. Prior therapies may also reduce the sensitivity of the BMQ-R and the test battery to some extent. This is because the person is exposed to compensatory skills that may reduce the appearance, but not eliminate the CAP problem.

3. Characteristics/History by category

The next section lists the characteristics associated with APD. They are grouped by Category (DEC=Decoding, INT=Integration, and ORG=Organization). Tolerance-Fading Memory (TFM) is not listed by name, rather its three subcategories (Noi=Noise, Mem=Memory, Var=Various TFM). The group of characteristics/history labeled *APD* suggests processing problems that may suggest more than one of the four Buffalo Model categories. The *GEN* (General) section is a group of general characteristics/history that may, or may not, be associated with APD. The 48 characteristics/history have two or three response choices:

Y = The patient exhibits the characteristic/history

N = The patient does not exhibit the characteristic/history

NA = This does not apply to the patient because it has never been attempted, or has not been diagnosed. This is available for questions 4, 5, 6, 9, 25, 26, 35, and 47.

4. Comments, explanations, questions

Below the characteristic/history section, toward the bottom of the form, there are lines for the individual completing the form to provide any additional information, questions, or comments. This may also allow the audiologist space to provide any additional information or questions that may need to be addressed.

5. Scoring of responses

The bottom section of this form is a table that is used by the professional to score the BMQ-R. The scoring is divided into the categories used in the characteristic/history section, plus a *TFM* total score to obtain the BMQ-R score (ΣCAP). The person scoring the BMQ-R counts the number of “Y” responses for each category and places the number in the appropriate box. The ΣCAP is the total “Y” indications of the four Buffalo Model categories (DEC, TFM, INT, and ORG) plus the non-specific *APD* score for a total of 39 items. Please note the number of “Y” indications from the *GEN* category is not included in ΣCAP score.

It should take approximately 1 minute to score the BMQ-R to obtain invaluable information that can be used in the evaluation, counseling, and rehabilitation phases. Figure 1 shows the BMQ-R form as described above. Please note the four sections that are to be completed by the person completing the form and the one section by the professional scoring the questionnaire.

Instructions to the Individual Filling Out the Questionnaire

For the most part, the BMQ-R is self-explanatory. Instructions are shown, above the prior therapies table, to circle the “Y” and enter the number of years of therapy. It is important to provide the number of years of prior therapies to estimate the influence that it might have had on the person’s performance. If, for example, the person had 3 years of Speech Therapy, it could explain why item one was, “N”.

The instructions for the characteristic/history section are to read each of the 48 potential problems. If the characteristic/history is an issue for the person being evaluated, please circle “Y”, if not circle “N”. If the characteristic/history does not apply, has never been attempted, and/or has not been diagnosed, please circle “NA”. “NA” is available for questions 4, 5, 6, 9, 25, 26, 35, and 47.

Figure 1

The current BMQ-R form

BUFFALO MODEL QUESTIONNAIRE-REVISED

Name _____ Date _____

Age _____ Grade _____ Form completed by _____

Please circle 'Y' if the individual being evaluated is currently receiving or has received any of the services and indicate the number of years received

Y Auditory training? ____ yrs	Y Speech therapy? ____ yrs	Y Phonological awareness training? ____ yrs
Y Special phonics training? ____ yrs	Y Reading therapy/tutoring? ____ yrs	Y Sensory-integration training? ____ yrs

1) Please circle 'Y' if the statement applies to the person being evaluated or 'N' if the statement does not apply to the person
2) If it does not apply, circle 'NA' (e.g., if a kindergartner has no foreign language training; circle 'NA' for #9)

DEC 1) Y N Has difficulty saying speech sounds accurately 2) Y N Has difficulty understanding language 3) Y N Has difficulty understanding verbal directions 4) Y N NA Has difficulty reading aloud 5) Y N NA Has difficulty with phonics 6) Y N NA Has difficulty with spelling 7) Y N Responds slowly/delayed to spoken language 8) Y N Speaks slowly 9) Y N NA Has difficulty learning foreign language Noi 10) Y N Is hypersensitive to noise 11) Y N Is distracted by noise 12) Y N Has difficulty understanding speech in noise 13) Y N Is noisy/makes more noise than peers Mem 14) Y N Responds too quickly, at times 15) Y N Interrupts others frequently 16) Y N Has difficulties with reading comprehension 17) Y N Speaks quickly 18) Y N Forgets things told 19) Y N Has difficulty remembering spoken instructions Var 20) Y N Has difficulty paying attention 21) Y N Has difficulty using language 22) Y N Has ADHD/ADD 23) Y N Has anxiety (e.g. new situations)	INT 24) Y N Has very poor handwriting 25) Y N NA Has difficulty with sound/symbol relationships 26) Y N NA Has severe reading/spelling difficulties 27) Y N Has severe visual perception difficulties 28) Y N Sometimes has very long delays in responding 29) Y N Has been diagnosed with dyslexia ORG 30) Y N Has difficulty keeping things organized 31) Y N Has difficulty saying/writing things in proper sequence/order 32) Y N Is messy/tends to lose things APD 33) Y N Has had ear infections/fluid, e.g., as a child 34) Y N Has difficulties processing/understanding what is said 35) Y N NA Has a learning disability 36) Y N Has difficulty following verbal instructions 37) Y N Has an intellectual disability 38) Y N Has had a head injury 39) Y N Has Autism or a related problem Gen 40) Y N Is hypersensitive to touch 41) Y N Has difficulty maintaining eye contact with a speaker 42) Y N Has difficulty with long-term memory 43) Y N Has a psychological problem 44) Y N Has a behavior problem 45) Y N Has difficulty coordinating body movements 46) Y N Has allergies 47) Y N NA Has difficulty with math 48) Y N Has a hearing problem/hearing loss
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Comments, explanations, questions: _____

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DEC	(Noi)	(Mem)	(Var)	TFM	INT	ORG	APD	ΣCAP	(Gen)
/9	(/4)	(/6)	(/4)	/14	/6	/3	/7	/39	(/9)

If the person asks what should be written in the “comments, explanations, questions” section, they may be informed that this is a place for them to comment on any characteristic/history, any limitations in filling out the form, or to mention what was not clearly understood. Often the individual will provide further explanations for responses and may add “sometimes” for an item that was scored “Y” or “No”. The inclusion of “Sometimes” provides the rationale for the “Y” or “N” response.

BMQ-R Scoring and Interpretation

1. At the bottom of the form, indicate the number of “Y” responses for each below the category/sub-category. If there were 6 Y’s in the DEC category, enter that number in the DEC box at the bottom of the form and it should appear as “**6**/9”.
2. The significance, and perhaps the strength of the finding, depends, *for the most part*, on the number of “Y” responses compared to the potential number of items. For this reason, we subtract the “NA” responses from the total number of items. To reduce the number of items in a category, simply draw a diagonal line “\” through the total number of items and write in that number minus any “NA” items. For example, if “NA” was circled for question 9, draw a diagonal line “\” through 9 in the DEC box at the bottom of the form and write in 8. The reduction in the number of items for individual categories must be carried to the *ΣCAP* box to reduce the total number of items in the questionnaire.
3. In the scoring boxes at the bottom of the form, the 3 subcategories of the TFM category are in grey and in parentheses to remind you that these are part of the TFM category and will be summed and placed in the *TFM* box. If the numbers for the Noise, Memory, and Various items are 2, 5, and 3, respectively, enter the total of these items in the *TFM* box (**10**/14).
4. Follow the same procedures for the other 4 groups.
5. Sum the *DEC*, *TFM* (do not to include the values from Noise, Memory, and Various, in parentheses, a second time), *INT*, *ORG* and *APD* scores. Enter this value in the *ΣCAP* box and remember to reduce the questionnaire’s total items by the number of “NA” by drawing a diagonal line through the total number of items and replace it with the corrected total. For example, if one “NA” was circled on the questionnaire, draw a diagonal line through 39 in the *ΣCAP* box and write in 38.
6. Review the 6 therapies to see if they may have influenced the BMQ-R responses.
7. Next, consider the written comments to determine if they will influence your analysis or expectations.
8. The quickest and simplest analysis of the data is to determine if the person had a *ΣCAP* score of 8 or more. If so, APD testing is warranted because the person is exhibiting a significant number of APD signs. It should be noted; the *GEN* items may provide additional useful information, but are not included in the *ΣCAP* because they are not necessarily associated with APD.
9. A “+” sign is placed in the bottom box of the scoring table to indicate an “at risk” category. The “+” is used for the major categories and not the subcategories because of the greater reliability of the entire category. For that reason, the boxes beneath the *Noi*, *Mem*, *Var*, and *Gen* are blacked out to minimize potentially misleading information. A question mark “?” can be entered in the box if the professional is uncertain of the indication. The audiologist can review the suggested categories in the report or the conference with the family to better understand how the exhibited characteristics and the test findings compare. It can be said the BMQ-R identified areas of concern for X and Y categories and the diagnostic testing verified weaknesses in those areas. This adds strength to the finding and indicates the tests results are consistent with the areas of weakness that are exhibited on the BMQ-R. Where they disagree, there are usually reasonable explanations for the discrepancy.

Figure 2 illustrates a completed BMQ-R. One can see that the person completing the questionnaire is able to quickly go down each group of items and circle those that do or do not apply. Also, from the audiologist’s point of view, it is easy to see how quickly one can add the number of “Y” responses and enter the number in the appropriate box. If there are “NA” responses, they are subtracted from the total number of characteristics for that category and the total number of items, with the updated values written in the scoring table (see the DEC and *ΣCAP* scoring box in Figure 2).

Figure 2

A sample completed BMQ-R form

BUFFALO MODEL QUESTIONNAIRE-REVISED

Name Bill Brown Date _____

Age 9 Grade 3rd Form completed by Mom

Please circle 'Y' if the individual being evaluated is currently receiving or has received any of the services and indicate the number of years received

Y Auditory training? ____ yrs	☒ Speech therapy? <u>4</u> yrs	Y Phonological awareness training? ____ yrs
☒ Special phonics training? <u>1</u> yrs	☒ Reading therapy/tutoring? <u>2</u> yrs	Y Sensory-integration training? ____ yrs

- 1) Please circle 'Y' if the statement applies to the person being evaluated or 'N' if the statement does not apply to the person
 2) If it does not apply, circle 'NA' (e.g., if a kindergartner has no foreign language training; circle 'NA' for #9)

DEC 1) ☒ N Has difficulty saying speech sounds accurately 2) ☒ N Has difficulty understanding language 3) ☒ N Has difficulty understanding verbal directions 4) ☒ N NA Has difficulty reading aloud 5) ☒ N NA Has difficulty with phonics 6) ☒ N NA Has difficulty with spelling 7) Y ☒ Responds slowly/delayed to spoken language 8) Y ☒ Speaks slowly 9) Y N ☒ NA Has difficulty learning foreign language Noi 10) ☒ N Is hypersensitive to noise 11) ☒ N Is distracted by noise 12) ☒ N Has difficulty understanding speech in noise 13) ☒ N Is noisy/makes more noise than peers Mem 14) Y ☒ Responds too quickly, at times 15) Y ☒ Interrupts others frequently 16) ☒ N Has difficulties with reading comprehension 17) ☒ N Speaks quickly 18) ☒ N Forgets things told 19) ☒ N Has difficulty remembering spoken instructions Var 20) ☒ N Has difficulty paying attention 21) ☒ N Has difficulty using language 22) Y ☒ Has ADHD/ADD 23) Y ☒ Has anxiety (e.g. new situations)	INT 24) Y ☒ Has very poor handwriting 25) Y ☒ NA Has difficulty with sound/symbol relationships 26) Y ☒ NA Has severe reading/spelling difficulties 27) Y ☒ Has severe visual perception difficulties 28) Y ☒ Sometimes has very long delays in responding 29) Y ☒ Has been diagnosed with dyslexia ORG 30) Y ☒ Has difficulty keeping things organized 31) Y ☒ Has difficulty saying/writing things in proper sequence/order 32) Y ☒ Is messy/tends to lose things APD 33) ☒ N Has had ear infections/fluid, e.g., as a child 34) ☒ N Has difficulties processing/understanding what is said 35) ☒ N NA Has a learning disability 36) ☒ N Has difficulty following verbal instructions 37) ☒ N Has an intellectual disability 38) Y ☒ Has had a head injury 39) ☒ N Has Autism or a related problem Gen 40) Y ☒ Is hypersensitive to touch 41) Y ☒ Has difficulty maintaining eye contact with a speaker 42) ☒ N Has difficulty with long-term memory 43) Y ☒ Has a psychological problem 44) Y ☒ Has a behavior problem 45) Y ☒ Has difficulty coordinating body movements 46) Y ☒ Has allergies 47) ☒ N NA Has difficulty with math 48) Y ☒ Has a hearing problem/hearing loss
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Comments, explanations, questions: #33 I don't think he has had one for the past 6 months

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DEC	(Noi)	(Mem)	(Var)	TFM	INT	ORG	APD	ΣCAP	(Gen)
6/ 8	(4 /4)	(3 /6)	(2 /4)	9/14	- /6	- /3	6 /7	21/ 3 38	(2 /9)

It is interesting to go down the list of “Y” responses to obtain an overview of the patient’s challenges. An APD category is supported when a parent indicates a characteristic on the BMQ-R that is identified on the diagnostic evaluation. While no one item may designate an APD weakness, it can help to explain the exhibited difficulties. For example, item #7 indicates slow speech or language, which could result from poor DEC. The person likely requires additional time to comprehend what is heard. However, at school, the teacher will not be waiting for this child to digest what was said, which leads to missed information as the teacher continues to speak. The student then becomes confused and frustrated and the child must use more cognitive resources to try to obtain the missed material, causing fatigue as a result of the extra work required to obtain the information.

The information from the BMQ-R can contribute to the explanations and counseling following the evaluation. Parents and teachers may benefit from understanding the underlying reasons for the child/person’s auditory challenges. This could also show the need for appropriate classroom accommodations.

Buffalo Model Questionnaire – Information and Data

Prior Therapies that May Influence Responses on the BMQ-R

At the top of the form are six therapies (previous or current) that can influence the performances on the diagnostic test battery and influence the BMQ-R. Therefore, that training should be considered for better than expected performance and beyond their actual auditory processing skill. For example, intensive Phonics training may make a person a better Decoder, and importantly more sophisticated in combining individual sounds. This could decrease the exhibited problems that a parent and/or teacher may interpret as resolution of the processing problem. Although the problem would not be resolved, the parent/teacher’s responses could suggest better performance on the BMQ-R. The longer a person is in a therapy the more likely it could influence the BMQ-R and the APD tests. Although speech has improved, some children continue to have milder/less obvious articulation errors after speech therapy and the parent may circle “N” for “Has difficulty saying speech sounds accurately”. The same is true for other forms of training. Children who have had Sensory-Integration (S-I) training may not show a Type-A pattern on the SSW test but still have auditory Integration (INT) weakness. If we know that a person had S-I training, we can be more alert for the presence of subtle signs of INT on the BMQ-R and the test battery. In order to identify the correct weakness, we should consider the influence of prior therapies, superior intelligence, as well as various compensations (e.g., visual), which could influence the BMQ-R and test battery. It is important to identify those who have to ~~deal~~ with APD, even if they exhibit minimal problems because the weakness can be more significant than it appears.

Table 2 presents the 6 therapies that have a potential impact on the BMQ-R and the Buffalo Model test battery. This alerts us to the tests and APD categories that are most likely to appear better because the patient has been exposed to specific therapies. In 6 to 18-years old’s with APD, there was an average of 2 prior therapies per child. Speech therapy was the most commonly identified (63%) prior therapy, followed by Reading Tutoring/Therapy (56%). Phonics and Phonological Awareness Training were each indicated 28% of the time. The least frequent therapies, but important nevertheless, are Sensory-Integration (18%) and Auditory Training (16%).

Table 2

Therapies that may reduce the number of “Y” response on the BMQ-R and show improved performance on the Buffalo Model diagnostic test battery

Prior Therapy	Test/Category Effected
Auditory Training	Depends on the specific training
Speech Therapy	Primarily Phonemic Synthesis; DEC
Phonological Awareness	Primarily Phonemic Synthesis; DEC
Intensive Phonics	Primarily Phonemic Synthesis; DEC
Reading	Primarily Phonemic Synthesis; DEC
Sensory-Integration	Primarily SSW Type-A; INT

Table 3 contains mean “Y” responses with standard deviations in parentheses for normal Controls <6 years (n=10), 6-18 years (n=55), and >18 years (n=57). These are not the normal limits, but provide an idea of how the Control groups were characterized on the BMQ-R. The mean Σ CAP scores for the <6 years Control group was 2.0, for the 6-18 years group was 1.4 and for those >18 years group the score was 1.7 out of 39 items. This suggests that those who do not have APD are extremely unlikely to have Σ CAP scores of 8 or more.

Table 3

Normal Control Groups

Group	Total Items	Mean for Children < 6 yrs	Mean for Children 6-18 yrs	Mean for >18 yrs
DEC	9	.4 (0.7)	.1 (0.4)	.1 (0.3)
(Noi)	(4)	.1 (0.3)	.1 (0.3)	.3 (0.5)
(Mem)	(6)	.6 (0.8)	.4 (0.6)	.3 (0.6)
(Var)	(4)	.3 (0.4)	.2 (0.4)	.3 (0.5)
TFM	14	1.0 (0.7)	.7 (0.9)	1.0 (0.9)
INT	6	.0 (0.0)	.0 (0.2)	.01 (0.1)
ORG	3	.2 (0.4)	.3 (0.6)	.3 (0.5)
APD	7	.4 (0.5)	.2 (0.4)	.3 (0.5)
Σ CAP	39	2.0 (1.6)	1.4 (1.2)	1.7 (1.3)
(Gen)	9	.5 (0.5)	.4 (0.5)	.5 (0.6)

Note. Mean (and SDs) of “Y” responses on the BMQ-R categories/subcategories for normal Controls. Results for <6 years, 6 – 18 years and >18 years age groups are shown.

Table 4 contains mean BMQ-R “Y” responses with standard deviations in parentheses for those found to have APD on the Buffalo Battery. The age groupings are <6 years (n=39), 6-18 years (n=150), and >18 years (n=24).

Table 4*Auditory Processing Disorder Groups*

Group	Total Items	Mean for Children < 6 yrs	Mean for Children 6-18 yrs	Mean for > 18 yrs
DEC	9	3.0 (1.8)	4.5 (1.9)	3.5 (1.8)
(Noi)	(4)	1.9 (1.2)	2.1 (1.2)	2.1 (1.1)
(Mem)	(6)	2.6 (1.6)	2.9 (1.3)	2.4 (1.6)
(Var)	(4)	1.9 (1.0)	2.1 (1.2)	1.9 (1.0)
TFM	14	6.4 (2.7)	7.1 (2.8)	6.5 (2.7)
INT	6	0.8 (1.0)	1.7 (1.4)	0.67 (0.8)
ORG	3	1.1 (1.0)	0.7 (1.1)	1.48 (1.1)
APD	7	2.7 (0.5)	3.0 (0.9)	2.9 (1.2)
ΣCAP	39	14.0 (5.5)	18.0 (5.5)	15.0 (5.5)
(Gen)	(9)	1.7 (1.4)	2.8 (1.9)	2.9 (1.8)

Note. Mean (and SDs) for “Y” responses for each BMQ-R grouping for those with APD. The results are shown for ages <6, 6 – 18 and >18 years.

Interpreting the BMQ

The BMQ has been found to be an invaluable tool at various stages in working with those who have APD. It provides an independent view of an individual’s performance at home and at school as reported by the parent and/or teacher. Knowledge of classroom performance is essential for many questions; directly or indirectly involving teachers, report cards, and/or conferences.

Numerically, each item of the questionnaire is equally weighted because the BMQ-R does not depend on any one item. The significance and perhaps the strength of the finding depends, in large part, on the number of “Y” responses versus the potential number of items (though we do consider the sensitivity of the item as shown below). To compare the proper numbers, we subtract the “NA” responses from the total number of characteristics/history items as well as from the ΣCAP score (see BMQ-R Scoring and Interpretation for additional information). Thus, if question 9 response is NA, the 9 DEC questions would be reduced to 8 (see Table 6).

Table 5*Sample Scoring No “NA” Items*

DEC	(Noi)	(Mem)	(Var)	TFM	INT	ORG	APD	ΣCAP	(Gen)
6/9	(3/4)	(3/6)	(2/4)	10/14	1/6	2/3	3/7	22/39	(2/9)
+				+	?	+	+	+	

Table 6*Sample Scoring With “NA” Items*

DEC	(Noi)	(Mem)	(Var)	TFM	INT	ORG	APD	ΣCAP	(Gen)
6/9 8	(3/4)	(3/6)	(2/4)	10/14	1/6 4	2/3	3/7	22/39 36	(2/9)
+				+	?	+		+	

Table 5 provides an overview of what the BMQ-R reveals. Later, the results can be compared to the age norms. Six of the 9 positive DEC items are impressive. Clinically, almost every person with APD shows some characteristics/history of DEC. Thus, a positive DEC finding is generally expected (although 6/9 is higher than average). A “+” is placed below the DEC box (see Table 5). The three TFM subcategories are not reviewed at this point; but they are considered when planning management. The combined score for TFM is 10/14, so a “+” is placed below the TFM box. Again, this is a large number for an individual exhibiting characteristics/history of TFM. Each of the subcategories contributed to the total. This is a strong indication for TFM difficulties; both Noise and Memory characteristics were reported plus Various items (e.g., Attention). This gives a great deal of support for TFM (see Tillery, Katz, & Keller, 2000).

The next box in Table 5 shows INT results. Generally speaking, if only 1 out of 6 items is positive, this is not a very strong indication (although prior therapies or high intelligence may make even one characteristic more significant). It should be noted that either item 26, “Has severe reading/spelling difficulty” or item 29 “Has been diagnosed with dyslexia” can often stand alone as an INT indicator. Academically young children have fewer of these INT challenges. For all three age groups in Table 4, the INT items have relatively few positive responses. This may occur because: a) INT signs are less frequent in young children (INT characteristics are generally noted in reading and spelling challenges), b) INT problems involve fewer cases than the other three categories, c) INT is a higher-level function, so it may involve other APD categories, the signs are likely not as pure (e.g., 3 of the 6 INT items do not deal with audition at all). Reviewing the characteristics/history can suggest that INT is part of the person’s APD. Although “Has very poor handwriting” is not a sign of auditory INT, but it co-exists in many people with INT challenges. This less common characteristic provides more strength in indicating this less common and more complex category. Table 7 shows that INT characteristics were noted least often by far. So, INT may not be as easy to support as the other categories. In addition to items 26 and 29, if you wish to show concern, for this important category, despite just one INT indicator, you can enter a question mark “?” in the INT box (see Table 6).

Table 7*Some BMQ-R items and the percent of times they were identified in the APD group*

Category	Most Common Item	%	Common Item	%	Least Common Item	%
Decoding	Understand oral directions	79	Phonics	65	Speaks Slowly	41
Noise	Distracted by noise	65	Understands in noise	63	Noisy child	21
Memory	Remember oral directions	79	Reading comprehension	65	Speaks quickly	17
Various	Attention	64	Use language	50	ADD/ADHD	39
Integration	Auditory-Visual Integration	38	Some very long delays	33	Dyslexia	23
Organization	Sequencing	59	Keeps things in order	58	Messy/loses things	55

For the Organization category, Sequencing is the strongest and most important characteristic. Since poor auditory sequencing exemplifies the presence of Organization, it is strong enough alone to indicate an Organization problem. However, it would be best to have at least one more item supporting this category.

Other considerations in assessing the BMQ-R

Unlike tests, questionnaires depend on the individual completing the form to provide the information. However, children with APD below 6 years of age tend to have slightly better scores than older children (see Table 4). This may be due to the lack of exposure to certain activities, such as oral reading and reading comprehension. APD in children below the age of 6 may be more difficult to detect on the BMQ-R than over 6 years of age. The “Characteristics of Young Children” is an APD screening questionnaire that focuses on early life challenges in children below age 6 that can add important information and support.

Bright children are often rated higher because they are able to compensate for their APD better than children with less advanced cognitive skills. In the early grades when the tasks are simple, children can depend heavily on their visual skills to read and spell. Also, the adult group generally has better BMQ-R scores because adults may have difficulty recalling problems they experienced earlier in life, have developed compensations and have chosen occupations that avoid their problems. Thus, all the factors should be considered, especially when the BMQ-R outcome does not agree with test results.

Table 8 presents the normal limits for the Control (No APD) groups. The <6 years group ranged in age from 3-5 years while the >18 years group ranged in age from 21-69 years. A finding is significant if the obtained score exceeds the value listed in Table 8.

Table 8

Control Group

	< 6 years	6-18 years	>18 years
Decoding	2	1	1
Noise	1	1	1
Memory	2	2	2
Various	1	1	1
Tolerance-Fading Memory	2	3	3
Integration	0	0	0
Organization	1	2	1
ΣCAP	5	4	4
General	2	1	2

Note. Normal limits are set for the Control subjects at 2 standard deviations above the mean. The ‘Sequencing’ item was found to be significant for ORG; even by itself.

The norms in Table 3 show the means and standard deviations that can be used to assess the BMQ-R groupings. However, the norms in Table 8 enable the user to quickly identify the significant findings. A ΣCAP score of 8, based on Table 4, would help to minimize false positive findings. In one analysis of more than 150 children with APD and 30 sibling-controls, there was no overlap on the BMQ-R in the outcomes of the 2 groups. Thus, if there are 8 or more ΣCAP items noted on the BMQ-R it strongly suggests the need for APD diagnostic evaluation.

A study completed by Pavlick, Zalewski, González, and Duncan (2010) examined the relatedness that exists between findings on the BMQ and the Buffalo Model diagnostic test battery. Descriptive statistics showed a sensitivity rate for the BMQ of 89% (i.e., 40 of the 45 children who received a diagnosis of APD received scores of eight or above on the BMQ). A Chi Square Test for Independence performed on data that were collected through a retrospective chart review showed that findings from the parent-completed BMQ screening

tool were significantly related to the diagnosis of APD as determined by the Buffalo Model diagnostic test battery. Data from the Pavlick et al. (2010) study supports the use of the BMQ as an appropriate screening tool as a complement to the Buffalo Model diagnostic test battery.

BMQ-R Following Therapy

The BMQ-R is also very useful for determining the effectiveness of an APD therapy program on a child's performance at school and home; as reported by the parent and/or teacher. The items that were initially noted to be of concern to the rater are listed under the 'Factor' column (see Table 9). Each item can be rated following therapy on a scale (e.g., from -1 to +3). In this rating '-1' indicates that the problem has "Gotten Slightly Worse" up to '+3' showing the problem has "Greatly Improved". Further, only the BMQ-R characteristics/history related to the specific therapy are listed. Therefore, the BMQ-R characteristics/history "Has had ear infections/fluid, especially as a child" and "Has difficulty keeping things organized" would be omitted as these items would not be influenced by this type of training. However, items that the rater may not have identified initially as a problem on the BMQ-R (e.g., Has a learning disability) may be added to the list of factors. Usually, such items are listed separately as shown (on the right side of the form) in Table 9. Such ratings can be used in addition to the diagnostic test-retest information and the actual performance on the therapy materials to estimate the person's progress. Quite often, items initially omitted show excellent improvement. Having these three separate views of the therapeutic program (1. ratings from the table below, 2. diagnostic test-retest results, and 3. therapy performance) provide a broader and stronger view of its effectiveness.

Table 9

Illustration of a section of a rating form to determine the generalization of therapy results using items from the BMQ-R

Factors	Improved Greatly	Improved Moderately	Improved Slightly	Stayed Same	Got Slightly Worse	Factors	Improved Greatly	Improved Moderately	Improved Slightly	Stayed Same	Got Slightly Worse
Has difficulty saying speech sounds accurately 1		X				For my own information, please rate the following, if applicable					
Has difficulty reading aloud 4	X										
Has difficulty with phonics 5	X										
Is distracted by noise 11		X				Never attempted foreign language learning 9		X			
Has difficulty understands speech in noise 12			X			Has a learning disability 35		X			

Summary and Conclusions

The field of Audiology has come a long way, over the years, in developing test batteries to identify APD as well as therapies to improve APD. But one of the problems that we have on a day-to-day basis is the need for independent support and confirmation that our diagnoses are correct and that our therapies have been effective. The Buffalo Model Questionnaire - Revised (BMQ-R) contributes effectively for those purposes. In this manual we discuss this powerful tool. This revision improves the readability of the tool, reduces the completion time, reduces both the technical jargon, and scoring time for the Audiologist.

The BMQ-R can play an important part in a) confirming test results, b) relating concerns of parents and/or teachers to APD test results, and c) provide a better understanding of how aspects of APD can influence a person's communication and education. The BMQ-R can also aid in d) the development of an effective therapy program and e) in assessing the benefits of a training/therapy program. The BMQ-R can be an indispensable tool in the day-to-day work for professionals serving those who have APD when using the Buffalo Model tests and/or therapy procedures.

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