21 PHONAK FOCUS

News / Ideas / High Technology / Acoustics No. 21, 1996

The Abbreviated Profile of Hearing Aid Benefit (APHAB) – *Administration and Application*

Robyn M. Cox, Ph. D.
Professor of Audiology
University of Memphis,
Memphis, TN

Acknowledgment: Preparation of this manuscript was supported by funding from the US Department of Veterans Affairs Rehabilitation Research and Development Service.

APHAB is an acronym that stands for the Abbreviated Profile of Hearing Aid Benefit. It is a self-assessment inventory in which patients report the amount of trouble they are having with communication or noises in various everyday situations. The APHAB was developed to be used as part of a hearing aid fitting procedure, to provide a standardized test for quantifying the disability associated with the hearing impairment of a patient. Although use of a standardized approach employing predetermined situations is open to criticism because all of the chosen situations will not be equally relevant or important to every patient, standardization also has a number of advantages which, hopefully, will become apparent. This article will:

1. outline the background and development of the inventory;
2. describe the APHAB;
3. discuss how to give and score the test either in paper-and-pencil format or directly at the computer keyboard;
4. provide information about interpreting the results; and
5. discuss some potential applications of the procedure.

Background and Development

It would probably be impossible to cite the earliest effort to construct a standardized questionnaire to explore the opinions and attitudes of hearing-impaired individuals towards their hearing losses. There have been many. In the Hearing Aid Research Laboratory at the University of Memphis, we needed a self-assessment tool to measure the hearing aid wearer's opinions about the helpfulness of his/her hearing aid. Drawing upon the literature and contributions in related areas, we developed the Profile of Hearing aid Performance, or PHAP (Cox and Gilmore, 1990). This questionnaire consists of 66 items which are scored in seven subscales. Five subscales address the problems people have communicating in daily life and two subscales center on the unpleasantness of everyday sounds.

The PHAP is answered from the point of view of the person wearing hearing aids, that is, it asks about the individual's experiences when the hearing aid is being worn. We soon expanded the scope of the questionnaire to include responses to the items from the point of view of the unaided listener. By determining the difference between responses for "with my hearing aid" and "without my hearing aid", it is possible to derive a measure of the individual's opinion about some of the benefits and costs associated with hearing aid use. This expanded questionnaire is called the Profile of Hearing Aid Benefit, or PHAB (Cox, Gilmore and Alexander, 1991). It comprises the same items and the same subscales as the PHAP.

The PHAP and PHAB were developed to be used as research instruments and were too long to be practical for many clinical applications. However, there was strong interest in these questionnaires among clinicians and, in response to this interest, a shortened, or abbreviated, version of the PHAB was developed. This was called the APHAB (Cox and Alexander, 1995).

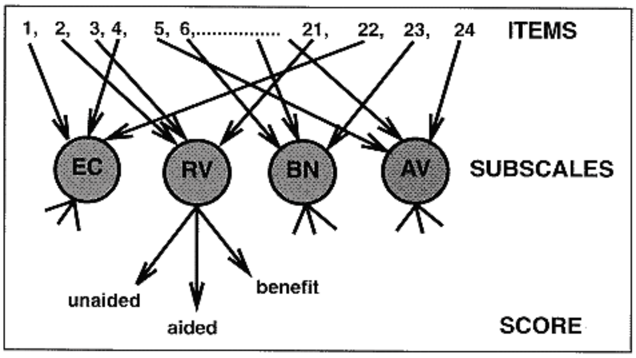
Description of the Inventory

The APHAB comprises 24 items that are scored in four subscales. The subscales are:

- Ease of Communication (EC). The strain of communicating under relatively favorable conditions.
- Reverberation (RV). Communication in reverberant rooms such as classrooms.
- Background Noise (BN). Communication in settings with high background noise levels.
- Aversiveness (AV). The unpleasantness of environmental sounds.

Figure 1 is a diagrammatic representation of the APHAB. There are 24 items. Each item contributes to only one subscale and there are six items for each subscale, distributed randomly within the inventory. Each item is answered for "without my hearing aid" and "with my hearing aid" so that each subscale produces a score for unaided listening and a score for aided listening. In addition, the difference between these two scores can be obtained to give a score for benefit (which can be negative if the hearing aid actually makes things worse). In summary then, the complete APHAB generates twelve scores, three for each of four subscales.

Fig. 1: *Diagrammatic representation of the APHAB*



Each item of the APHAB is a statement, such as " I can understand my family at the dinner table". The patient must decide how often the statement is true by choosing from a list of seven alternatives which are shown in Figure 2. Each alternative's descriptive word is associated with a percentage of occasions to help the patient interpret the word.

Fig. 2: *Seven response alternatives of the APHAB*

APHAB Response Scale		
A.	Always	(99%)
B.	Almost Always	(87%)
C.	Generally	(75%)
D.	Half-the-time	(50%)
E.	Occasionally	(25%)
F.	Seldom	(12%)
G.	Never	(1%)

Figure 3 shows a sample item from the EC subscale and illustrates the appearance of the computer screen when the patient responds to the inventory directly on the keyboard, using the software produced by the Hearing Aid Research Laboratory. Other software may produce a screen that looks different from Figure 3 but the important considerations will remain the same. Notice that the screen display has four parts: instructions, item statement, response for "without hearing aid", and response for "with hearing aid". There are two important matters to bear in mind when using this screen. First, be aware that the instructions are actually a shortened version of the ones used with the paper-and-pencil administration. This was necessary because of the limited space on the screen. The screen instructions should be thought of as a reminder for the patient about how to proceed. To begin the inventory, you should read or say the full and complete set of instructions to the patient. The complete instructions are:

"Please circle the answers that come closest to your everyday experience. Notice that each choice includes a percentage. You can use this to help you decide on your answer. For example, if a statement is true about 75% of the time, circle "C" for that item. If you have not experienced the situation we describe, try to think of a similar situation that you have been in and respond for that situation. If you have no idea, leave that item blank."

Second, it is important to tell the patient that each item must be read carefully because sometimes a response of "always" means a lot of problems and sometimes it means few or no problems. For example, the item statement in Figure 3 is "When I am in a small office, interviewing or answering questions, I have difficulty following the conversation" and the highlighted response in the "without hearing aid" column is "almost always". This means the patient almost always has difficulty following the conversation when in a small office. In other words, he/she is having a lot of problems in this situation without a hearing aid. Now consider this item which is from subscale RV: "When I am talking with someone across a large empty room, I understand the words". Choosing a response of "almost always" for this statement would mean that the patient is experiencing very few problems conversing across a large empty room. The items were written this way to make sure that patients pay close attention to their content. Otherwise, some patients will read only the first item or two and then just give the same answer to all the rest, which defeats the analytic purpose of the inventory. In our experience, if you tell patients about this feature of the questionnaire, and perhaps even show them some items that demonstrate the point, the great majority of people will complete the questionnaire successfully. However, a certain proportion of patients, especially very elderly ones, find this aspect of the inventory confusing. The extent of this problem depends very largely on your patient population.

Fig. 3: *Sample item from the EC subscale*

Please select the answer that comes closest to your everyday experience. If you have not experienced a particular situation, imagine how you would respond in a similar situation.

10. When I am in a small office, interviewing or answering questions, I have difficulty following the conversation.

Without My Hearing Aid	With My Hearing Aid
A. Always (99%)	A. Always (99%)
B. Almost Always (87%)	B. Almost Always (87%)
C. Generally (75%)	C. Generally (75%)
D. Half-the-time (50%)	D. Half-the-time (50%)
E. Occasionally (25%)	E. Occasionally (25%)
F. Seldom (12%)	F. Seldom (12%)
G. Never (1%)	G. Never (1%)

Administering the test

Scoring the APHAB is accomplished using a software program. The responses from the patient can be obtained using a traditional paper-and-pencil format or with the patient responding directly on the computer keyboard. If the paper-and-pencil format is used, the dispenser then keys the responses into the program for scoring, using a data entry screen that is optimized for this task. Obviously, it is more convenient for the dispenser if the patient completes the inventory using the keyboard because this saves the 5 minutes (or less) required to key in his/her responses. However, clinicians using the inventory have reported that many elderly hearing aid candidates are not sufficiently computer-literate to be comfortable with this approach. Thus, it is often best to use the paper-and-pencil method.

The APHAB was designed and developed with the assumption that patients would read the items. Although the reading level is quite low, it is possible to encounter patients who cannot read the items, either because of literacy or vision problems. Clinicians have reported administering the inventory by reading items to patients but this quite often produces anomalous results and might not be advisable.

It is quite acceptable to complete only the "without hearing aid" portion or only the "with hearing aid" portion at any one sitting, depending on your purposes for using the inventory (see applications, below). If you want the patient to complete both portions in the same sitting, you should ask him/her to complete all the "without hearing aid" responses first and then go to all the "with hearing aid" responses. This precaution minimizes the likelihood of the patient becoming confused and entering data in the wrong columns.

Sometimes patients have difficulty responding to a particular item because they do not experience the specific situation described in their daily life. In this case, attempt to help them identify a similar situation in preference to leaving the item blank. To choose a suitable alternative situation, consider the background noise level, the talker-listener distance, reverberation, and presence of visual cues. With practice you will learn which alternative situations seem appropriate for your population. If leaving an item blank appears unavoidable, keep in mind that you probably should not give much weight to subscale scores derived from fewer than four responses.

The most common application of the APHAB is probably in conjunction with the fitting of a new hearing aid. In this case, it is recommended that you administer the "without hearing aid" portion before the new aid is fitted, possibly on the same day that the initial hearing evaluation is done (perhaps while the earmold impression is hardening). As discussed below, the unaided profile might be helpful in planning your approach to the fitting. The "with hearing aid" part is then added after the patient has had two weeks to accommodate to the new instrument. Although full adjustment to a new hearing aid almost always takes longer than two weeks, it is best to administer the post-fitting evaluation after a convenient standardized accommodation period and two weeks has been found to work quite well.

To maximize the validity and reliability of the data, the patient is allowed to see his/her responses to the "without hearing aid" portion while he/she is completing the "with hearing aid" part several weeks later. The patient should be encouraged to review the earlier responses. In addition, he/she is allowed to change responses to the "without hearing aid" part retrospectively if he/she no longer agrees with them. Actually, patients very seldom change their minds about their responses to the "without hearing aid" portion but reviewing their previous responses probably "recalibrates" patients, if necessary, and this improves the quality of the "with hearing aid" data they provide.

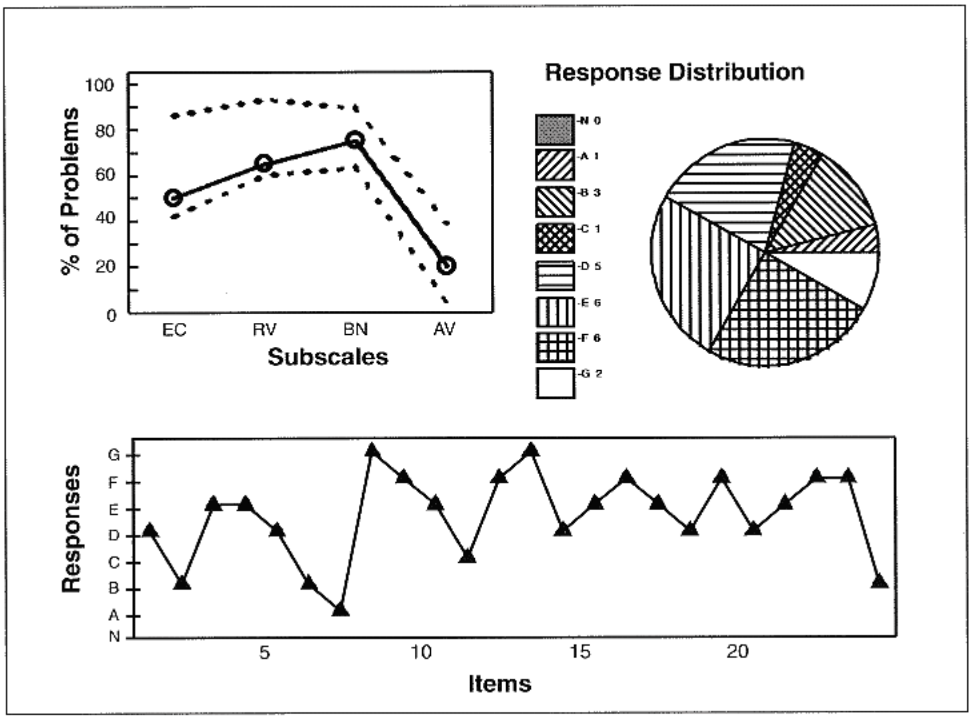
Sometimes patients exaggerate the benefits provided by the hearing aid because they are grateful for the concern you, the dispenser, have displayed for their problems and the efforts you have made to alleviate them. Their way of saying "thank you" is to praise the hearing aid excessively. Be alert for this tendency and make sure your patients know that you really want an honest assessment of their experiences with the fitting, even the negative parts. This will give you the opportunity to provide them with the benefit of your expertise and maximize the likelihood that they will become repeat customers and recommend you to their friends.

Interpreting the Results

Once the patient's responses to the 24 items have been entered into the software program, scores are generated for each subscale and a graphical display is provided for the dispenser to evaluate. The first task is to check the pattern of the responses to see whether they appear to be valid. Because of the different types of items in the inventory and because some of them are written with reversed logic (i. e., "always" means few problems), we expect to see a pattern of responses in which most of the response alternatives are used at least once and the pattern of usage is not systematic. If we do not see this type of response behavior, it is likely that the patient did not respond to the inventory in a valid manner and the data should, therefore, be viewed with caution. Of course, even the appearance of a valid response pattern does not absolutely guarantee the quality of the data. Nothing can substitute for careful observation by the dispensing clinician.

Figure 4 illustrates the screen showing the response pattern and scores for unaided listening. Other screens display corresponding data for aided listening and benefit. The figure at the bottom displays the response to each item in the order they occurred. In this figure, we hope to see a fairly random-looking pattern, indicating typical responses to the different types of items. Any obvious systematic pattern should lead to skepticism about the data. In the upper right, the pie chart displays the number of times each response was used. A quick visual check reveals whether the pie has quite a few slices, indicating that most of the response alternatives have been used. The figure in the upper left provides some guidance about the extent and pattern of disability reported by the patient. This figure compares the results for the individual patient with those of a norm group.

Fig. 4: *Screen graphics showing response pattern and score for unaided listening*



The norm group used in this software is composed of experienced, regular wearers of linear hearing aids (Cox and Alexander, 1995). They were mostly elderly with mild-to-moderate sloping or flat bilateral hearing loss. Most wore in-the-ear instruments and about half were binaurally aided. They had at least one year of hearing aid experience and all wore their hearing aids four or more hours per day. It would be possible to define many other types of norm groups. For instance, we could select wearers of non-linear hearing aids, or highly satisfied amplification users, or persons of a particular age range. At present, we do not know how differently those groups would respond to the inventory. Collection of data to characterize different norm groups is a priority in future research with the APHAB. In the meantime, when you compare your patient with the norm group in this software, it is important to keep the characteristics of the norm group in mind.

In Figure 4, the dotted lines display the 20th and 80th percentile profiles of the norm group. Twenty percent of unaided subscale scores from persons who regularly wear linear hearing aids are less than the lower line and twenty percent of them are more than the upper line. Sixty percent fall between the two lines. Since the profile yielded by the patient illustrated in Figure 4 (open circles) falls between the two lines, we may conclude that the pattern is typical of persons who become long-term users of linear hearing aids. If the profile of your individual patient does not fall between the dotted lines, this does not mean that he/she will not be successful in adjusting to hearing aid use. It only means that he/she is somewhat less typical. As we accumulate more experience with measures like the APHAB, it will become more clear what, if any, actions are indicated by this type of observation. In fact, it might be quite useful to know how your patient compares with others with considerably more precision than it is possible to display on this small screen figure. To meet this need, the printout from the software displays the patient's scores along with an entire family of equal-percentile profiles from the norm group. Figures 7, 8, and 9 illustrate some possible uses for these types of data.

Potential Applications

Many dispensers have found that using the APHAB during hearing aid fittings has helped them to focus discussions and counseling with patients and has helped patients to realize some subtle benefits of amplification that might not otherwise have been obvious to them. In addition to utilizing the inventory in these intuitive ways, several data-based applications are possible. The main advantage of using a standardized test is the ability to compare the results for your patient with those obtained by others and to employ statistical principles in evaluating scores obtained under various conditions. Figure 5 lists four potential applications of APHAB scores.

Fig. 5: *Some potential applications*

Potential Applications of APHAB

1. **Predict success from unaided scores**
2. **Compare results with different hearing aids**
3. **Evaluate fitting in an absolute sense**
4. **Measure benefit from fitting**

Predicting success from unaided scores
Two individuals with essentially the same audiograms will often give different scores on the unaided portion of the APHAB administered before the hearing aid fitting. A typical example is shown in Figure 6. The upper panel depicts the audiogram for each of two hearing aid candidates and the lower panel shows the corresponding unaided APHAB profiles. Because the two audiograms are very similar, the likelihood of success with amplification would seem to be similar for these two persons. However, the unaided APHAB profiles show that one person consistently reported a higher percentage of problems than the other. Apparently, although the two patients have about the same hearing **impairment**, they have different amounts of hearing **disability** as a result of that impairment.

Observations from our laboratory suggest that the amount and pattern of disability reported on the unaided APHAB might be predictive of whether the patient will successfully adjust to linear amplification. Figures 7, 8, and 9 illustrate three patterns that have been identified. Each figure shows a patient's profile compared with a family of equal-percentile profiles for experienced, regular wearers of linear hearing aids.

Fig. 6: *Audiograms (upper panel) and corresponding unaided APHAB scores (lower panel) for two patients.*

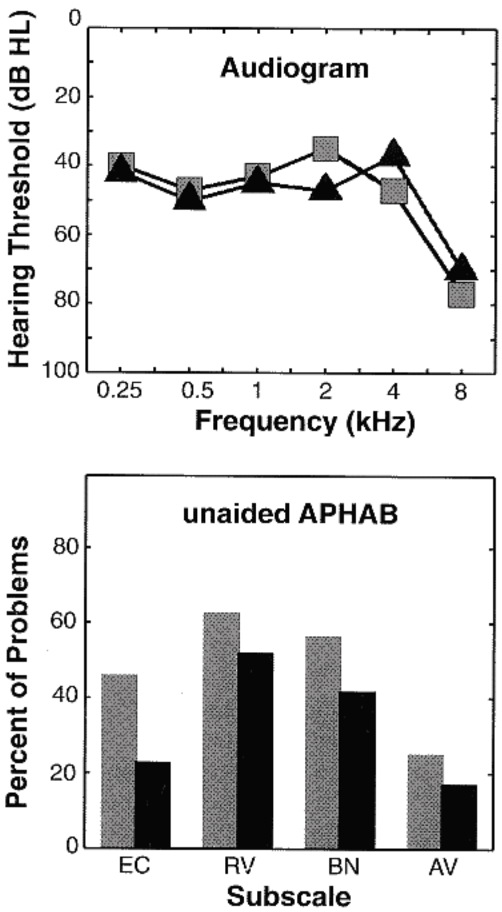


Figure 7 depicts a profile in which scores for the three speech communication subscales, EC, RV, and BN, all fall above the 35th percentile for the norm group while the AV score falls below the 65th percentile. Essentially, this individual is telling us that he/she is having quite a few daily life problems in communication areas and that environmental sounds are not especially negative or unpleasant. In our experience, this unaided pattern is often associated with a good adjustment to linear amplification.

Fig. 7: *Unaided APHAB profile often associated with a good adjustment to linear amplification*

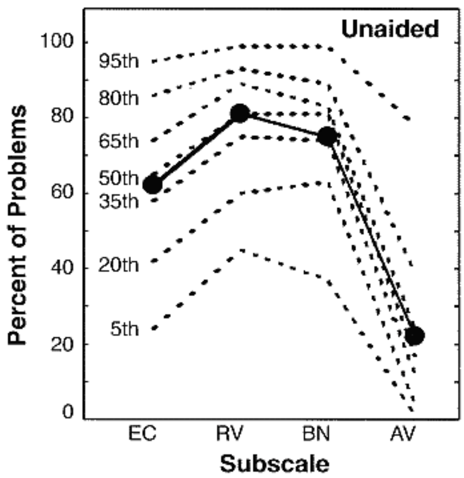


Figure 8 shows a pattern which, in our experience, is often associated with a poor adjustment to linear amplification. In this profile, the three speech communication subscale scores are all less than the 35th percentile for the norm group **and** the AV score is above the 65th percentile. This individual is reporting relatively few communication problems combined with fairly high aversion for environmental sounds. We could speculate that linear amplification may be unsuccessful for such individuals because the benefits of a modest improvement in communication ability are outweighed by the high cost of the additional aversiveness that results from linear amplification of environmental sounds. Styer and Weaver (1995) also noted that this pattern was associated with unsuccessful adjustment to linear hearing aid use. It seems reasonable to further speculate that this unaided pattern should be a warning to the dispenser to consider the use of some form of compression in choosing the hearing aid(s) for this individual.

Fig. 8: *Unaided APHAB profile often associated with a poor adjustement to linear amplification*

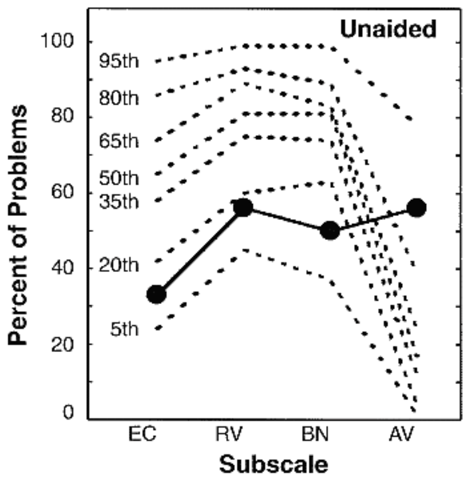
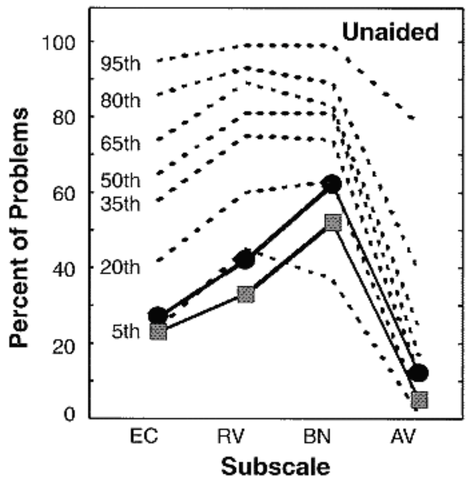


Figure 9 depicts a pattern in which scores for EC, RV, and AV are all relatively low but scores for BN are higher. We interpret this as indicative of an individual who only experiences hearing problems when they attempt to communicate in a noisy listening environment. At present, we regard this pattern as ambiguous. Some of these individuals become amplification users whereas others try amplification but are not successful. Knowing this as a dispenser, you might wish to tell the patient that some people with their types of hearing problems do find amplification helpful but some do not. Hence, the best recommendation is probably trial use of amplification in daily life while maintaining an open mind about the benefits that might result.

Fig. 9: *Unaided APHAB profile which suggests need for trial period*



Comparing results with different fittings

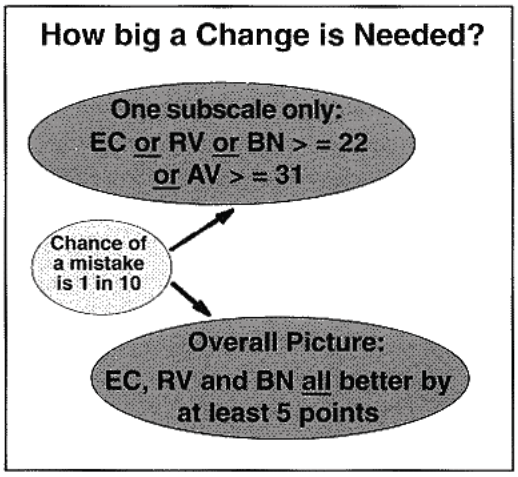
In the rapidly changing amplification climate of the 1990s, we are often uncertain about the relative value of different types of hearing aid fittings for a particular individual. For example, we might wish to know whether a patient would be better fitted with a linear class D amplifier or an input compression device. Or we might wish to determine whether a new hearing aid would provide superior performance compared to an existing fitting. APHAB data can be used to address these questions.

To compare two potentially useful fittings, you allow the patient to wear one fitting in daily life for a reasonable period of time (say, two weeks) and complete the APHAB aided portion (i. e., "with my hearing aid") for that fitting. Then switch to the other fitting for the same amount of time and under the same wearing conditions as much as possible. Then complete the APHAB aided portion for the second fitting. You can then compare aided data from the two fittings.

It is almost certain that the two sets of results will not be identical. However, we know that human beings are not very precise instruments and measurements obtained with any subjective test will contain inherent random variability. The fewer the items used, the more variable is the test result. So, in clinical practice, we are constantly attempting to find an acceptable balance between time devoted to testing (i. e., number of items used) and variability of the data. With any test, we must have some information about expected variability before we can generate guidelines about how to interpret differences in scores from the same patient from one time to another or from one condition (hearing aid fitting) to another.

To evaluate this matter for the APHAB, Cox and Alexander (1995) analyzed data from a group of hearing aid wearers. Some of the derived rules for comparing aided scores are summarized in Figure 10. These rules are appropriate for interpreting differences in aided scores **from the same individual** at different times or under different conditions. You might be primarily interested in results for only one subscale. This could happen, for example, if you only want to know whether one fitting is better than another in noisy listening environments. In this example, you would compare aided results for subscale BN for the two fittings. As Figure 10 shows, you need to see a difference in BN subscale scores of at least 22 points before you can have reasonable certainty that the results represent a real difference between fittings and are not due to chance variations.

Fig. 10: *Rules for comparing aided APHAB scores from the same patient*



If you are interested in a more global assessment of the two fittings, you can consider the aided results for the three communication subscales together. If EC, RV, and BN all are superior for the same fitting by at least 5 points, you can be fairly certain that the better-scoring fitting is truly superior. If the difference between fittings is at least 10 points for all three subscales, the likelihood of this occurring by chance is only about 4 percent.

Figure 11 displays an example from our laboratory. This patient wore each of two hearing aids (aid 1 and aid 2) for several weeks and completed the aided APHAB at the end of each trial period. The Figure shows the results for each instrument. There are no differences between individual subscales that exceed the values shown in Figure 10 and neither fitting was consistently superior. When asked to judge the better hearing aid, this patient said that they were "about the same", thus agreeing with the statistical evaluation of the scores.

Fig. 11: *Results for two hearing aids worn by the same patient and judged to be about the same*

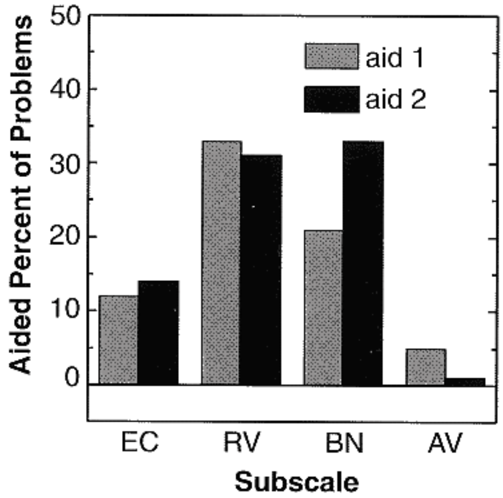
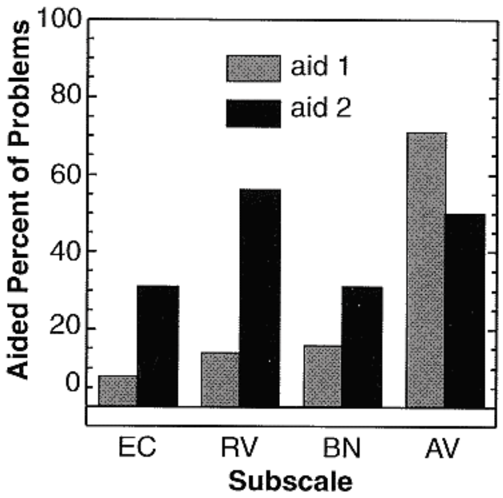


Figure 12 shows another example. Again the patient wore each hearing aid for a period of weeks and completed the aided APHAB after each trial period. As the Figure indicates, responses for the three speech communication subscales (EC, RV, BN) taken together, were clearly different for aid 1 and aid 2. This is consistent with an overall difference between the instruments.

Fig. 12: *Results for two hearing aids worn by the same patient and judged to be slightly different*



In addition, significant differences between the fittings were observed for individual subscales EC and RV. When asked to judge the relative merits of the fittings, this patient noted that aid 1 was "slightly better" than aid 2. This is consistent with the statistical evaluation because responses for aid 1 were indicative of fewer aided problems that those for aid 2. It is somewhat surprising that such a large apparent difference between fittings translated into a judgment of "slightly different". However, we might speculate that the superiority of aid 1 on the speech communication subscales was partly offset by the fact that aid 1 scored more highly on aversiveness (the AV subscale) than aid 2.

Evaluating the fitting in an absolute sense

At times either the dispenser or the patient might be interested in assessing the merit of the fitting in an overall sense. One approach to this is to compare the patient's aided responses with those from a norm group. This allows you to put the patient's fitting outcome in perspective. We have identified three norm groups that might be of interest and, as mentioned earlier, numerous other norm groups would be possible. For each norm group we have generated a set of equal-percentile profiles that can be used as a basis for evaluation of the fitting for a particular individual. The norm groups are:

Norm group 1: Established wearers of linear hearing aids. The norms show responses for aided performance. By comparing your patient's results to those of this group, you can describe his/her performance relative to other persons with hearing impairment who are regular hearing aid wearers.

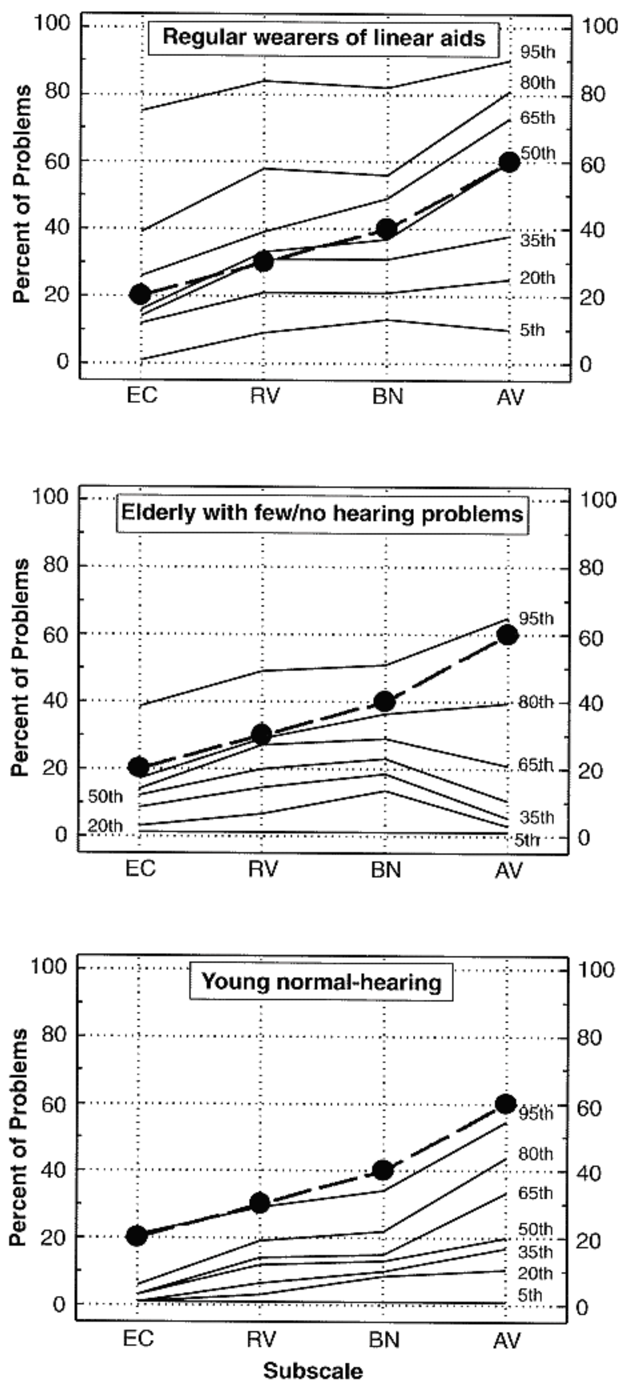
Norm group 2: Elderly persons with few or no self-assessed hearing problems. This group of individuals is similar in several ways to many hearing aid wearers, but they do not experience hearing problems. The norms show responses for unaided performance (these individuals do not use amplification). Elderly hearing aid wearers may be interested to know how the problems they experience in daily life with amplification compare to those of similar persons who do not have hearing difficulty.

Norm group 3: Young normal-hearing listeners. Even people with excellent hearing sometimes experience hearing difficulties in daily life communication. Therefore, it would be quite unrealistic for a hearing aid wearer to expect or hope that any amplification system could solve all hearing problems. It can be reassuring for hearing aid wearers to realize this and to compare their aided performance with the everyday experiences of the group with the best hearing.

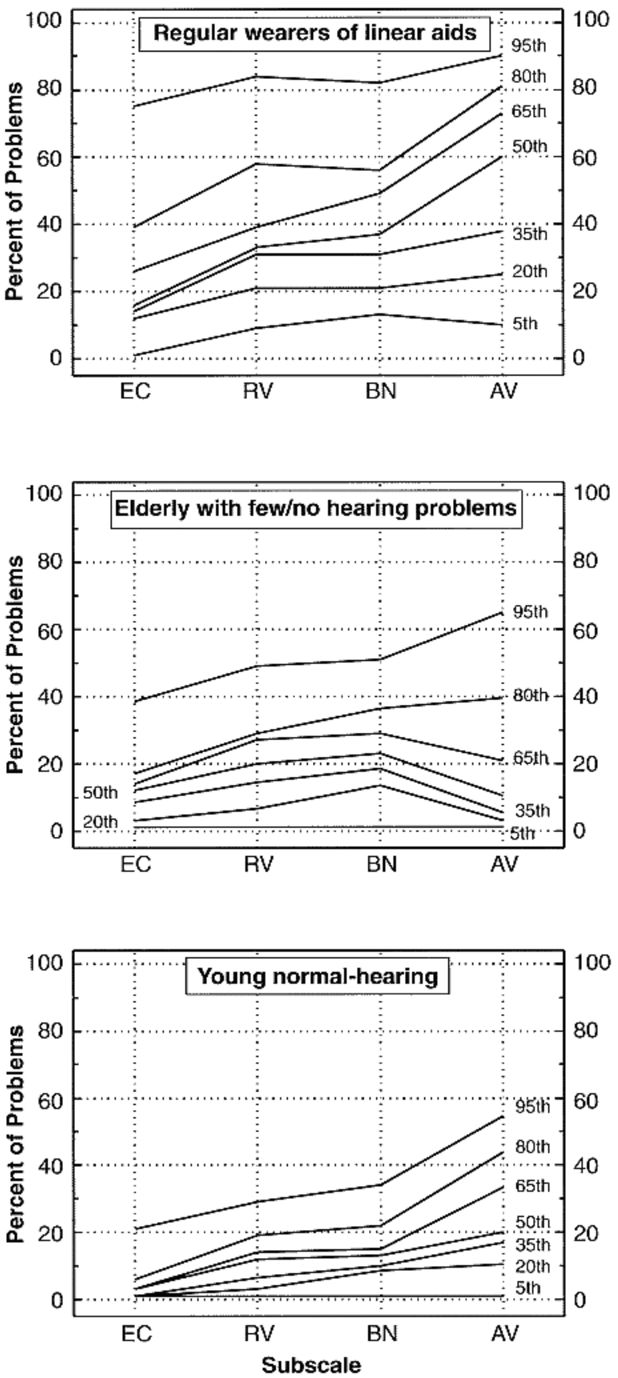
Appendix A contains the set of equal-percentile profiles from each norm group. This page can be copied and the results of an individual patient can be plotted for comparison with one or all groups.

Figure 13 shows an example in which the aided responses for a particular hearing aid wearer (EC = 20, RV = 30, BN = 40, AV = 60) are plotted against those of each norm group. Since all of the circles are above the 95th percentile line for young normal-hearers, we may conclude that not many persons with excellent hearing would report the extent of problems experienced by this patient. Note, however, that the patient's scores for EC, RV, and BN are near the 80th percentile for the elderly listeners with essentially normal hearing. This indicates that nearly 20 percent of the patient's "normal hearing" contemporaries report more daily communication problems than he/she experiences when using the hearing aid. Finally, in the context of other (linear) hearing aid wearers, this individual's performance is near the 50th percentile and is, therefore, very typical (about half of hearing aid wearers report more difficulties and half report fewer).

Fig. 13: *Aided responses for one patient plotted against each of three norm groups*



Appendix A: *Equal-percentile profiles for each of three norm groups. Aided data for an individual patient can be compared with those for each group*



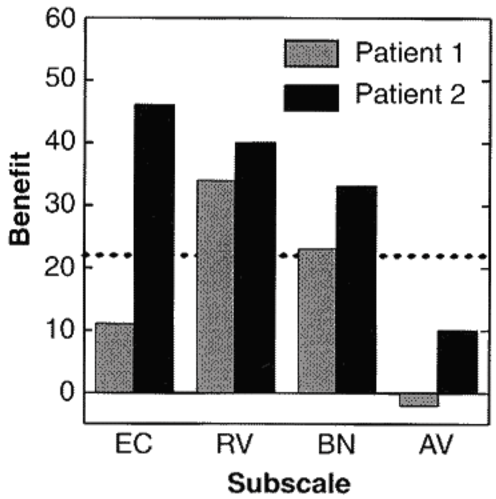
Quantifying Benefit

There are at least two good reasons for measuring the benefit obtained from a particular hearing aid fitting. First, you might be in a position of needing to determine whether you have provided **significant** benefit, that is, whether the patient's performance with the hearing aid is truly improved over his/her performance unaided. This sort of documentation is increasingly demanded by health-care providers and other third-party payers. In addition, a benefit metric is often of considerable interest to the patient, who may be reassured to see his/her subjective impression confirmed by the quantification process. Keep in mind that, because human beings are variable responders, it is possible to see an apparent improvement in scores which is due to measurement error rather than real change. Thus, to help determine whether observed differences depict real benefit, we use statistical concepts based on data from other persons who have taken the APHAB. The guidelines shown in Figure 10 for evaluating differences between aided scores can also be used to evaluate differences between aided and unaided scores. Thus, when considering individual subscales, you need to see a difference of about 22 points between unaided and aided scores for EC or RV or BN in order to be reasonably certain that the change in scores represents a real difference between conditions. If you are more interested in a global evaluation of the hearing aid, a pattern in which the aided score is at least 5 points better (fewer problems) than the unaided score for EC and RV and BN is a basis for reasonable certainty that the hearing aid is providing improved performance. This conclusion would be wrong about 1 time in 10. You can be even more confident that real benefit is obtained if you see a pattern in which aided performance is better than unaided performance by at least 10 points on all three subscales. This will be a chance occurrence only about 4 times in 100.

Second, you might wish to quantify benefit as part of an effort to determine whether the patient is likely to be **satisfied** with the amplification you have provided. In this context, it is essential to realize that satisfaction is a complex variable and that benefit is only one of its components, albeit an important one. Although all the elements of satisfaction are not clearly understood at this time, it probably encompasses issues such as communication needs and personality traits as well as the actual benefit provided. Furthermore, satisfaction is difficult to define in a way that will receive widespread acceptance. If we define it simply as the response to the question "How satisfied are you?" we quickly encounter patients who claim to be very satisfied but who return the hearing aid, or keep it but seldom or never wear it. If we define satisfaction simply as keeping and using the hearing aid, we will have many persons who meet this definition and yet claim to be quite dissatisfied with the instrument.

For the sake of discussion, let us define satisfaction as choosing to pay for and keep the hearing aid after a suitable trial period. Using this definition to quantify satisfaction, data from our laboratory show that a hearing aid can provide significant benefit but still be unsatisfactory to the patient. Figure 14 illustrates this point. This Figure depicts APHAB benefit results from two patients after each had tried a hearing aid for a three month period. Notice that, since the measured variable is benefit (i. e. unaided problems minus aided problems), a taller bar indicates better performance in this Figure.

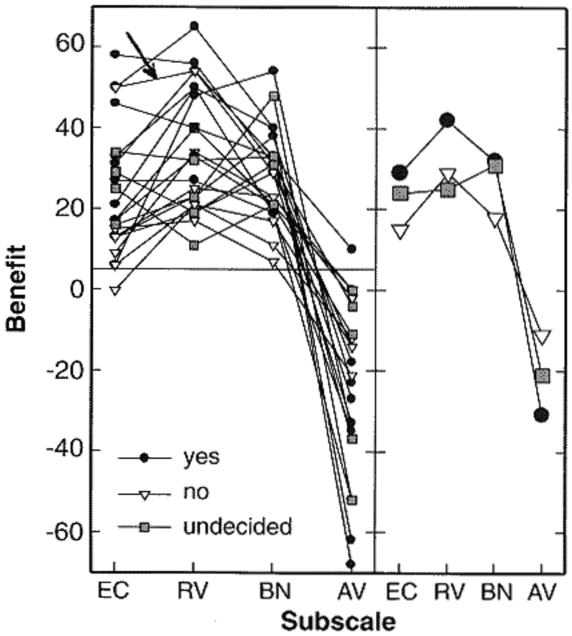
Fig. 14: *APHAB benefit scores from two patients with different satisfaction*



Any speech communication subscale extending above the dotted horizontal line is showing significant benefit in its own right. This is true of EC, RV, and BN for Patient 2 and of RV and BN for Patient 1. In addition, for both patients, all three speech communication subscales yielded benefit scores greater than 10, indicating that both hearing aids clearly provided significant benefit in an overall sense. What happened? Patient 2 chose to pay for and keep the hearing aid but Patient 1 returned the instrument.

Figure 15 shows the benefit and satisfaction outcomes for 22 elderly patients after being fitted with their first hearing aids (all linear processors) and wearing them for three months. After this trial period, eleven patients elected to keep the hearing aids (the "yes" group), six decided to return them (the "no" group), and five still could not make up their minds (the "undecided" group). Incidentally, this was a research group and the distribution of yes/no/undecided judgments is not necessarily representative of a random sample of hearing aid wearers. In the left panel of Figure 15, each individual's APHAB data are shown. A line is drawn across this panel at a benefit of 5 points. Any individual who's EC, RV, and BN scores are all above the line has demonstrated significant overall benefit from the amplification. Only one patient fails this test – all the rest did have significant benefit. In the right panel, the mean subscales scores are given for each decision group.

Fig. 15: *APHAB benefit scores from 22 patients divided into three satisfaction groups*



We can learn several things from studying these data. First, there is clearly a lot of overlap between the decision groups when we observe the individual data in the left panel. On the other hand, the mean values for each group (right panel) show a clear pattern in which the yes group's speech communication scores were consistently about 15 points higher than those for the no group while the undecided group's scores were interweaving among those of the two other groups. Based on these observations it is reasonable to conclude that a pattern showing higher APHAB benefit for EC, RV, and BN (say, 25 or more) is more likely to be associated with satisfaction (as we have defined it), whereas a pattern showing benefit of, say, 20 or less is more likely to be associated with a decision to reject the amplification system. However, the range of the individual data in each group shows clearly that factors other than benefit enter into this decision. A striking example is seen in Figure 15, left panel, in the member of the no group marked with an arrow. This individual lived alone and wanted the hearing aid mainly to facilitate communication with her grandchildren during their visits. As the Figure shows, she obtained high benefit scores. Nevertheless, considering the financial commitment required and the need to wear the hearing aid fairly frequently (even when alone) in order to obtain maximum benefit from it, she decided that the benefit/cost ratio was not high enough and elected not to keep the hearing aid. Overall, these data from a group of elderly new hearing aid wearers illustrate that benefit is an important aspect of satisfaction but other variables also have a substantial impact on the outcome of a fitting.

The AV subscale

Not much has been said in this article about the AV subscale. This is because we do not yet clearly understand the significance of patterns of responses on this subscale. Because the content of the subscale focuses on the hearing aid wearer's impression of environmental sounds, we speculate that aided responses can provide information about the appropriateness of the hearing aid's limiting system or maximum output level. Some clinicians have reported successfully using the AV score as the basis for adjustment of SSPL90 settings but data to support this practice have not been obtained at this time. Further research is necessary before we can use the AV scores in a scientific manner to improve hearing aid fittings.

Conclusions

The process of hearing aid fitting should always include an element that determines the patient's impression of the benefits provided by the amplification system. Use of the APHAB as a part of the fitting procedure has several advantages:

- By directing the patient's attention to performance in specific situations, the inventory often helps him/her to develop a more studied appreciation of the pros and cons of hearing aid use.
- The patient's responses to the items can guide the dispenser to matters that should be attended to in counseling.
- Responses to the unaided portion of the inventory might be useful predictors of the likelihood of a successful adjustment to amplification, or of the type of processing to try.
- Responses to aided portion of the inventory can be compared to those of a norm group to provide a basis for judging the quality or merit of the fitting.
- APHAB data can be used to compare two potentially useful fittings to determine whether one is significantly superior.
- The inventory can be used to document hearing aid benefit for accountability purposes or as part of a program to assess satisfaction with the fitting.
- Other applications can be expected to emerge as more data are gathered using the APHAB.

Finally, we should not lose sight of the limitations of the APHAB, some of which also apply to other similar standardized instruments. The principle problem is that there is no method that accounts for the importance to the individual of the situations described in the APHAB items. In addition, patients sometimes cannot relate to every situation that is described because they do not encounter them in daily life. Furthermore, patients with reading problems or vision problems might not be able to complete the inventory satisfactorily, and some patients are seriously challenged by the fact that the sense of the items alternates between positive and negative. As a result of these considerations, it is safe to conclude that, although the quantification of unaided performance, aided performance, and benefit that is available from the APHAB can be highly valuable in facilitating the hearing aid fitting process, the uniqueness of each patient's individual circumstances will continue to demand the dispenser's careful personal attention.

REFERENCES

Cox R.M., and Alexander G.C. "The Abbreviated Profile of Hearing Aid Benefit (APHAB)".
Ear and Hearing, 16, 176–186 (1995).

Cox R.M., and Gilmore C. "Development of the Profile of Hearing Aid Performance (PHAP)".
Journal of Speech and Hearing Research, 33, 343–357 (1990).

Cox R.M., Gilmore C.G., and Alexander G.C. "Comparison of Two Questionnaires for Patient–Assessed Hearing Aid Benefit".
Journal of the American Academy of Audiology, 2, 134–145 (1991).

Styer S.O., and Weaver H.R. "Outcome Measures from High Frequency Hearing Aids using the Abbreviated Profile of Hearing Aid Benefit (APHAB)".
Presented at the First Biennial Conference on Hearing Aid Research and Development, Bethesda, MD, September, 1995.

Other Readings

Paul R.G.(Feature Editor), and Cox R.M. "Measuring hearing aid benefit with the APHAB: Is this as good as it gets?" American Journal of Audiology, 4(3), 10–13 (1995).

Cox R.M., and Rivera I.M. "Predictability and Reliability of Hearing Aid Benefit Measured Using the PHAB". Journal of the American Academy of Audiology, 3, 242–254 (1992).

Phonak Focus Overview

For further information:

Robyn M. Cox is a Professor of Audiology and the Director of the Hearing Aid Research Laboratory in the School of Audiology and Speech-Language Pathology, University of Memphis, Memphis, Tennessee, USA. She received a Diploma in Speech Therapy from the University of Queensland in 1967; B. S. and M. A. degrees in Audiology and Psychology from Ball State University, Muncie, Indiana (1969, 1971); and Ph. D. in Audiology from Indiana University in Bloomington, Indiana in 1974. Her research interests encompass hearing aid fitting strategies, prediction of fitting outcomes, and measurement strategies in hearing aid rehabilitation with the elderly.

28599(GB)/0996 • na/Focus 21 (GB)/0996 • Printed in Switzerland

PHONAK AG, CH-8712 STÄFA, SWITZERLAND