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My Friend, the Queen of Outcomes…

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Robyn Cox must be old. Harsh words, but in my world, it must be a fact. She was one of my first heroes, one of my mid-career idols, and has been my good friend for at least 20 years. So, she must be old since she is retiring and I am still ramping up...

For example, she published a couple of important calibration-related papers nearly 40 years ago to help practicing clinical audiologists like me understand earphones and couplers in daily audiometric testing.[1,2,3] She invented the terms “preferred listening level” and “upper level of comfortable listening” and an entire hearing aid fitting scheme when the rest of the Audiology world was just getting used to the fact we could ethically dispense the things.[4] She was developing and norming speech tests when many of us were still transitioning from the “modified-live voice” approach to assessing speech perception. But Robyn’s real heroism – in terms of the practicing clinician and applied researcher – has been in the arena of self-report outcome measures.

Many years ago, following one of her typically profound presentations at a national meeting, I timidly asked Professor Cox for advice. Specifically, I wondered what outcome measure would be best for my current plan to compare Hearing Aid A to Hearing Aid B. Following her typical thoughtful pause, she simply responded “What are you trying to measure?” That has become my teaching and research mantra: *What* are you trying to measure? As clinicians, we tend to look for a tool, sometimes, without thinking through our purpose.

An *outcome measure* is a measure of the impact of the management or treatment scheme. There are many dimensions, or domains, of outcomes for our consideration. One could argue that any of the following are appropriate outcomes to address:

- Listening effort
- Use time
- Quality of life
- Localization ability
- Naturalness of sound
- Sound quality (especially for music)
- Annoyance for loud environmental sounds
- Social interaction
- Satisfaction with device
- Reduced burden for the significant other(s)
- Speech understanding

Any one of these domains has its purpose (“What are you trying to measure?”). Perceptual measures of sound quality and/or speech perception can tell us something about “how it sounds”;

reports from significant other persons (SOPs) can be useful in understanding success in real-world environments, at least from an outsider's perspective. The most common approach, however, is through the use of self-report measures, allowing the hearing aid wearers themselves an opportunity to provide information relative to the real-world effectiveness of the current management scheme.

Choosing an outcome measure that has published *normative data* (norms), and critical difference values is important to the *clinical management process*. The norms tell us how our patient compares to other patients of similar demographics. The critical difference values allow the clinician to make a statement of true difference in scores between clinic visits or amplification schemes. (Robyn has painstakingly provided us with that information for each tool she has developed.)

Some of the most commonly used – and psychometrically sound – self-report outcome measures were developed by Robyn and her team in the Hearing Aid Lab (HARL) at the University of Memphis. For example: The **Abbreviated Profile of Hearing Aid Benefit (APHAB)** evolved in the early nineties. This tool provides "percent of problems" the patient has for three different listening conditions involving speech understanding (in quiet, in background noise and in reverberation) and problems related to annoyance of environmental sounds (aversiveness scale). These values can be obtained as a pre-test or unaided measure, as an aided measure, or – by looking at the aided to unaided difference score – as a benefit measure. The origins of the APHAB are from other more extensive self-assessment scales, also developed at the University of Memphis. The first of these was a scale designed to assess hearing aid users' opinions about the helpfulness of their hearing aids. This scale was the Profile of Hearing Aid Performance, or PHAP.[5] This questionnaire consisted of 66 items distributed among seven subscales. Five subscales addressed the problems people have communicating in daily life and two subscales related to the unpleasantness of everyday sounds. The PHAP was then modified so that the questions could also be answered by the unaided listener, which could then assess opinions regarding the benefit of using hearing aids. This revision of the PHAP was dubbed the Profile of Hearing Aid Benefit, or PHAB.[5] It comprised the same items and the same subscales as the PHAP. The PHAP and the PHAB were developed as research tools – the 66 questions and scoring for seven subscales was not generally considered "clinically friendly." This led to the development of the shortened (or abbreviated) version of the PHAB, the 24-item, four subscale APHAB,[6] perhaps the most used outcome measure in our discipline.

The **Satisfaction in Daily Living (SADL)** tool was designed to evaluate the patient's satisfaction with a new or current hearing aid or to assess differences between previous and new hearing aids. When the SADL was first developed, many outcome measures focused on hearing aid benefit. While benefit is closely related to the performance of the hearing aid, it does not encompass other factors – such as services or cost – that affect the satisfaction of the hearing aid user. The SADL was developed to find a hearing aid user's overall satisfaction score, as well as break the score down into specific problem areas.[7] The scale is made up of 15 items with four subscales: Positive Effect, Service & Cost, Negative Features, and Personal Image. All items are rated on a 7 category scale: Not At All, A Little, Somewhat, Medium, Considerably, Greatly, Tremendously, and it takes about 10 minutes to complete.

Each of the four subscales of the SADL covers a different aspect of satisfaction and was decided upon by interviewing many hearing aid users with at least one year of experience. Cox and Alexander reported that, according to hearing aid user interviews, the domains of satisfaction are cosmetics and self-image, comfort and ease of use, sound quality/acoustics, cost, benefit, and

service. Further exploration showed that comfort & ease of use did not significantly contribute to user satisfaction. While it is unclear why comfort and ease of use were not significant factors, it is unlikely that a hearing aid wearer will purchase and keep a hearing aid that is either uncomfortable, or too difficult to use. If so, these may still be important factors to hearing aid wearers, the just don't show up as significant when listeners who wear a particular set of hearing aids are evaluated.

More recently, the **Device Oriented Satisfaction Outcome (DOSO)** was developed, as the name implies, to measure the benefit of the device, and to be less sensitive to personality of the hearing aid wearer.[7] In an earlier study[8] it was reported that many questions on self-report questionnaires are more closely related to the hearing aid user's personality than to their audiometric hearing loss. The DOSO attempts to separate outcomes with the device from the influence of personality. Questions on the DOSO are worded to minimize the effect of personality and "point" towards the hearing instrument. Therefore, if a patient cannot decide between two hearing aids, the DOSO may be administered to compare the two instruments. When clear differences in instruments are apparent, this outcome measure can aid in the decision-making process.

Each of these three tools was designed to address a particular domain – or set of domains – that measure the impact of hearing aid intervention. If they are not being used in *your* clinical setting, you are at risk of not following best practices. Successful use of hearing aids is a multi-dimensional construct. Depending upon the outcome domain of interest to you and/or your clinic ("*What* are you trying to measure?"), different tools exist for consideration. If you are not already doing so, consider these three options. In this era of evidence-based practice and accountability, it is important that we document – using psychometrically strong instruments – the impact of our efforts. Robyn Cox, my "old" friend, has spent a lifetime developing efficient, robust tools that cross various domains. I am sure she would not mind a call, email or letter each time you have the question, "Which is the best in *my* practice?" (Sorry, Robyn.)

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