Letters to the Editor

HOLLOWNESS PERCEPTION

To the Editor:

I read with great interest the recent article on hollowness perception presented by Kuk et al (1992). As I read the article, however, I became somewhat concerned by the fact that the authors used a perceptive rating scale ranging from “extremely hollow” to “extremely clear.” My first reaction was that these two qualities do not belong on the same scale. Is it not true that speech can sound hollow but nevertheless clear? Others (e.g., Gabrielsson et al, 1981) have described the perception of “spaciousness” (on a scale from “very closed” to “very open”), a quality that is quite distinct from “clarity.” While I do not dispute the use of the quality “hollowness,” I do feel that it bears no relationship to the quality of “speech clarity.” I would be interested to know if others share my opinion.

My next thought was how this definition of sound quality may have influenced the results presented. The authors stated that when fitting the hearing aids, gain and frequency response adjustments were made in order to maximize speech clarity. Subjects were then provided with the rating scale task, and told that a score of “0” should represent “extremely hollow,” while a score of 100 should represent “extremely clear.” What if the subject’s own aided speech was at best only marginally clear, despite the best efforts to maximize clarity when adjusting the aid? Some subjects might find their own speech quite clear and would have no difficulty rating it with numbers approaching 100. Others, for whom speech was at best distorted, would be unlikely to rate it with high rating values, regardless of the degree of hollowness perceived. For such a subject, a score of 20 could be interpreted either as being somewhat hollow or as being very unclear, and the reader has no way of knowing which aspect of speech the subject was attending to. It would almost be as if this subject were working off a restricted scale (say 0–50, since speech would never approach “extremely clear”), despite the actual response form used. The authors reported that their subjects with moderate flat hearing losses showed a reduction in hollowness perception with noise reduction circuitry. A second group of subjects, having sloping, high-frequency losses, showed no such benefit. If the former group of subjects perceived good speech clarity when the aids were initially fit, they likely would have used a wide range of rating scores as conditions varied, increasing the likelihood of significant effects. Conversely, if the latter group of subjects perceived poor speech clarity at best, their responses would likely have been limited to the lower end of the scale for all conditions, reducing the likelihood of significant effects. Since hollowness and clarity were placed on the same scale, and since the reader does not know how clear optimal aided speech was for these two groups of subjects, it becomes difficult to interpret the results. This difficulty could have been avoided had hollowness and clarity been rated at distinctly different qualities, as I believe they are.

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Response to Fortune

To the Editor:

Fortune asserted that the experiment we reported in JAAA (Kuk et al, 1992) used “hollowness” and “clarity” as two poles of a continuum. Consequently, he was concerned with the interpretation of the obtained results.

We believe Fortune’s concerns may have arisen from the fact that judgment of “speech clarity” and judgment of “hollowness” were made at different times during the experiment, and that the word “clear” was included in the instructions to the subjects. We want to thank Fortune for pointing out a potential source of confusion for other readers. We would like to “clarify” this confusion by pointing out some important aspects of the experimental procedure.

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The experimental hearing aids were fitted using a forced-choice procedure. Subjects selected the combination of F-, G-, and gain settings while judging the clarity of the passage “In
one typical day ... reusable materials.” This method of hearing aid fitting assumes that the selected settings are the “best” settings on the specific hearing aids for the subject. It does not assume that the selected frequency response will be the best (i.e., best speech clarity) for listening to externally presented speech or to one’s vocalization when one compares it to other hearing aids.

After the hearing aids were fitted, subjects were asked to repeat the phrase “Baby Jeanie was teeny tiny” and judge the “hollowness” in their voice as they were vocalizing. Subjects were specifically instructed to pay attention to the amount of hollowness in their voice (i.e., lines 6–8 of Appendix B). Although the phrase “If your voice is extremely clear, I want you to assign the number 100” (lines 9–10 of Appendix B) was used, it was always used with the clarification of “no hollowness,” as reported in the section “Subjective Rating Task” (p. 42). It is doubtful that subjects judged “clarity” when they were specifically asked to judge “hollowness.” Furthermore, these were experienced hearing aid users who knew what “clear voice” meant when they were asked to judge “hollowness.”

Fortune was concerned that the experimental outcome may be biased because not all subjects may find their own aided speech clear. He found it difficult to interpret the results not knowing the quality of the aided speech of the subjects. In retrospect, this may be a valid point. To put this concern to rest, we would like to supply the readers with the raw data we used to generate Figure 3 in the article. The following figure (Fig. 1) is a scatter-plot of the averaged individual hollowness ratings during vocalization. The abscissa represents ratings with noise-reduction circuitry off, and the ordinate represents ratings with noise-reduction circuitry on. Symbols above the diagonal represent instances in which a reduction of hollowness perception was reported with the activation of the noise-reduction circuit. The letters “a,” “b,” and “c” represent the different voice levels (loud, normal, and soft). Several observations are apparent. Firstly, subjects did not rate the hearing aids poorly. Most assigned ratings that were greater than 60% in their hollowness judgment. Secondly, there was a spread of hollowness ratings. Group B subjects showed more dispersion than Group A subjects. Thirdly, the average Group A subject showed higher ratings (i.e., less hollowness) than the average Group B subject, suggesting that Group A subjects may have perceived less hollowness in their voice than Group B subjects in the no-noise reduction state. Consequently, they showed less change in hollowness perception with the noise reduction circuit. The lack of a significant effect in Group A subjects is not due to poor quality hearing aids. Rather, the hearing aids that were fitted initially for clarity optimization (to externally presented speech) were also appropriate for voice optimization (to own vocalization) and thus no additional benefits were offered by the noise-reduction circuit. For Group B subjects, hearing aids that were fitted to optimize clarity (to externally presented speech) resulted in a wide range of hollowness ratings (to own vocalization) and thus these subjects noticed the benefits of the noise-reduction hearing aids.

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