



Real World Performance of Oticon Dual XW: A Field Report

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Introduction

High end instruments today employ advanced signal processing features that are engaged almost simultaneously via the automatics of the instrument, albeit to various extents, in different listening situations. Singling out and testing a single feature may provide valuable information on the effectiveness of that specific feature in a specific listening condition. However, this type of qualification may fail to represent the performance of the instrument as a whole, or reflect the users' perspective on the instruments' actual performance in the "real world." This field report presents the results of a study investigating the performance of Oticon Dual in the "real world."

Oticon Dual is a hearing instrument created with a special focus on the most acceptable design, excellent performance for speech and music, and wireless connectivity to media devices. Oticon Dual accomplishes this by utilizing the wireless RISE technology with advanced features such as 10 kHz bandwidth, binaural processing and decision making of noise reduction, directionality, feedback cancellation, and compression. The combination and balance of the latter feature, known as spatial sound, is a binaurally processed compression system in which gain settings between right and left instruments are optimized for better preservation of psychoacoustic spatial cues. These cues are key to effective localization in noise and provide the hearing impaired user with an enhanced sense of their acoustical environment.

Purpose

The primary purpose of this field study was to compare the real world performance of Dual with currently used instruments in terms of listening comfort, speech understanding, sound quality and spatial perception. Additionally, the special music program of Dual was also evaluated separately in terms of clarity, sound quality and overall impression.

Method

Ten subjects (2 females and 8 males) aged between 32 and 80 years with mild to moderate sensorineural hearing loss participated in the present study. All subjects, who were experienced users of amplification and RITE (Receiver In The Ear) instruments, were fitted bilaterally using prescribed settings, vent sizes and domes with Dual XW, the most advanced model in the Dual family of instruments. Prior to being fitted with Dual, subjects rated their own instruments in terms of listening comfort, speech understanding, sound quality, overall impression and spatial perception using Oticon's own 10-point scale questionnaire and the Speech, Spatial and Quality (SSQ) scale¹. Following acclimatization to the Dual instruments in their daily environment over a period of approximately 4 weeks, subjects completed the same Oticon questionnaire and SSQ scale for Dual. Prior to filling out the questionnaires all subjects used their own instruments and Dual in the following daily listening situations: speech in quiet, speech in car/bus, conversation in larger groups, speech in street, traffic noise, speech in windy situations, speech at a distance, speech on a landline telephone, speech on a mobile phone, TV, sounds of kitchen cutlery, soft sounds at home (fridge or PC), and sudden sounds (e.g. door slam).

Also, as part of the field study, another 9 subjects compared Dual's music program with its general program after listening to music pieces they typically listen to at home. Dual's music program differs from the general program in that it is specially optimized for music enjoyment.

Overall ratings in daily environment

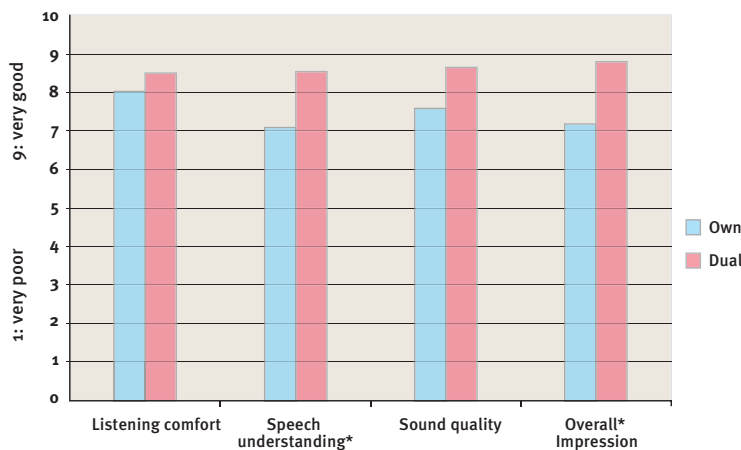


Figure 1: Average ratings ($n=10$) of Listening comfort, Speech Understanding, Sound Quality and Overall Impression in subjects' daily environment. Note that *denotes statistical significance ($p<0.05$).

Results and Discussion

Average overall ratings of listening comfort, speech understanding and sound quality and overall impression of the instrument in all of the afore-mentioned listening situations in the daily environment are shown in Figure 1. Subjects performed significantly better with Dual than they did with their own instruments in ratings of speech understanding and overall impression.

Results of the SSQ are shown in Figure 2. Selected items from the Speech, Spatial and Quality (SSQ) scale are presented as pragmatic subscales except item 17 of the spatial domain. The latter is presented as an item as it does not fit into any of the subscales specified by Gatehouse and Arkroyd (2006)². These subscales provide an index of hearing ability in dynamic or complex listening situations. Except for the last item –Listening Effort – all items shown in Figure 2 represent a spatial dimension of sound or speech. It is worth noting that while the mean performance on all 16 items was higher for Dual than for subjects' own instruments, Dual performed significantly better ($*p<0.05$ and $**p<0.01$) in 9 out of these 16 items (see Figure 2).

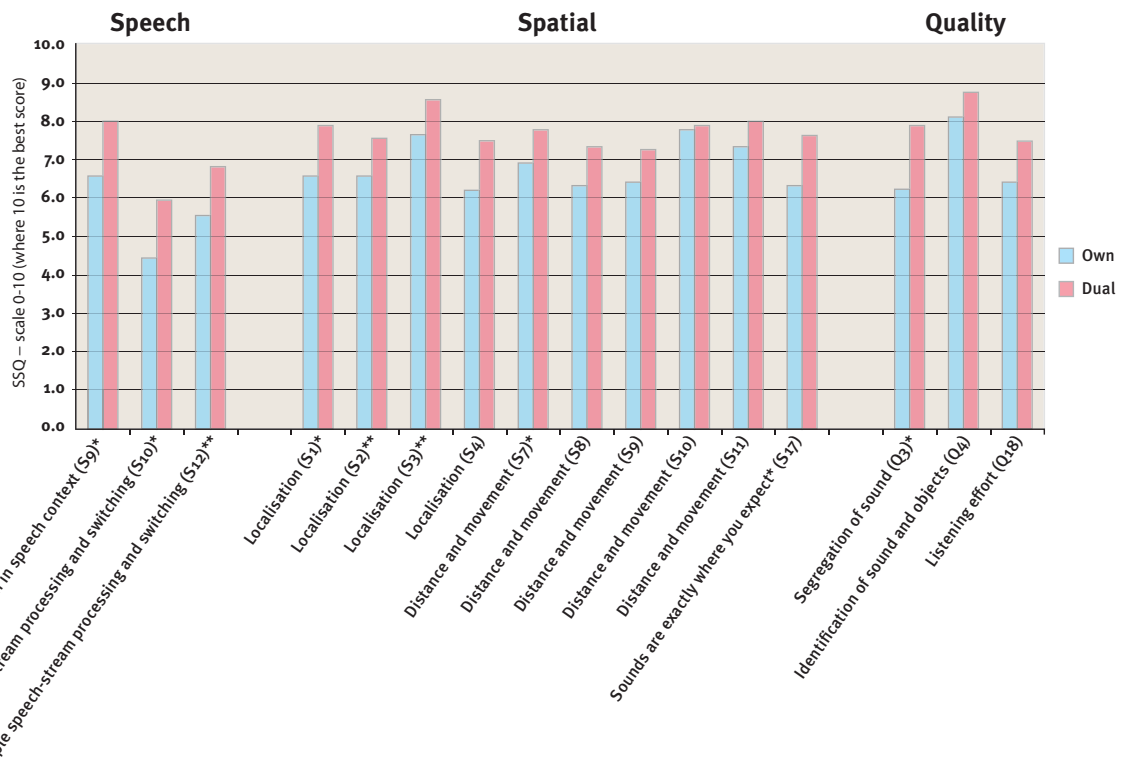


Figure 2: Average ratings ($n=10$), of Spatial and Quality Scale results for 16 selected items presented as pragmatic subscales. Note that * and ** denote statistical significance $p<0.05$ and $p<0.01$ respectively.

Ratings of the music program of Dual are shown in Figure 3. Dual's Music program was rated significantly better ($p < 0.05$) than the general program in terms of clarity, sound quality and overall impression. With the music program the gain in the speech region is de-emphasised, resulting in a flatter overall frequency response. Also, the automatics of Dual are specially tuned such that any potential interference to music listening is kept to an absolute minimum.

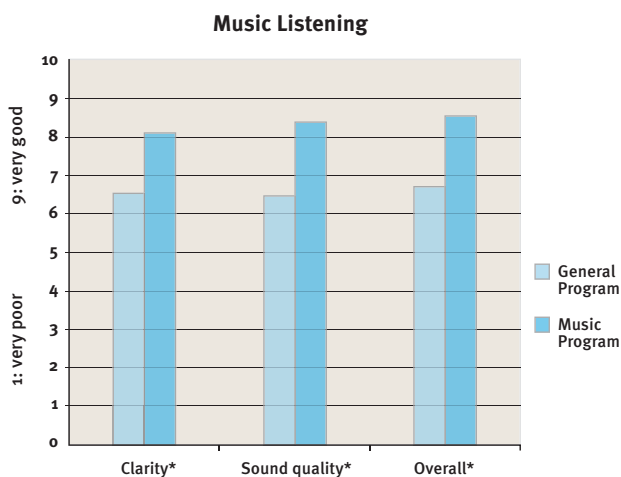


Figure 3: Average ratings ($n=9$) of the music program for Dual and the general program in terms of Clarity, Sound Quality and Overall Impression. Please note * denotes statistical significance ($p < 0.05$).

Conclusion

The present field study clearly demonstrated the superior performance of Dual as compared to individuals' own instruments in their daily environment. Overall ratings of listening comfort, speech understanding and sound quality, and overall impression were better for Dual. In particular, speech understanding and overall impression were rated to be significantly better than subjects' own instruments as was spatial perception as measured by SSQ. It is also worth noting that the Music program that has been specially designed for music enjoyment in Dual was rated significantly better than its general program (space) in terms of clarity, sound quality and overall music listening experience.

Reference

1. Gatehouse S, Noble W (2004) **The Speech, Spatial and Qualities of Hearing Scale (SSQ)**. *International Journal of Audiology* 43:85-99
2. Gatehouse S, Akeroyd MA (2006) **Two-eared listening in dynamic situations**. *International Journal of Audiology* 45:120-124

