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Original article

## Evaluation of the impact of hearing loss in adults: Validation of a quality of life questionnaire

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### ABSTRACT

**Objectives:** The impact of hearing loss and of auditory rehabilitation (hearing aid, cochlear implant) on quality of life is a crucial issue. Commonly used questionnaires to assess quality of life in these patients (Nijmegen, APHAB, GBI) are time-consuming, difficult for patients to fill out, and show poor sensitivity to small improvements or deterioration. The objective of the present study was to validate a dedicated quality of life scale for hearing-impaired adults with or without auditory rehabilitation.

**Material and methods:** ERSA (Évaluation du Retentissement de la Surdit  chez l'Adulte: Evaluation of the Impact of Hearing Loss in Adults) is a self-administered questionnaire. It is divided into 4 domains, each comprising 5 questions graded from 1 to 10. The questions are simple, and formulated so patients will answer according to how they feel at the actual time of the session. Test-retest reliability was measured in 38 patients. Internal coherence and validity against the APHAB questionnaire as gold standard and in relation to hearing performance were measured in 122 patients at auditory assessment. Sensitivity to change in hearing was measured in 36 cochlear implant patients, before and 6 or 12 months after implantation.

**Results:** Test-retest reliability was very satisfactory ( $\rho = 0.88$ ). Internal coherence was good for all questions. External validity, comparing ERSA to APHAB scores in the same non-implanted hearing-impaired patients, was good ( $\rho = 0.52$ ). Additionally, ERSA scores correlated with hearing performance in adverse conditions (monosyllabic words:  $\rho = 0.22$ ; sentences in noise:  $\rho = 0.19$ ). In patients tested before and after cochlear implantation, improvement in hearing performance in silence and in noise correlated with an improvement in ERSA score ( $\rho = 0.37$  to  $0.59$ , depending on the test), but not to GBI score.

**Conclusion:** The ERSA questionnaire is easy and quick to use, reliable, and sensitive to change in hearing performance after cochlear implantation.

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### 1. Introduction

Cochlear implantation is indicated in severe-to-profound bilateral sensorineural hearing loss unimproved by conventional hearing aids. The principle consists in using electrodes in the cochlea to stimulate conserved neurons so as to re-establish

afferent activity toward the central nervous system. Cochlear implants spectacularly improve speech comprehension in a large number of patients, with performance exceeding 80% for bisyllabic words in silence without lip-reading [1–3]. However, speech comprehension in more complex listening contexts, in noise or with several speakers, and listening to music remain a challenge for many cochlear implant users. There is also wide variation in individual performance, which is difficult to explain. In all cases, quality of life is impaired, and requires precise assessment. Indeed, hearing impairment without rehabilitation or with inadequate rehabilitation is an obstacle to communication that can have negative social and occupational consequences [4,5] and also impact the patient's psychological and emotional status [6].

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Apart from simple interview, the quality of life of hearing-impaired adults with or without rehabilitation can be assessed using instruments not specific to hearing loss, such as the Short Form 36 Health Survey [7] or Nottingham Health Profile [8], to assess quality of life before and after surgery or other treatment. However, these scales lack specificity and sensitivity for change in quality of life following cochlear implantation. The Glasgow Benefit Inventory (GBI) [9] is a self-administered questionnaire that can be adapted for patients undergoing ENT surgery or receiving rehabilitation by conventional hearing aid or by cochlear implant. It assesses improvement or deterioration in quality of life with respect to the prior situation, but not at a given time-point without reference, for example, to the pre-implantation period. The Abbreviated Profile of Hearing Aid Benefit (APHAB) questionnaire [10] quantifies the trouble experienced in communicating in everyday life situations. It comprises 24 questions, sometimes formulated positively, sometimes negatively, with multiple choice between 7 responses. However, experience shows that it is often badly filled out, due to how the questions are phrased and the complexity of the response scoring system. Moreover, some questions refer to situations that patients may not necessarily be familiar with (theater, conferences, religious services, etc.) and therefore skip; if the questionnaire has not been completely filled out, the score comes out wrong, as it is not calculated according to the number of questions answered. And finally, it does not shed light on the impact of hearing loss on the subject's quality of life. The Nijmegen Cochlear Implant Questionnaire [11,12] is widely used in clinical research to assess quality of life after cochlear implantation. It explores 3 general domains (physical, psychological and social function) divided into 6 sub-domains (basic sound perception, advanced sound perception, speech production, self-esteem, activity, and social interaction) and provides a fairly precise assessment of improvement. However, it has been shown to lack reliability in the self-esteem and speech production sub-domains [13]. Moreover, implementation in clinical practice is hindered by the length of the questionnaire (60 questions), as patients often do not answer all the questions.

Given this need to be able to assess precisely the impact of hearing loss and of rehabilitation on quality of life, a questionnaire entitled Evaluation of the Impact of Hearing Loss in Adults (Évaluation du Retentissement de la Surdit  chez l'Adulte: ERSA) was drawn up. The intention was to enable hearing-impaired adults, with or without rehabilitation by conventional hearing aid or cochlear implant, to assess their quality of life in 4 domains: general quality of life, personal life, social life and occupational life. Five short and simple questions per domain were formulated in such a way that patients would assess their experience in the present moment, rather than in comparison with a previous state. The aim of the present study was to present and validate the psychometric qualities of the questionnaire in patients consulting for hearing loss and in patients with profound to total hearing loss before and after cochlear implantation. It is an interesting instrument, specific to hearing impairment, available to cochlear implantation centers and those working with the hearing-impaired (license available at 1KrfozxMqagei67q9Gj5v2tw2Zj8jP48WU, <http://creativecommons.fr/>), to assess the impact of hearing loss on quality of life and progression of quality of life after cochlear implantation.

## 2. Material and methods

### 2.1. Drawing up the ERSA questionnaire

The ERSA questionnaire was drawn up by a multidisciplinary team of 3 ENT physicians, including 1 researcher at the Inserm

national health research institute, 3 speech therapists and 1 clinical psychologist, working in the rare diseases center (adult genetic hearing loss, and type-2 neurofibromatosis) in the adult cochlear implant reference center of the Paris region of France (Île-de-France).

ERSA (Appendix 1) is a self-administered questionnaire with a non-controlled administration time of about 5 minutes. It comprises 4 domains (quality of life, personal life, social life, and occupational life) exploring the impact of hearing loss on everyday life, regardless of specific activities. Each domain comprises 5 precise, short questions framed in ordinary language, without negative formulations that would invert the response. Unlike other questionnaires, and notably the GBI, the questions are expressed in such a way that patients will respond according to their present feeling, without any reference to past situations. For each question, a 0–10 Visual Analog Scale allows quick scoring, with points 0, 5 and 10 associated to 3 emoticons (unhappy for 0, neutral for 5, happy for 10) and to 3 appropriate phrases according to how the question is formulated (e.g., “not at all/more or less/totally”, or “never/sometimes/usually”). Formulation is uniform, with no inversions: 0 always corresponds to maximal difficulty and 10 to an ideal situation, so that the lower the score the greater the impact of hearing loss on quality of life. Maximum score is 200 for respondents in work and 150 for those not in work or in retirement. In what follows, “ERSA/200” refers to the ERSA questionnaire scored on all 4 domains (out of 200) by those respondents who were in work, and “ERSA/150” to scores of all respondents on the 3 “quality of life”, “personal life” and “social life” domains (out of 150).

The check understanding and the relevance of the questions, the questionnaire was pre-tested in 20 adult hearing-impaired patients. Understanding was good, self-administration time very quick, and resort to the examiner for help very rare. Instructions were easily understood, enabling rapid continuous responses without the respondent needing to go back. Two questions, however, were considered ambiguous or negative in connotation, and were reformulated for the final version used in the present study (Appendix 1).

### 2.2. Other questionnaires used

The APHAB questionnaire comprises 24 questions assessing difficulty in communicating in favorable situations (“Facility of communication”) and situations with reverberations (“Reverberation”) or background noise (“Background noise”), and tolerance of environmental sounds (“Aversion”). Questions are randomized and sometimes repeated with inverted formulation. For each question, the respondent has a choice between 7 possible responses, from “Always” to “Never”. The questionnaire is scored from 0 to 100%, 0 being no difficulty and 100% maximal impact of hearing loss on quality of life.

The GBI questionnaire assesses change in quality of life following auditory rehabilitation: cochlear implantation in the present case, or else conventional hearing aid. It comprises 18 questions beginning or ending “since you had [the cochlear implant]. . .” Each item is scored on 5 points (much more, more, no change, less, much less), for a scale from –100 (maximal deterioration) to +110 (maximal improvement).

### 2.3. Validation of ERSA questionnaire

#### 2.3.1. Population

The study was conducted between March 2009 (start of pre-test) and March 2011. Participants were adult French-speakers or at least with a level of written French sufficient to full out the questionnaire.

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