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ORIGINAL ARTICLE

Pilot evaluation of a protocol and a clinical tool developed to assess the audiological needs of adults with hearing loss

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ABSTRACT

Objective: To evaluate the Québec Audiological Assessment Protocol for Younger and Older Adults (QAAP-YOA) and its accompanying clinical tool efficacy to assess the needs of individuals with hearing loss in a simulated context. This study is the Phase 2 in the development of the QAAP-YOA. Design: Participants completed two needs assessments with simulated clients and wrote audiological reports, while applying the QAAP-YOA with and without the use of its clinical tool. Interviews were filmed, and reports collected. Both were scored by two independent evaluators. A qualitative analysis of reports was also conducted. Study sample: Eleven audiology students and four early-career audiologists ($n = 15$). Results: The clinical tool did not influence the interview process since both experimental conditions had similar compliance rates to the protocol ($p = 0.114$). Compliance rates for assessment reports were higher with the clinical tool ($p < 0.001$). Participants' conclusions after applying the QAAP-YOA were consistent across participants. The information provided in the reports was more comprehensive and coherent with the client's needs when participants used the clinical tool. Conclusions: The QAAP-YOA can lead to a greater standardisation of needs assessments and to more comprehensive reports, which may lead to intervention programs more closely aligned with clients' needs.

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Introduction

Clients often seek an audiological evaluation because their hearing problems cause them significant difficulties in their life. It is important for the audiologist not only to assess the hearing impairment, but also to explore how the hearing impairment leads to functional difficulties in the particular context of the client (Gatehouse 2003). Conducting a comprehensive needs assessment allows the client and professional to establish a satisfactory treatment or rehabilitation plan that considers the specific needs of the client. The resulting intervention program, which may or may not include the use of hearing aids, is then better adapted to the client's personal situation, and focusses on alleviating the main difficulties they face in everyday life. As such, this approach often leads to better rehabilitation outcomes (Grenness et al. 2014; Hickson et al. 2014).

This functional evaluation of the client's needs is deeply rooted in the conceptual framework of the World Health Organisation's (WHO) International Classification of Functioning, Disability and Health (ICF) (World Health Organization 2001). This framework, well established in audiology and other health sciences, states that body functions and structures are only part of a person's health condition. The pathophysiological problem dynamically interacts with the activities, tasks, and actions that an individual needs to execute to actively participate in their everyday life. The social participation and body functions of an individual are also influenced by his personal or environmental context, which can include physical, social, or technological factors. Activity limitations and participation restrictions are thus created by this dynamic interaction between multiple elements that are specific to the individual's life experience, meaning that persons with similar levels of body function can experience different levels of activity limitations and participation restrictions. In audiology, the clinical assessment of the hearing function is only one of the steps undertaken to characterise a person's level of functioning. To address activity limitations and participation restrictions in rehabilitation, clinicians must investigate all of the domains of the ICF model to identify the specific rehabilitation needs of the client (Gagné, Jennings, and Southall 2021) and their family (Grenness et al. 2016). Other conceptual frameworks, such as the client-centered care and goal setting approaches, are also useful for assessing the client's needs and for identifying hearing-related rehabilitation objectives (Grenness et al. 2014; Erdman 2021).

Both the British Society of Audiology (BSA) and the American Academy of Audiology (AAA) have published guidelines in which an audiological needs assessment is discussed while taking into account the ICF and the client-centered frameworks (Ferguson, Handscomb, and Pryce 2016; Valente et al. 2006). The BSA suggests using open-ended questions and probing answers to find out which challenging situations are most important for the client. The goal of this exercise is to learn about the client's perspective, needs, desires and hearing loss experience. This information will serve to establish an

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intervention program that will cater specifically to the client's goals. The AAA proposes to use standardised questionnaires to assess communication needs and functions (i.e. the way the client perceives their hearing-related activity limitations and participation restrictions) before the hearing aid fitting is considered. According to the AAA, non-auditory needs that may influence amplification outcomes should also be explored during the case history. These non-auditory needs refer to personal (e.g. expectations, motivation, previous hearing aid experience, hearing aid readiness, cognitive abilities, comorbidities, or other sensory impairments) and environmental factors (e.g. work constraints, recreational activities, or social support networks). It is important to take these factors into account during the needs assessment, as they may have a positive or negative impact on amplification outcomes.

Despite the existence of the BSA and AAA guidelines, until recently audiologists did not dispose of any clear protocol or clinical tool that was specifically designed to conduct a comprehensive needs assessment with a client. An exploratory survey conducted with clinical audiologists working in a primary care setting in the province of Québec (Canada) showed that most of the participants surveyed did not use any standardised protocol, questionnaire or other established tools to assess the needs of their clients (Hotton, Gagné, and Doucet 2018). The survey results also seemed to suggest a great variability and lack of systematisation in which topics were discussed, in the way needs assessment is conducted, and in the amount of time allowed for this activity. This finding was expected because the number of standardised tools available to conduct a needs assessment was limited. In their 2015 book on hearing assistive devices, Atcherson, Franklin, and Smith-Olinde (2015) proposed multiple tools (e.g. questions, motivation tools, standardised questionnaire) based on the ICF and client-centered framework that an audiologist may use to conduct a comprehensive needs assessment. Although these tools and the accompanying book chapter are helpful, the authors adopted a broad perspective to discuss this issue rather than proposing a specific needs assessment protocol. Also of interest is a new intake tool based on the ICF developed by a research team in The Netherlands (van Leeuwen et al. 2020). This tool consists of a questionnaire composed mostly of close-set questions about general activity limitations and participation restrictions that the client with hearing loss may experience. The main drawback of this questionnaire is that it is made for intake purposes and is therefore not suited as a full-fledged needs assessment. The closed-set questions lack flexibility and do not allow the client to describe the specific context in which difficulties arise due to hearing problems. Hence, its usefulness remains unclear with respect to client-driven needs assessment and the development of an individualised intervention program.

This article presents the second phase in the development of an audiological needs assessment protocol designed to be applied in a primary care audiology setting. In the first phase of this project, Hotton and Gagné (2022) developed the Québec Audiological Assessment Protocol for Younger and Older Adults (QAAP-YOA). This protocol, initially developed in Canadian French and then translated to and published in English, aims to provide audiologists who work in public or private primary care settings a structured approach to conduct a comprehensive needs assessment with adults of all ages, within a perspective of setting rehabilitation goals and developing an appropriate intervention program. It integrates the ICF framework and is compatible with the principles of a client-centered approach to intervention (Grenness et al. 2014) and of goal setting (McKenna 1987). It is designed to gather information using a semi-structured interview approach. Thus, the QAAP-YOA and its administration are conceived to be flexible, to be adapted to each client whatever his age, personal context, and environment. The five domains covered in the protocol include: (1) Audiological needs (activity limitations, participation restrictions, and environmental factors), (2) Living conditions (social networks and living environment), (3) Personal factors (motivation, dexterity, cognition, etc.), (4) Discussion with the client concerning the goals of the treatment program and the intervention strategies retained, and (5) Formulation of recommendations. An overview of the QAAP-YOA is presented in Table 1.

The QAAP-YOA protocol can be used with an accompanying clinical tool which consists of a written document (i.e. a form) that contains open and closed-set questions as well as checklists. The clinical tool follows the structure and content of the needs assessment protocol. Each section and item of the protocol is included in the tool. It is intended to be used by the audiologist to guide the interview with the client and to serve as a checklist of the issues that should be discussed with the client. The form can be completed by checking items and filling-in text sections. Once completed, the clinical tool may be used to report the results of the needs assessment and be placed in the client's file. The use of the clinical tool is optional when applying the protocol; depending on its clinical context, type of practice, other clinical tools used, and the client's individual profile, an audiologist may choose not to use it and rather to mention the results of the needs assessment in the audiological report. No score is computed after the completion of the QAAP-YOA and of the accompanying clinical tool as they are not standardised questionnaires, as opposed to many well-known clinical tools currently used in the field of audiology. Therefore, the approach proposed by the QAAP-YOA is more descriptive and personalised. For more information about the English version of the QAAP-YOA, its accompanying clinical tool, and how to use them, the reader is referred to Hotton and Gagné (2022). The original Canadian French version of the QAAP-YOA is available from authors upon request.

The methodology followed to develop the QAAP-YOA and its accompanying clinical tool was based on the Knowledge-to-Action (KTA) framework (Graham et al. 2006). A validation of the QAAP-YOA and its clinical tool (i.e. content validity) was accomplished through an iterative process of consultation with a panel of 15 experts and 14 clinical audiologists. The final version of the QAAP-YOA (including the accompanying clinical tool) is the result of a wide consensus reached among the research team, the members of the expert panel, and the consulted clinicians. The underlying rationale and the procedure used to develop and validate the QAAP-YOA and its accompanying clinical tool are described in Hotton and Gagné (2022).

The second phase of the research project, presented in this article, is a pilot study conducted to evaluate the Canadian French original version of the QAAP-YOA in a simulated clinical context. The research objective was to measure the efficacy of the QAAP-YOA for assessing the needs of individuals with hearing loss with and without the use of the accompanying clinical tool. A related goal was to examine the added value (or lack thereof) procured by using the accompanying clinical tool in relation to the appropriateness of the conclusions reached by participants. These steps were required to complete the action cycle of the KTA framework, to satisfy scientific best practices, and to explore the feasibility of pursuing the research project

Table 1. Overview of the QAAP-YOA.

Section 1: Audiological needs
• Explore activity limitations and participation restrictions in various aspects of life (ex. at work, at school, at home, in personal relationships, etc.)
• For each significant difficulty, describe:
○ The context and the environment in which it occurs;
○ The extent of the difficulty and its frequency of occurrence;
○ The importance of the difficulty for the client;
○ The strategies/aids the client uses in that situation and their effectiveness.
○ Rank the difficulties by importance from the client's own perspective, in order to set priorities for intervention.
Section 2: Living conditions
○ Explore the client's social networks (ex. if the client lives alone or not).
○ Describe the client's living environment (ex. If the client lives in his own house, a seniors' residence, a hospital …)
Section 3: Personal factors
○ Document personal factors that may impact the rehabilitation process (facilitators or obstacles).
○ Explore the client's interest and motivation regarding rehabilitation and the proposed intervention.
○ Verify the support offered by significant other(s).
○ Consider the extent of the client's hearing loss (i.e. audiometric results).
Section 4: Discussion with the client concerning treatment goals and intervention
○ Consider the client as a full, equal partner (use a client-centered approach).
○ Discuss openly and negotiate the terms of the « contract » with him.
○ Reach a mutual agreement on goals and means of intervention (e.g. hearing aids, ALDs, aural rehabilitation or else).
Section 5: Formulation of recommendations
○ Recommendations should be aligned with the conclusions of your discussion with the client (the client should agree with them).
○ Recommendations should be clearly linked to specific difficulties reported by the client, and should contain:
○ Client difficulties due to hearing problems ranked by importance, including a summary of identified facilitators and obstacles to rehabilitation.
○ For each prioritised difficulty specify:
○ A goal for intervention;
○ A means to reach this goal;
○ A timeline;
○ A plan for follow-up.
○ The audiologic report should include a statement that a needs assessment has been conducted with the client and that results, recommendations and the intervention plan have been discussed and indicate that the client agrees with the audiologist's conclusions.

Note. Reproduced with permission from Hotton and Gagné (2022).

into a future third phase, which would consist of assessing the value of using the QAAP-YOA and its accompanying clinical tool in a clinical setting.

In the context of this study, we were also interested in determining whether the audiologic conclusions reached by participants after the use of the QAAP-YOA with and without the use of the accompanying clinical tool would be similar across participants when facing the same clinical situation. This research question is related to the concept of measurement tools reliability, which is "the degree of consistency with which an instrument or rater measures a variable" (Portney and Watkins 2009). Given that the administration of the QAAP-YOA protocol and of its accompanying clinical tool does not generate numerical scores, it was not possible nor appropriate to conduct a standard quantitative psychometric study to measure their inter or intra rater reliability. However, before pursuing any further development of the QAAP-YOA, it was deemed important to assess whether the QAAP-YOA was useful and beneficial as a procedure to conduct a needs assessment in audiology. The present study was designed to address three specific issues: (1) Is the amount and the pertinence of the information gathered more relevant when both the needs assessment protocol and the accompanying tool are administered together than when the protocol is administered by itself? (2) Are the recommendations formulated by the hearing healthcare professional more comprehensive and more coherent with the client's needs when they are based on information collected using the protocol alone or when they are collected by using the protocol and the clinical tool? (3) Are the recommendations formulated across the hearing healthcare professionals more varied when they are based on information gathered by applying the protocol alone or when both the protocol and the clinical tool are used simultaneously? We opted to use a qualitative methodology to address these issues.

Materials and methods

Research design

A mixed-methods cross-over research design combining quantitative and qualitative data sources was used (Fortin 2010). A clinical trial of the QAAP-YOA was completed by all participants (graduate audiology students and early-career audiologists) on two simulated clients (i.e. hired actors who played the role of hearing impaired clients). Each participant used the QAAP-YOA under two conditions: (1) In the Without Tool condition, the QAAP-YOA was applied without the aid of the accompanying clinical tool; (2) in the With Tool condition, the QAAP-YOA was applied with the help of the clinical tool. After completing each experimental condition, the participant had to write an audiological report based on the information obtained from the simulated client. All testing sessions were video recorded, and reports were collected. The performance of the participant during each experimental condition and the content of his reports were scored by two independent judges using two assessment grids specifically developed for this purpose. Compliance ratings regarding the QAAP-YOA prescriptions were computed for each experimental condition and item and were compared between conditions using quantitative statistical analyses. Second, the content of the audiological reports written by participants in each condition was analysed using a qualitative content analysis methodology.

Participants

Eleven students enrolled in the second year of the professional master's degree program in audiology at the University of Montreal and four recent audiology graduates with less than two years of clinical experience were recruited ($n = 15$; 14 females and 1 male; mean age = 24.3 ± 2.3 years). No attrition occurred during the project. We intentionally recruited audiology students and early-career audiologists instead of more experienced audiologists because it was important, at this stage of the research project, to ensure that the QAAP-YOA and its accompanying clinical tool were easy to understand and use, even by professionals with a limited amount of experience. If students and young professionals were able to apply the QAAP-YOA and use the accompanying clinical tool during the study without any significant difficulties, then it could be assumed that this would be even easier for experienced clinicians to do. Contrarily, if specific difficulties were encountered by students and young professionals during the project, the impact of those difficulties on their performance might be amplified because of their limited experience and adaptability. Then, the issues regarding the QAAP-YOA and its accompanying clinical tool use and applicability would be more easily identified.

Inclusion criteria for audiology students consisted in having successfully completed at least one internship in a primary care audiology clinic and being registered as a student member of the Ordre des orthophonistes et audiologistes du Québec (OOAQ). Recent graduates needed to have worked in a primary care audiology clinic at the time of their recruitment. Also, they had to be registered as a regular member of the OOAQ. No specific minimum experience was required for those participants, as they were all licenced audiologists, but their total experience in the work force could not exceed 24 months. All participants used French as their main language of communication. Therefore, all needs assessments were conducted in French during the project.

Simulated clients

Two actors were hired from the simulated patient actor pool of the University of Montreal's Faculty of medicine to take part in the study as simulated clients. Both were native Canadian French-speaking individuals (one female and one male) aged between 60 and 70 years old. Each simulated client was assigned a specific fictitious clinical case. These fictitious clinical cases included information about the characteristics of the simulated client, the hearing-related functional difficulties of the client, and possible responses to questions participants were likely to ask. Both cases were tested beforehand by the research team and the actors to prepare the actors for their task and to ensure that both cases were complete and realistic.

Procedures

First, the participants attended a 2-h training course during which the QAAP-YOA was described. The training course included information about the theoretical bases of the protocol (e.g. the ICF, client-centredness, and goal setting) and its components. How to apply the QAAP-YOA and to use the accompanying clinical tool were demonstrated during the training session. Then, the participants had to conduct two independent assessments of needs, one with each simulated client. For one of the simulated clients, the participant conducted the needs assessment without the use of the clinical tool (Without Tool condition). For the other simulated client, the audiologist was instructed to apply the protocol and use the clinical tool (With Tool condition).

Participants were randomly split in two experimental groups. This made it possible to counterbalance the order in which the experimental conditions were administered. Half of the participants conducted the assessment first in the Without Tool condition, followed by the With Tool condition. The other half of the participants did it in the reverse order. The order of the simulated clients was also counterbalanced across participants. All simulated assessments (15 for each simulated client, for a total of 30 simulated assessments) were conducted at the University of Montreal's School of Speech-Language Pathology and Audiology.

The participants were asked to conduct the interviews and proceed to the needs assessment as though they were in a real clinical setting. Before the interview, participants had access to the simulated client's medical file which included information about general health, the audiogram, and other details of the audiometric evaluation. Participants had a maximum of 30 min to conduct the interview, including the needs assessment. All interviews were filmed. The video recordings were analysed and scored a posteriori by two independent evaluators (experienced audiologists) to rate the performance of each participant under each experimental condition. A custom-made evaluation grid was developed for this quantitative evaluation.

After each interview, the participant had to use the information obtained and the observations made to write a report. When only the protocol was used, the participants were instructed to write a regular report as they generally do in the clinic or during their clinical placement. When both the protocol and the accompanying assessment tool were used to conduct the interview, the participants were instructed to fill in and submit the clinical tool. The participants had an additional 30 min to complete this step. The written report was analysed and scored by the same two independent evaluators using a second custom-made evaluation grid.

Variables

The participants had to conduct the needs assessment under two different experimental conditions (one independent variable): (1) In the Without Tool condition; (2) in the With Tool condition. For each condition, the performance of the participants was measured by two parameters which served as dependent variables: (1) compliance rating (a percentage score) based on the administration of the protocol during the interviews and (2) compliance rating (a percentage score) based on the information included in the assessment report. In the context of this study, compliance was defined as the participants' ability to adhere to the QAAP-YOA while assessing the needs of the simulated clients and writing its reports. Therefore, a 100% compliance rating (for interviews or reports) corresponded to a total adherence to the QAAP-YOA requirements.

Measurement tools

To assess the adherence to the protocol, custom-made evaluation grids were developed specifically for this experiment, in accordance with the needs assessment protocol used and the simulated clinical cases used for the interviews. One grid was developed to evaluate the video recording of the needs assessment interviews, and a second one was developed to evaluate the audiological reports. The evaluation grids were developed by a panel of

experts in audiology and were based on existing evaluation tools (Dinsmore, Bohnert, and Preminger 2013; English et al. 2007). They included statements describing elements that the audiologist was expected to address during the interview and in the assessment report (23 statements in the video recorded interview scoring grid; 10 statements in the report scoring grid). For each statement, a 5-point rating scale was used to assess the degree of conformity of the participant's performance regarding the QAAP-YOA prescriptions. Grading of both the interviews and the assessment reports was accomplished by two external evaluators who were experienced audiologists. Those evaluators had more than 10 years of clinical experience, including experience in teaching and clinical supervision. The ratings were done independently by the evaluators. The percentage of adherence (i.e. compliance ratings) to the QAAP-YOA was then calculated by averaging the scores attributed by each evaluator. The two scoring grids are presented in Supplementary File 1.

Data analysis

Descriptive statistics (means and standard deviations) were computed for each experimental condition and assessment parameter. Counterbalancing was used to minimise any potential order effect of the experimental conditions (Without Tool or With Tool first) as well as an effect of the order in which the simulated clients were interviewed (#1 or #2 first). All the data (including the order in which the interview was conducted and whether or not the clinical tool was used) obtained from one client was compared to the data obtained from the other client. T-tests failed to reveal any difference across the two simulated clients for interviews [$t(14) = -1.492$, $p = 0.158$, observed power = 0.285, effect size = −0.385] and for reports [$t(14) = 0.137$, $p = 0.893$, observed power = 0.052, effect size = 0.035]. Based on those results, the data obtained for each simulated client were collapsed. All the results below are based on the merged data obtained from Client #1 and Client #2. Subsequently, the compliance ratings for the interviews and for the written reports were analysed using paired t-tests (IBM SPSS Statistics v28; alpha = 0.05) to investigate the effects of the experimental conditions. Observed power and effect size (using Cohen's d statistic) were also computed for each experimental condition.

Results obtained by the participants to items of the scoring grids for interviews and reports were also analysed using a visual approach. Mean compliance ratings and 95% confidence intervals for each item on the With Tool and the Without Tool conditions were graphed on a forest plot, which also illustrated the total mean scores for each condition and 1 standard deviation for the With Tool condition. This analysis was done by two authors (MH and JPG) to identify the potential items that may have contributed most to the changes observed in participants' performance. This visual analysis was supported by a secondary statistical analysis to compare the scores obtained in the two experimental conditions (with or without the use of the accompanying clinical tool) for each item of the scoring grids. Considering that an ordinal measurement scale was used in the scoring grids, a non-parametric approach was used for these analyses. Wilcoxon signed rank tests were computed and p-values were corrected for multiple comparisons using the Benjamini and Hochberg adjustment (IBM SPSS Statistics v28; alpha = 0.05). The visual analysis also facilitated the identification of items for which the participants performed worse during the experiment. Items that fell 1 standard deviation or more under the total mean score of the With Tool condition were identified. These items will be targeted for future work on the development of the QAAP-YOA.

Analyses were undertaken to determine if the audiologic conclusions reached would be similar across the participants for the same simulated cases and to establish whether differences would exist when the With Tool condition was compared to the Without Tool condition. Additionally, it was of interest to explore the potential added value of using the QAAP-YOA accompanying clinical tool when administrating the protocol. To address these issues a qualitative content analysis methodology was employed (Graneheim and Lundman 2004; Knudsen et al. 2012). Specifically, for these analyses, the conclusions and recommendations were extracted from each report and transcribed word for word using Microsoft Word. Transcriptions were then read to identify relevant content areas. Content areas were defined as text samples where participants described their professional conclusions and recommendations. Data extracted from those content areas were divided into meaning units, coded and classified by categories. Those categories were predetermined and corresponded to the main subdivisions of the recommendations section of the QAAP-YOA, namely: identified facilitators and barriers to rehabilitation, hearing difficulties prioritised by the client for intervention, selected rehabilitation goals, selected means for intervention, proposed timeline and follow-up to reach client's rehabilitation goals. Due to the research objectives and the nature of the transcriptions (i.e. health professional reports), we used manifest and deductive approaches to coding. Initial data coding and classification into categories was done independently by the first author (MH) and one of the evaluators that previously scored participants' reports. At the beginning of the coding process, a comparison was performed on a representative sample of content areas identified by the two coders to ensure a consistent coding process. The analysis was compared to the original participants' written reports on several occasions during the process to avoid errors and to validate the coding. Final data coding and categorisation was accomplished by merging the results of the two coders. When a disagreement occurred in the coding or categorisation, it was discussed and solved by mutual consensus. The software NVivo 1.6.2 (QSR International) was used to organise data and support coding. This qualitative content analysis was done only for written reports, not for video recorded interviews.

Ethics

This research project has been approved by the Vieillissement-Neuroimagerie ethics board of the Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal (#CER VN 18-19-10). Information and explanations about the project were given to the participants, and they had to sign a consent form prior to the beginning of the data collection. Participants received a financial compensation of 30 CAD for their participation in the study.

Results

Global compliance ratings for interviews and reports

The compliance ratings to the protocol for the interviews and the written assessment reports calculated for both experimental conditions are displayed in Figure 1. For the interviews, the mean rating of compliance to the protocol was equal to, or greater than, 72% under both the With Tool (M = 76.4,

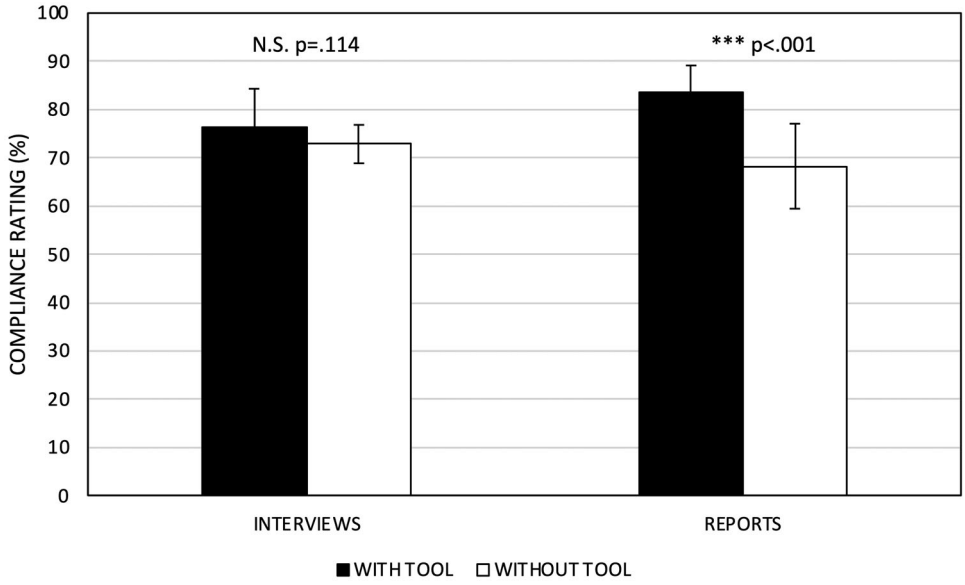

Figure 1. Mean compliance ratings to the protocol and standard deviations for interviews and written reports.

SD = 7.9) and the Without Tool (M = 72.9, SD = 4.0) conditions. These results suggest that participants were comfortable applying the protocol after the 2-h training course they received prior to conducting their two assessments. The use of the clinical tool did not have a significant effect on the rating of the compliance to the protocol during the interviews [t(14) = 1.687, $p = 0.114$, observed power = 0.350, effect size = 0.436]. However, for the assessment reports, the use of the clinical tool (M = 83.7, SD = 5.4) significantly increased the rating of the compliance to the protocol compared to the Without Tool condition [M = 68.2, SD = 8.8, $t(14) = 6.078$, $p < 0.001$, observed power = 1.000, effect size = 1.570]. Overall, the use of the clinical tool did not significantly increase the performance of the participants during the interview, but it helped them produce a more comprehensive written assessment report; one that was more closely aligned to the underlying goals of the new protocol.

Mean compliance ratings and 95% confidence intervals obtained by participants for each item of the scoring grids on the With Tool and the Without Tool conditions are illustrated in Supplementary Figure 1 for interviews and in Supplementary Figure 2 for reports. A visual analysis of those two figures suggests that no item of the interviews scoring grid underwent any apparent change between the two experimental conditions (see Supplementary Figure 1). As displayed in Supplementary Figure 2, it appears that the statistically significant difference in overall score observed for written reports (reported above) can be attributed to two specific items of the scoring grid. These two items are: "The participant clearly indicated that the needs assessment had been conducted, and that the results, recommendations, and treatment plan had been presented and discussed with the client" (Item 4) and "The participant clearly indicated that the client agreed with the proposed recommendations" (Item 6). It is noteworthy that items 4 and 6 are related to the discussion of the results of the assessment with the client. Those observations are supported by the results of the Wilcoxon signed rank tests, which are shown in Supplementary Table 1. No item of the interviews scoring grid revealed a significant difference between the two experimental conditions. However, item 4 [$T = 120.00$, $Z = -3.422$, $p < 0.001$, p-adjusted < 0.01] and item 6 [$T = 105.00$, $Z = -3.318$, $p < 0.001$, p-adjusted < 0.01] of the reports scoring grid showed a statistically significant improvement under the With Tool condition.

The visual analysis of the data based on the interviews (see Supplementary Figure 1) revealed that the participants performed well during the interviews on other items related to the same topic, regardless of whether the tool was used or not (e.g. item 18 – "The participant discussed the objectives of the intervention program and the proposed treatment plan with the client, and both arrived at a consensus"; and item 19 – "The participant's recommendations were coherent with the consensus reached with the client"). This result suggests that the participants discussed the information gathered during the interview and reach a consensus with the client concerning the treatment. However, these aspects of the interview were not observed in as much detail in the assessment reports that were written without the use of the clinical tool.

Further visual analysis of each item indicates that, during the interview, under both the With and Without Tool conditions, the participants generally performed more poorly on some items. Considering a criterion of one standard deviation under the global With Tool condition mean score, the grid items for which lower scores were obtained are:

- "For each difficulty identified, the participant evaluated the extent of that difficulty (e.g. little or great difficulty)" (item 3);
- "For each difficulty identified, the participant evaluated the frequency of occurrence of the that difficulty" (item 4);
- "The participant proposed rehabilitation objectives that are coherent with each prioritized difficulty" (item 16);
- "For each prioritized difficulty, the participant formulated rehabilitation objectives coherent with the clinical data collected during the evaluation" (item 20).

In the assessment report, excluding item 4 and item 6 which had lower ratings only in the Without Tool condition and considering the same criterion, the participants performed more poorly on the following items:

- "The participant described the main difficulties of the client and their significant others in a clear and complete manner that took into account the context of occurrence" (item 1);

- "The participant mentioned by which means the rehabilitation objectives will be verified to determine whether they have been met" (item 10).

Qualitative content analysis of reports and clinical tools

Using the written audiological reports and the completed clinical tools provided by the participants, a qualitative content analysis was undertaken. Overall, this analysis revealed that participants who conducted the needs assessment with the same simulated client generally produced similar recommendations regardless of whether they used the clinical tool or not. Prioritised difficulties, rehabilitation objectives, and treatment plans were generally consistent across participants and across experimental conditions. For example, for the first simulated client, the prioritised difficulties were most often: (1) listening to birdsongs, (2) communication with colleagues at work, and (3) communication by phone with the grandchildren. The rehabilitation objectives were most often: (1) hearing birdsongs better, (2) improve phone communication with the grandchildren, and (3) improve communication at work. The strategies chosen to reach these objectives were most often: (1) use of communication strategies at work (including use of writing to communicate tasks), (2) use of an amplified phone at home. Most participants did not recommend hearing aids since they noted that during the interview, the client mentioned that he was not interested in this option.

For the second simulated client, the three prioritised difficulties most often recorded were: (1) communication during the choir activity (including communication in noise and understanding the choir director), (2) communication with her sisters at the coffee shop, and (3) communication in the car during volunteering activities. The rehabilitation objectives were all coherent with these three main difficulties. Most participants recommended the use of hearing aids in addition to communication strategies. These recommendations were deemed coherent for simulated client 2 who expressed an interest in using hearing aids and was willing to discuss the reported difficulties with his friends, colleagues, and family.

Notwithstanding those results, qualitative analyses also showed some differences between the two test conditions regarding the number and the variety of difficulties targeted for intervention. When the participants used the clinical tool during the needs assessment, they prioritised fewer difficulties for the treatment plan. When the clinical tool was used, the intervention program of all the participants focussed on addressing exactly three difficult situations. In the Without Tool condition, approximately half the participants developed an intervention program that targeted as many as four or five difficulties. Similarly, in the Without Tool condition, the participants selected a greater number of strategies to address the rehabilitation objectives. Both the order of priority in which the difficulties were listed, and the strategies chosen to address the problematic situations were more varied under the Without Tool condition.

Discussion

The current study aimed to evaluate the Québec Audiological Assessment Protocol for Younger and Older Adults (QAAP-YOA) efficacy for assessing the needs of individuals with hearing loss with and without the use of the accompanying clinical tool, to explore the added value of using the accompanying clinical tool when applying the protocol, and to determine if the audiologic conclusions reached by participants after the use of the QAAP-YOA with and without the use of the accompanying clinical tool would be similar across participants when assessing the same simulated client. Participants attended a 2-h training session on the administration of the QAAP-YOA and its application in a clinical setting. Then, they were asked to apply the protocol in two different simulated clinical conditions. Two actors trained to play the role of clients with hearing loss were hired for the investigation. Each participant conducted an audiologic needs assessment under two experimental conditions: Without using the accompanying clinical tool and while using the clinical tool. All the interviews with the simulated clients were videorecorded. Based on customised scoring grids, the participants were evaluated to determine whether they complied with the protocol requirements. After each interview, the participants were asked to write an audiological report based on the information obtained during the meeting. A second customised scoring grid was used to assess the audiological reports written by the participants.

The results revealed that after taking part in a relatively short 2-h training course, participants were able to apply the needs assessment protocol correctly during the interview. As the study was realised with audiology students and recent audiology graduates, it might be expected that experienced clinicians would be able to apply the QAAP-YOA after a similar training. This would need to be verified with clinicians during a field trial.

The use of the clinical tool did not enhance or hinder the interview process since both experimental conditions had similar compliance ratings to the protocol's expected outcomes (72% without and 76% with the clinical tool). Significant differences in the results were obtained when the data related to the written reports were compared. Assessment reports were more comprehensive and more coherent when the clinical tool was used to conduct the needs assessment interview and to support report writing. The information provided in the audiological reports were more consistent across participants when they used the accompanying clinical tool to conduct the needs assessment interview. These results suggest that together the use of the protocol and its accompanying clinical tool could lead to a greater standardisation of needs assessments interviews as well as to reports that are more comprehensive and in line with the protocol's requirements.

As shown by the detailed analysis of compliance ratings obtained by participants to each item of the scoring grids, some items included in the interview and the report evaluation grid generally had lower scores, regardless of whether the clinical tool was used or not. Those items were related to elements of the QAAP-YOA such as the description of the difficulties experienced by the client and of the personal factors which may influence functioning and rehabilitation, to the formulation of the rehabilitation objectives, of the treatment plan and of the follow-up schedule. This suggests that the participants may have experienced some difficulty while applying those elements of the QAAP-YOA. It is possible that the 2-h training offered to the participants at the beginning of the study might not have been sufficient. Another possibility is that the performance of the participants might have been influenced by their limited clinical experience, as they were all audiology students and young graduates. Notwithstanding the underlying reasons, the results highlight the importance of providing appropriate training to clinicians prior to implementing new clinical protocols and tools. Future work on the QAAP-YOA should include a review of the training modules to ensure that the coverage of the protocol's elements is comprehensive.

According to the results of the qualitative content analysis, the audiologic conclusions reached by participants after the use of the QAAP-YOA were found to be consistent across participants, with or without the use of the accompanying clinical tool. In fact, different participants facing similar fictitious clinical situations tended to produce similar results. Specifically, the audiological reports prepared by the participants contained the same audiological conclusions and recommendations. However, the qualitative analysis also revealed some interesting differences between conditions which merit notice. Notably, in the With Tool condition, all participants retained exactly three difficult situations for intervention planning purposes, but in the Without Tool condition, some participants targeted as many as four or five difficulties. Also, in the latter condition, the order of priority in which the difficulties were listed and the intervention strategies retained were more varied. This greater variability and number of priorities and recommendations formulated by the participants in the Without Tool condition may indicate that, under this condition, the needs assessment may be less effective for intervention planning purposes. For example, many participants suggested that the simulated client 1 should obtain wireless headphones for the television. Another suggestion was that the client try a visual alerting system at home. These recommendations did not specifically address any of the main difficulties reported by the simulated client 1. In contrast, neither of these two recommendations were proposed when the participants used the clinical tool. Instead, the participants recommended technologies that focussed on solving specific difficulties prioritised with the simulated client 1, such as listening to birdsongs (ex. with PSAPs) or hearing the grandchildren during telephone conversations (ex. with a videoconference software to give access to lipreading). The QAAP-YOA protocol states that the audiologist should focus on only the three most difficult situations for the client. When using the clinical tool, the participants tended to follow this guideline. As a result, the recommendations seemed to be more consistent across participants. In addition, when this guideline was applied, there was less variability in the conclusion and in the proposed treatment plan. These results suggest that the clinical tool might allow for a greater standardisation of the needs assessment, which could lead to intervention programs that are more closely aligned with the client's most important difficulties and particular needs.

Overall, the results of this study were deemed sufficiently positive to pursue the development of the QAAP-YOA. Specifically, it would be of interest to evaluate the protocol and the clinical tool in a real clinical setting. The study could take the form of a randomised clinical trial involving experienced audiologists who work in a primary care setting and their clients who report hearing difficulties.

Study limitations

One limitation of the present study was that the data collected was based on interactions between participants (i.e. graduate students in audiology and young audiology graduates) and professional actors trained to play the role of clients with hearing loss, representing a limited adult age range. Conducting clinical research almost always involves some trade-offs. In the present study the decision was made to use simulated clients to standardise (as much as possible) the information available to the participants. As a result, for each simulated client, the same information was conveyed to all participants. This setup made it possible to analyse the information that each participant gathered during the interview as well as the information included in the audiological report. Also, participants and simulated clients were not questioned regarding their experience with the QAAP-YOA and its accompanying clinical tool during the experiment. This information would have been useful to better support their content validity and the feasibility of using them in the clinic. Further studies will be needed to evaluate the usefulness of the QAAP-YOA when used by certified audiologists with clients of different ages in real clinical settings.

Another limitation is the small sample size used in this study. The number of participants ($n = 15$) may have impacted the results of statistical analyses. For example, the results of the paired t-test comparing the compliance ratings in the two experimental conditions during the interviews did not reach statistical significance, and the observed power was quite low. A larger sample size might have allowed this test to reach significance. The small sample size also limited the number of statistical tests that could be applied to the collected data. Studies that involve simulated clinical activities are very rare in audiological research. Consequently, determining the number of participants required to achieve appropriate statistical power was challenging. Initially, the study was designed so that covariance and correlation analyses could be computed. However, based on the number of participants finally included in the study, the requirements for applying those statistical analyses were not met. Notwithstanding the challenges associated with conducting research to evaluate clinical activities, studies using experimental designs like the one reported in the present article should be encouraged because they are closely aligned to the type of clinical activities that are applied in real clinical settings.

Conclusion

This article presents the second phase in the development of the QAAP-YOA, an audiological needs assessment protocol designed to be applied in primary care settings. It consisted in a pilot study conducted to evaluate the protocol and its accompanying clinical tool in a simulated clinical context. For each simulated case, the results of the needs assessment conducted by the participants were similar and appropriate based on the profile of the actor who simulated a client having hearing difficulties. Specifically, consistent assessments emerged for the same clinical case across participants. The use of the clinical tool did not increase the participants' compliance to the protocol's requirements during the interview, suggesting that, in general, participants were able to assess the client's needs in the way recommended by the protocol whether they used the clinical tool or not. Based on the quantitative and the qualitative data analysed, the use of the clinical tool increased the participants' compliance to the protocol's requirements for reports and improved the appropriateness and consistency of the reports prepared by the participants. The results of the present study are encouraging, but some limitations remain. Notably, this study did not evaluate the performance of the protocol and the clinical tool in a real primary care setting. The next phase of the project will consist of a trial of the QAAP-YOA in the clinic with experienced professionals and real individuals with hearing loss in a primary care audiology setting.

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