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CONTENT VALIDITY OF SELECTED ITEMS FROM THE *SPEECH, SPATIAL AND QUALITIES OF HEARING SCALE FOR PARENTS* (SSQ-P) AS MEASURED BY A SURVEY OF EXPERT OPINION

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Contributions:
A Study design/planning
B Data collection/entry
C Data analysis/statistics
D Data interpretation
E Preparation of manuscript
F Literature analysis/search
G Funds collection

Abstract

Introduction: The purpose of this small-scale study was to assess the content validity of a modified subset of 10 items from the *Speech, Spatial and Qualities of Hearing Scale for Parents* (SSQ-P) via a survey of expert opinion.

Material and methods: An online survey was used to obtain opinions from 10 experts in the field of children's hearing and hearing assessment. Experts were asked to rate the relevance and representativeness of each SSQ-P item to deaf and hard of hearing children aged 5 years and over. Content validity was assessed by the item content validity index (ICVI), with excellent content validity identified as an ICVI above 0.8. Experts were also asked to suggest where they felt the wording of items could be improved.

Results: For all items, ICVIs > 0.8 were obtained for both relevance and representativeness, indicating excellent content validity. Some minor rewording suggestions were made.

Conclusions: The 10 items tested are candidates for inclusion in an abbreviated version of SSQ-P. Some minor rewording of items may be required, along with assessment of internal consistency and test–retest stability.

Key words: outcome measure • content validity • questionnaire • children

TRAFNOŚĆ TREŚCIOWA WYBRANYCH POZYCJI Z KWESTIONARIUSZA *SPEECH, SPATIAL AND QUALITIES OF HEARING DLA RODZICÓW* (SSQ-P) ZMIERZONA W BADANIU OPINII EKSPERTÓW

Streszczenie

Wprowadzenie: Celem tego przeprowadzonego na niewielką skalę badania była ocena przez ekspertów trafności treściowej zmodyfikowanego podzbioru 10 pozycji z kwestionariusza *Speech, Spatial and Qualities of Hearing Scale for Parents* (SSQ-P).

Materiał i metody: Przeprowadzono ankietę internetową w celu zebrania opinii 10 ekspertów w dziedzinie słuchu i jego oceny u dzieci. Ekspertów poproszono o ocenienie istotności i reprezentatywności każdej z pozycji SSQ-P dla dzieci z głuchotą lub niedosłuchem w wieku 5 lat i powyżej. Trafność treściowa została oceniona za pomocą indeksu trafności treściowej pozycji (ICVI), w którym doskonała trafność treściowa została określona jako ICVI większe niż 0,8. Ekspertów poproszono także o przedstawienie propozycji odnośnie poprawienia sformułowań pozycji kwestionariusza.

Wyniki: Dla wszystkich pozycji uzyskano wartość ICVI > 0,8, zarówno dla istotności, jak i reprezentatywności, co wskazuje na doskonałą trafność treściową kwestionariusza. Zaproponowano niewielkie poprawki językowe.

Wnioski: Do włączenia do skróconej wersji SSQ-P wybrano 10 zbadanych pozycji. Konieczne może być wprowadzenie niewielkich zmian w tekście pozycji oraz przeprowadzenie oceny wewnętrznej spójności i stabilności czasowej testu.

Słowa kluczowe: miara wyniku • trafność treściowa • kwestionariusz • dzieci

Key for abbreviations	
ICVI	item content validity index
IRT	item response theory
QH	qualities of hearing
SH	spatial hearing
SP	speech perception
SSQ-P	*Speech, Spatial and Qualities of Hearing Scale for Parents*
YAIS	Yorkshire Auditory Implant Service

Introduction

The need for outcome measures to assess the hearing abilities of deaf and hard of hearing children, including spatial listening skills, in the real world is well-established [e.g. 1–3]. Traditional clinical tests based on audibility or symbolic speech perception in quiet do not adequately represent real-life challenges such as listening in complex background noise or interpreting supra-segmental qualities of speech [e.g. 4,5]. Equipment to behaviourally assess spatial hearing can be costly, is often not available in clinical settings, and such tests are of questionable ecological validity. Carer reports are therefore a valuable way to assess children's abilities.

One such outcome measure is the *Speech, Spatial and Qualities of Hearing Scale for Parents* (SSQ-P) designed by Galvin and Noble [6]. This scale includes 23 items that aim to assess children's hearing abilities across the three dimensions of speech perception, spatial hearing, and other qualities of hearing such as naturalness and clarity of sounds. It was developed for use in research settings for children aged 5 years and over. The advised administration method includes an initial briefing for the parent followed by three separate, successive, week-long observation periods during which parents are instructed to actively observe their child's hearing behaviour across one of the three dimensions, while not providing training to their child. The observation periods are required since subjective feedback from parents indicates that they might not have noted their child's behaviour in these settings prior to being prompted to do so. An interview of the parent by the questionnaire administrator is required following each week-long observation period. While thorough, this method is burdensome and, as acknowledged by Galvin and Noble [6], limits the applicability of the tool in clinical settings.

Incorporating such lengthy tests into routine care is unworkable, due to significant funding and workforce constraints in the healthcare and education sectors [7,8]. Killan et al. [9] describe attempts at the Yorkshire Auditory Implant Service (YAIS) to utilise SSQ-P via a more practical, less intensive approach that demands less time and travel for staff and families. In short, parents of 145 children (aged 5 and above) with cochlear implants completed the SSQ-P *without* repeated interviews and formal week-long observation periods. Analysis by Killan et al. [9], via parental feedback and item response theory (IRT) modelling [10], revealed that when the SSQ-P is administered by the less intensive approach, most of its constituent items performed poorly in terms of face and content validity. (Face validity is the extent to which a measure is judged by users to assess a particular construct; content validity is the extent to which a measure assesses all aspects of a particular construct). However, a minority of items performed well, indicating acceptable validity. It was suggested that, with minor rewording, this subset of items could form the basis of an abbreviated version of the SSQ-P that might be used in clinical settings where the recommended method of administration cannot be followed.

This paper describes a small-scale study designed to assess the content validity of the subset of SSQ-P items, reworded where indicated, based on a simple survey of expert opinion in the field of children's hearing and hearing assessment. It is intended as a further step towards an abbreviated version of SSQ-P. The development and subsequent validation of an abbreviated form of SSQ-P would be of great value to those responsible for monitoring the progress of children with symmetric or asymmetric hearing abilities, especially those making management decisions regarding the provision of hearing devices.

Material and methods

Selection of subset of SSQ-P items and their modification

As noted above, the analysis by Killan et al. [9] identified certain items that performed well in terms of face and content validity. Specifically, face validity was considered acceptable when individual items were correctly completed (i.e. no missing information or duplicate responses) by ≥ 90% of parents. Acceptable content validity was evidenced where IRT information and discrimination scores were > 0.5 and > 2.0 respectively [e.g. 11,12]. These criteria were used in the present study to select those items to be included in the survey. Items found by Killan et al. [9] to meet these criteria were four items from the speech perception (SP) dimension (SP3, 4, 6, and 8), two from the spatial hearing (SH) dimension (SH1 and 2), and two from the qualities of hearing (QH) dimension (QH 3 and 4). These items are listed in **Table 1**.

However, to achieve balance across all three dimensions, one additional item from both the SH and the QH dimensions were selected – SH5 and QH5 (also shown in **Table 1**). Both these items met the content validity criteria but narrowly failed to meet the face validity criterion, with correctly completed responses accounting for 89.0% and 86.2% respectively. Both these items were reworded based on feedback from parents.

Table 1. Items selected for inclusion in the survey of expert opinion, based on analyses by Killan et al. [5]. Strikethrough shows deleted text and italics indicates added text

SSQ-P item	
SP3	Your child is in a group of about five people, sitting round a table. It is an otherwise quiet place. Your child can see everyone else in the group. Can your child follow the conversation?
SP4	Your child is in a group of about five people, sitting round a table. It is a noisy room, such as a busy restaurant or large family gathering at home. Your child can see everyone else in the group. Can your child follow the conversation?
SP6	Your child is in a group of about five people, sitting round a table. It is a noisy room, such as a busy restaurant or large family gathering at home. Your child cannot see everyone else in the group. Can your child follow the conversation?
SP8	You are talking to your child in a room in which there are many other people talking. Can your child follow what you say?
SH1	Your child is outdoors in an unfamiliar place. A loud constant noise, such as from a lawnmower, aeroplane or power tool, can be heard. The source of the sound can't be seen. Can your child tell right away where the sound is coming from?
SH2	Your child is sitting around a table with several people. Your child cannot see everyone. Can your child tell where any person is as soon as they start speaking?
SH5	Your child is outside. ~~A dog barks loudly.~~ *A loud sound such as a dog barking, a car horn or a door slamming occurs.* Can your child tell immediately where it is, without having to look?
QH3	Can your child recognize family members or other very familiar people by the sound of each one's voice without seeing them?
QH4	Can your child distinguish between different pieces of familiar music? Note that producing words or movements relevant to a song can indicate recognition.
QH5	Can your child tell the difference between sounds that are somewhat similar, for example, ~~a car versus a bus, OR water boiling in a pot versus food cooking in a frypan?~~ *a kettle boiling versus a washing machine, or a tap running versus a toilet tank filling?*

Killan et al. [9] identified that parents found it difficult to recall specific scenarios when only one example was provided. Therefore, item SH5 was reworded to provide more examples of short duration sounds (a car horn and door slamming was added to the example of a dog barking), with the resultant item being more consistent in format with item SH1, which has been shown to have good face validity. Parental feedback indicated that the original wording of QH5 was problematic due to the hazardous nature of the scenario (i.e. involving discriminating between the sound pairs of a car/a bus and a pot of boiling water/ frying food). This item was therefore reworded using suggestions from parents and YAIS teachers of the deaf, so that the scenarios were less hazardous (i.e. scenarios including sound pairs of boiling kettle/ washing machine and running tap/ toilet tank refilling). The wording modifications are shown in **Table 1** using strikethrough for deletions and italics for added words.

Survey

Assessment of questionnaire items via a survey of expert opinion is an established approach and has been used to validate outcome measures in a range of healthcare contexts [e.g. 13–15]. In the current study, an online survey (using the Jisc Online Survey platform https://www.onlinesurveys.ac.uk) was made available to experts in the field of children's hearing loss and assessment. Using an established approach [16,17], experts were required to rate the relevance and representativeness of each SSQ-P item to deaf and hard of hearing children aged 5 years and over. This was achieved by asking the experts to select one of four statements indicating their level of agreement that the item was relevant and representative within its specific dimension. Statements about relevance for the speech perception dimension are shown in **Table 2** (statements for representativeness were the same with relevance replaced by representativeness, and speech perception abilities replaced with spatial hearing abilities or qualities of hearing accordingly). Statements 1 and 2 were taken to indicate disagreement and statements 3 and 4 were taken as agreement.

Table 2. Statements used to indicate level of agreement

1. The item is not relevant to a child's speech perception abilities
2. The item needs major revisions to be relevant to a child's speech perception abilities
3. The item needs minor revisions to be relevant to a child's speech perception abilities
4. The item is relevant to a child's speech perception abilities

For the purposes of the survey, relevance was defined as the extent to which an item is appropriate in terms of the dimension it intends to measure, and representativeness was the extent to which an item is characteristic of listening scenarios a child might experience. These definitions were provided within the survey as a reference. In addition to indicating their agreement with the relevance and representativeness of items, experts were also asked to add comments to explain their decision or suggest revisions to improve the wording of items. Pilot testing of the survey was carried out prior to distributing it to the experts.

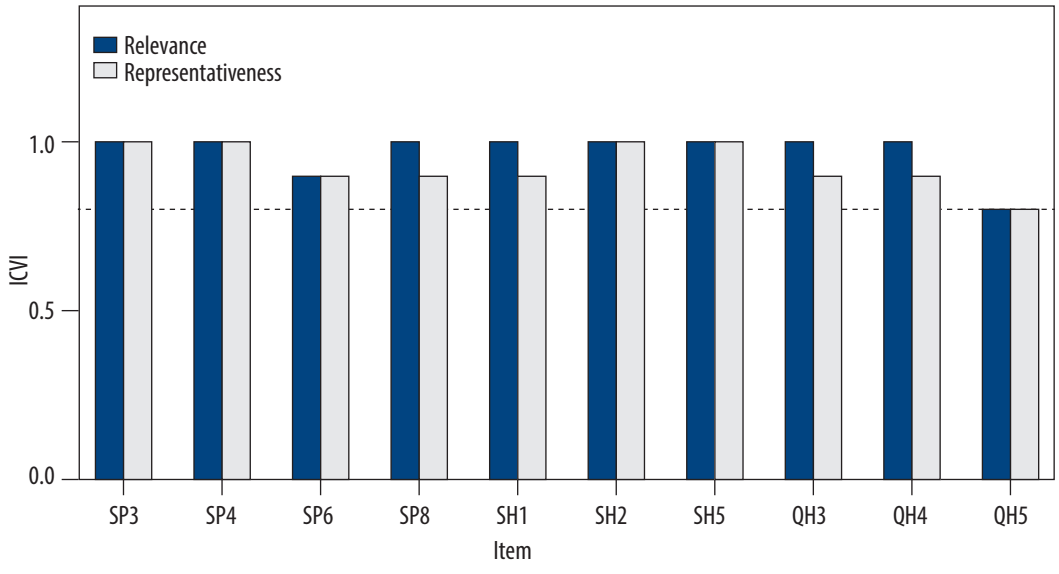

Figure 1. ICVIs for all 10 items based on relevance (dark blue) and representativeness (grey). The dashed horizontal line at ICVI = 0.8 is the threshold above which content validity is excellent

Experts were invited to complete the survey via an email which also included information about the aims of the survey and instructions. Ethics approval was obtained from the University of Leeds (MREC 17-023).

Experts

To ensure a broad range of expertise, individuals were identified based on established criteria for this purpose [13], i.e. they had 5 years or greater of clinical experience and relevant qualifications (at least UK postgraduate or equivalent in a relevant discipline), 5 years or greater experience of working with deaf and hard-of-hearing children, and/or a history of publications in relevant fields. Potential experts were identified from known publications in the field, internet searches, and through existing professional networks. All experts approached had English as first language. Other than completing the survey, identified experts made no other contribution to this study or its dissemination.

We sent email invitations to 15 potential candidates. Completed surveys were returned by 10 individuals, with no responses received from the remaining 5. Of the 10 experts (5 female), 6 were located in the UK, with 4 located in other English-speaking countries. All had expertise in pediatric or educational audiology, deaf education and/or hearing questionnaire design, and at least 5 years' experience in a relevant field.

Analysis of survey responses

Expert responses were used to assess validity by calculation of the item content validity index (ICVI) [e.g. 17–19]. For the 10 or more experts, ICVI is simply the proportion of them who agreed that an item was relevant or representative, as indicated by a survey score of 3 or 4, with no requirement to correct for chance agreement. ICVI values > 0.8 are usually considered to indicate excellent validity when surveying 10 or more experts [17]. Suggestions to reword items were collated and reviewed alongside ICVI values as appropriate.

Results

Analysis of survey responses revealed that, for both relevance and representativeness, ICVIs ranged from 0.8 to 1.0 across all items. **Figure 1** shows scores across all 10 items. Thus, all items scored higher than the threshold for excellent content validity of > 0.8 for 10 or more experts [17] and were held to demonstrate excellent content validity.

Despite the high ICVIs, some suggestions for rewording of items were returned by the expert panel. First, it was questioned whether a child who sat at a table with five other people would be able to see all the other people (as assumed by items SP3 and SP4). Second, it was noted that the inclusion of localisation of an aeroplane flying overhead (item SH1) is a difficult localisation task (due to distance and location in the vertical plane) for all listeners, and is probably too challenging a situation for a hearing impaired child. Third, the representativeness of item QH4 was queried. This item asks if a child can *distinguish* different pieces of familiar music. It was suggested it would be difficult for a parent to observe behaviour that evidenced discrimination between different pieces of music, and it was argued that the item should be reworded to instead require observation of *recognition* of music (as evidenced by some behaviour change like dancing).

Discussion

This small-scale study assessed the content validity of a modified subset of 10 SSQ-P items by surveying opinion of 10 experts. Findings demonstrated excellent content validity for all 10 items, consistent with previous validity analyses reported by Killan et al. [9]; however some suggestions for rewording were noted. It is important to consider

these rewording suggestions, as removing the structured interviews from the SSQ-P administration means that unambiguous wording is necessary for a short version to be independently completed by carers.

The aspect which the experts deemed most in need of clarification was whether a child could see all the talkers in a group conversation scenario (items SP3 and SP4). This is a reasonable criticism of the wording of these items, especially because a separate item (SP6) describes a deliberately more difficult scenario in which it is noted that the child *cannot* see all other people round the table. It could happen that, depending on seating arrangements, the difference in difficulty between SP6 and both SP3 and SP4 is not realised, and important information about a child's hearing abilities might be lost. This criticism is a valid one, because integrating visual and auditory information is important for children who are hard of hearing [20]. Datalogging shows that children of the age range SSQ-P is targeted toward typically spend 2 to 5 hours per day in speech-in-noise environments [21] and much of this time is likely in environments key to their social, emotional, and educational development. Potential rewording of items SP3 and SP4 should therefore be considered before they are included in an abbreviated version of SSQ-P, with the requirement for sitting round a table replaced by a scenario where a child can see all other people. In addition, it would be sensible to explicitly state that the child is able to see the faces of all the other people in the scenario, as this is where important speech-reading cues which support speech perception, especially in noisy environments, take place. Any such wording changes would need to be assessed in more detail as part of future efforts to finalise and validate an abbreviated version of SSQ-P.

The other rewording suggestions were concerned with decreasing the difficulty of one item related to sound-source localisation (SH1), and one item related to music perception (QH4). These are potentially important considerations. If situations are *too* challenging, then the items risk being redundant. However, including challenging items within a scale is likely to add variability in responses, and this would be beneficial in discriminating between children who are performing well with amplification from those who are not. Clinical applications in which good discrimination ability would be important in the sound localisation dimension include one that seeks to establish whether the benefits of a unilateral cochlear implant might outweigh the risk in a child with significant hearing loss asymmetry [22,23]. Retaining an item demanding a higher level of music perception could increase sensitivity to the benefit of retaining spectral fine structure in addition to the temporal cues predominantly used by children listening via standard cochlear implants [24]. It should also be noted that both SH1 and QH4 had ICVIs of 1.0 and 0.9 (for relevance and representativeness respectively) and Killan et al. [9] reported this item met their criteria for acceptable content (and face) validity. This argues in favour of retaining SH1 and QH4 without revisions.

Conclusions

The results of a survey of expert opinion demonstrate that a selection of items from SSQ-P have excellent content validity, and are candidates for inclusion in a short form that could be administered without formal interview. Some possible rewording of items is indicated, and it would be important to explore these in more detail if there is a future effort to finalise and validate an abbreviated version of SSQ-P. Assessment of internal consistency and test–retest stability would also be required. This paper makes publicly accessible the outcomes of our process to gauge content validity, and might help other research groups who wish to move in this direction.

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