TAS: A NEW TEST OF ADULT SPEECHREADING. DEAF PEOPLE REALLY CAN BE BETTER SPEECHREADERS

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ABSTRACT

A new Test of Adult Speechreading (TAS) is described. The TAS was designed for use with the born-deaf speechreader. It uses picture choice responses, and vocabulary and syntax appropriate to such users.

Over 100 deaf and hearing people have so far been tested using the TAS. The pattern of performance of subsets of users is described. The effects of factors including age (18-68), gender, non-verbal IQ, education, regional speech community, language preference, and the hearing status of participants and their parents is summarised.

Among the notable findings to date: in deaf but not hearing people, visible regional accent and level of education (tertiary vs. non-tertiary) affected performance markedly. Participants with similar southern regional accents to the talkers achieved higher scores than those with northern accents, and those with a tertiary level education performed better than those without. In the hearing participants, parental hearing status predicted performance (people with deaf parents were better speechreaders).

Most strikingly, after close matching of deaf and hearing individuals for all psychometric and background variables, deaf participants out-performed their hearing peers by a significant margin.

1. INTRODUCTION

Tests of adult speechreading typically assume that the testee has acquired spoken language normally, although s/he may have subsequently lost hearing. Both syntax and lexical development may be idiosyncratic with respect to hearing norms in people born deaf [1], and may be further affected by sign in deaf children of deaf parents (DoD) and by the non-optimal early language experience of deaf children of hearing parents (DoH).

Response measures in most speechreading tests also assume a level of speech, sign or literacy that may not fairly reflect the abilities of deaf people. Furthermore, speechreading tests with written responses have sometimes been used to predict literacy itself (e.g. [2]), which casts doubt on the independence of these measures, and therefore on the relationship between the two skills.

Under these circumstances, it is not too surprising that the general claim that hearing people out-speechread deaf people has been advanced and supported [3].

The Test of Adult Speechreading (TAS) was designed to measure speechreading ability in British adults, avoiding the pitfalls mentioned above. In the TAS, two young adult talkers of British (Southern) English are seen (figure 1). The items to be speechread include single words, sentences and short stories, all of which use concrete vocabulary items familiar to deaf people, in simple, colloquial syntactic structures. Words and sentences were pre-screened for familiarity and acceptability by deaf judges. Accuracy was measured through picture multiple-choice responses.

2. DETAILED DESCRIPTION OF THE TEST OF ADULT SPEECHREADING (TAS)

The TAS was administered as a video-test without sound, lasting about 20 minutes, using a skilled administrator to present response sheets and score responses. In addition, when administered to deaf participants, the test instructions and ongoing communication were in the preferred languages of the participant (sign, signed English, speech).

The talkers were recorded speaking normally. A full-face, naturally lit view was used, showing the head and shoulders of the talker (see figure 1). Talkers alternated for each item.

Figure 1: Video stills of talkers producing items to be speechread in the TAS.

The vocabulary of the TAS was selected to be in common use, familiar to profoundly prelingually

deaf participants, and clearly represented as a picture. The majority of the words used were chosen from the BKB sentences (which were developed from language produced by deaf children) [4] and from the Manchester Speechreading Test (which used words from an infant vocabulary source) [5]. Profoundly prelingually deaf adult volunteers working in a youth club for deaf people examined the test items. They rated the familiarity of the words, and commented on the suitability of the vocabulary, the sentences and the pictures. Items rated 'less familiar' or considered unsuitable were excluded, and the pictures and sentences were adjusted according to their suggestions.

In the first subtest, the identification of single words, there were two demonstration and four practice trials, during which feedback was given, and then 24 items (16 monosyllabic and 8 spondaic). The corresponding pictures were arranged randomly on four response sheets (plus one practice sheet), each made up of six target items and six distracters (figure 2).

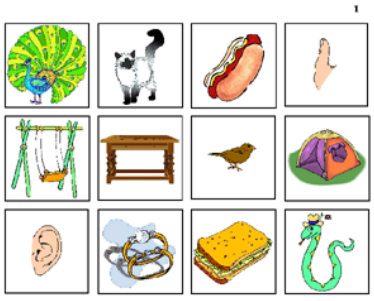

Figure 2: A picture response set for the TAS - single word subtest. Speechread targets were "thumb", "sandwich", "rings", "cat", "peacock" and "ear".

The second subtest comprised three practice trials and 15 sentence items, presented in a similar way. The five response sheets (and one practice sheet) for this subtest were each made up of three target pictures and six distracters. Each item was pictured with specific distracters so that subjects would need to understand more than one word of a sentence to identify the correct picture. For example, the distracters for 'He drops his ice-cream' included a boy dropping a computer and a boy eating an ice-cream. The items were arranged into groups with a common theme, so that a glance at the picture set would give the context. Sentences are rarely perceived without context in conversation.

The final, story subtest was of a demonstration trial, a practice trial, and then 5 short texts. Each had a choice of nine pictured descriptors (one target and eight distracters on each response sheet), and presentation followed similar guidelines to the other subtests.

Throughout the TAS, participants were asked to respond to each speechread item by pointing to the appropriate picture. They were given a score of 1 for a correct response, and 0 for an error. The total number of accurate responses for each subtest was recorded, and the sum of these provided the overall TAS score (with a possible total of 44).

3. THE PARTICIPANTS

109 participants have so far been assessed with the TAS:

3.1 Deaf Participants:

49 severely-profoundly prelingually deaf adults (28 female and 21 male) aged 18 to 61 years took part in the study. All had normal or corrected vision, and no additional impairments. Reflecting the heterogeneity of this population, participants were not excluded on the basis of their language preferences, education, or other background factors. 11 participants had deaf parents.

3.2 Hearing Participants:

60 adults (27 female and 33 male) with normal hearing, aged 21 to 68 years took part in the study. All had normal or corrected vision, and no reported impairments. 11 participants had deaf parents.

3.2 Summary of Speechreading Performance:

Speechreading performance across the groups is illustrated in figure 3.

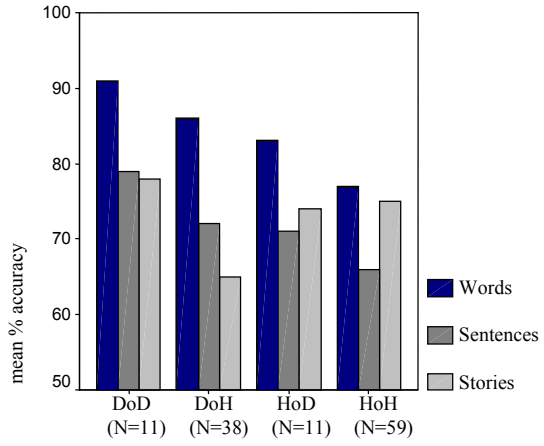

Figure 3: Mean % speechreading accuracy on the TAS subtests for the four groups of participants: deaf with deaf parents (DoD), deaf with hearing parents (DoH), hearing with deaf parents (HoD), and hearing with hearing parents (HoH).

There were four particularly striking findings:

(1) Deaf people were better than hearing people at speechreading;

(2) Participants with deaf parents were more accurate than those with hearing parents;

(3) Words were more accurately reported than sentences or stories;

(4) The pattern varies with hearing status: the deaf participants show a gradient of accuracy, from words (which are speechread most accurately), through sentences, to stories. The hearing do not show this gradient.

4. INFLUENCES OF BACKGROUND AND PSYCHOMETRIC VARIABLES

4.1 Non-verbal IQ:

In accordance with previous findings (e.g. [6]), there was no association of non-verbal IQ (measured using the block design task from the WAIS) with speechreading performance.

4.2 Gender:

Mean speechreading accuracy was slightly higher for females in both the deaf and hearing groups, but not significantly so, and there was no interaction with hearing status.

4.3 Age:

There was no association between the age of participants and their speechreading skill (fig. 4):

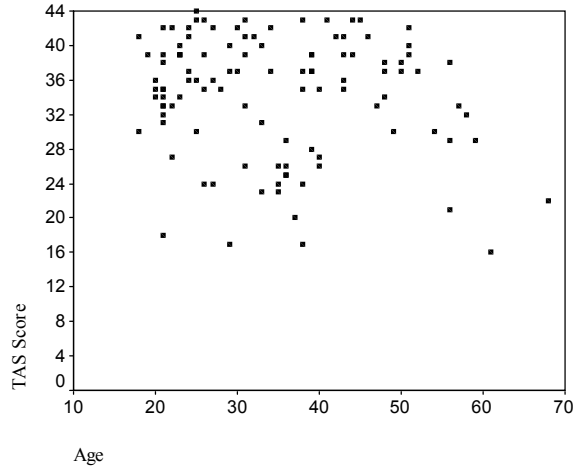

Figure 4: There was no significant correlation between age and speechreading ability on the TAS.

Previous research has found a decrease in speechreading ability with increasing age (e.g. [7]). One reason for the lack of such a finding here may be the absence of caution as a factor in the TAS. Honnell and colleagues found that subjects in their 60s are less willing to guess than those in their 20s [8]. It seems likely that the increase in caution is gradual between those ages, and it may be an important factor in the decrease in speechreading ability. However, the multiple-choice format of the TAS enables the test administrator to encourage a response to every item, so a decreasing willingness to guess does not affect performance.

4.4 Schooling of deaf participants:

30 of the deaf participants gave information regarding their schooling: 5 participants had been in mainstream schools, 22 had attended oral institutions and just 3 had attended Total Communication schools. The speechreading scores showed no advantage for oral education.

4.5 Level of Education:

A tertiary level education was associated with better speechreading. This was particularly striking for the deaf participants. This is unsurprising, since these individuals would have needed extremely good oral skills, including speechreading, to succeed in tertiary education.

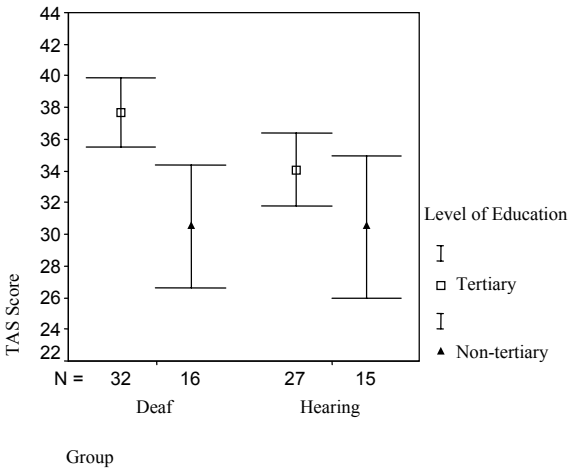

Figure 5: Mean TAS scores achieved by participants educated to a tertiary / non-tertiary level. Error bars show 95% confidence interval around the mean. Participants who had been educated to a tertiary level outperformed their peers. This difference is significant for the deaf participants ($t(46)=3.64$, $p<.002$).

4.6 Preferred language:

The language choice of the deaf adult did not have a significant bearing on speechreading performance. In particular, it is of note that the use of British Sign Language did not lower speechreading scores on the

TAS. Speechreading accuracy has previously been shown to be negatively correlated with the use of American Sign Language (e.g. [9]).

4.7 Regional variation:

A subset of deaf (N=9) and hearing (N=16) participants from the North of England viewed the Southern English talkers. These northern viewers were significantly poorer at speechreading, especially when they were deaf ($t(28)=3.70$, $p<.002$). A mismatch between the regional accent of the talkers and the speechreaders may, therefore, reduce speechreading performance.

4.8 Hearing Status:

20 pairs of deaf and hearing subjects were matched closely for all other recorded variables. The deaf participants in this group significantly outperformed the hearing on the TAS (figure 6).

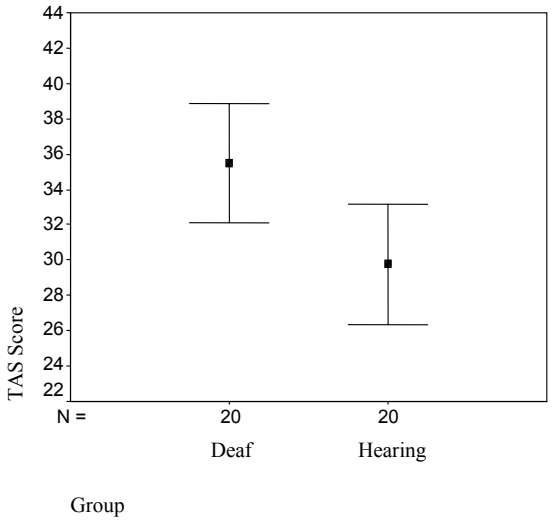

Figure 6: Mean TAS scores achieved by deaf and hearing participants. Error bars show 95% confidence interval around the mean. Deaf participants speechread significantly better than matched hearing participants ($t(38)=2.53$, $p<.02$).

4.9 Parental Hearing Status:

The 11 deaf and 11 hearing participants with deaf parents were matched (by all available background variables) to similar participants with hearing parents. There was no difference between the speechreading ability of the deaf participants with deaf parents (DoD) and those with hearing parents (DoH). However, the hearing subjects with deaf parents (HoD) significantly outperformed their peers with hearing parents (HoH) (figure 7).

The HoD group have developed a high awareness of communicating with deaf people, and this seems to include visual speech perception.

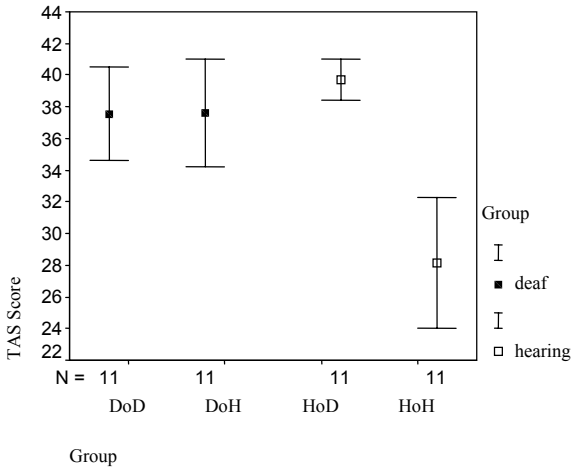

Figure 7: Mean TAS scores achieved DoD, DoH, HoD, and HoH participants. Error bars show 95% confidence interval around the mean. Parental hearing status did not affect speechreading ability in the deaf participants. In the hearing participants, the HoD group speechread significantly better than the HoH group ($t(20)=5.95$, $p<.001$).

4.10 Reading:

The Group Reading Test, 2nd edition, (GTR II) form C (NFER Nelson) was used to establish the reading level of 40 of the deaf participants. There was a strong correlation between their performances on the TAS and on the GTR II ($r=.42$, $p<.01$). The relationship between speechreading and reading exists, therefore, even when there is no element of literacy in the speechreading assessment used (figure 8).

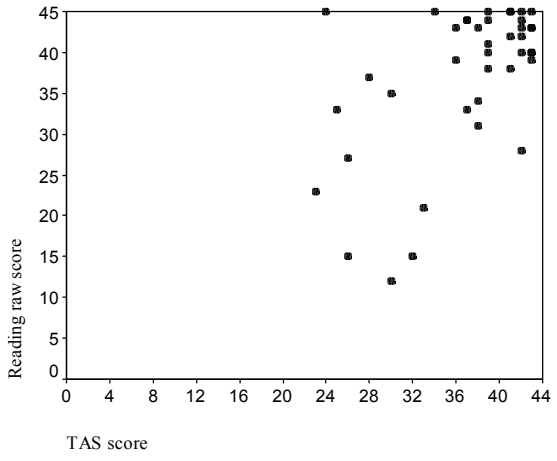

Figure 8: There is a strong correlation between reading and speechreading performance in this group of deaf participants.

5. CONCLUSIONS AND FUTURE DIRECTIONS

These results concur with some recent studies which suggest that, when tested appropriately, deaf people can speechread more efficiently than hearing people ([10], [11]).

The TAS has face validity, since it uses direct measures of speechreading comprehension, and has been shown to be reliable [12]. Moreover, the TAS is sensitive to a number of factors which may be important in the assessment of speechreading in both hearing and deaf populations (such as regional spoken accent, education level and parental hearing status).

It is an appropriate measure for assessing the factors that relate speechreading to literacy in deaf adults, and may provide a reliable measure of speechreading in relation to a number of other functions, including cortical activation (see MacSweeney et al, 2001 [13] for one example of its use).

Planned refinements of the TAS include (1) an additional subtest assessing discrimination at the phonological level (see Bernstein et al., 2000 [10]), (2) further selection of items, especially in the 'stories' task, (3) digitisation, which would make the test more portable, and easier and quicker to administer.

6. REFERENCES

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