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Development of the Communication and Acceptance Scale (CAS) for group aural rehabilitation

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ABSTRACT

Objective: The aim of the current study was to develop a reliable instrument for the Active Communication Education (ACE) programme evaluating changes in communication strategies and the emotional consequences, knowledge and acceptance of hearing loss and to examine its reliability and face, content and construct validity.

Design: Semistructured interviews and questionnaires were conducted with participants and clinicians engaged in the ACE intervention.

Study sample: The psychometric properties were evaluated in two phases for two samples of adults with hearing loss who participated in the ACE programme, including 61 and 41 participants, respectively.

Results: The final Communication and Acceptance Scale (CAS) contained 18 items, and the reliability of the overall scale (Cronbach's alpha 0.86) and the test-retest reliability ($r = 0.89$, $p < 0.001$) were good. The construct validity, evaluated with principal component analysis, suggested a five-factor solution explaining 72% of the variance. The questionnaire revealed statistically significant short- and long-term effects of the ACE programme. Both participants and clinicians found the questionnaire relevant, useful and easy to administer.

Conclusion: The CAS questionnaire was found to be valid and reliable, but because of the low sample size, further analysis with a larger population is needed.

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Communication strategies; questionnaire; validity; hearing loss; Active Communication Education programme

Introduction

More than 5% of the world's population and approximately one-third of people over 65 years of age are affected by disabling hearing loss (WHO 2018). People with hearing loss who seek help are often advised to use hearing aids. Many individuals who have been fitted with hearing aids are satisfied and use them regularly (Arlinger, Nordqvist, and Öberg 2017). However, not all elderly people wear their aids or are satisfied with them (Lupsakko, Kautiainen, and Sulkava 2005; Popelka et al. 1998; Öberg et al. 2012). It is important to provide counselling and additional audiological rehabilitation, as untreated hearing loss can lead to poorer psychosocial health (Arlinger 2003; Öberg et al. 2012). Several studies have found that group audiological rehabilitation programmes improve activity, participation and communication strategies (Hawkins 2005; Hickson, Worrall, and Scarinci 2007a; Preminger 2003; Preminger 2007; Preminger and Yoo 2010; Öberg 2017; Öberg, Bohn, and Larsson 2014a). The Active Communication Education (ACE) programme was developed by Hickson, Worrall, and Scarinci (2007b) and is a group rehabilitation programme that consists of five weekly two-hour sessions. The programme uses an interactive problem-solving approach that encourages participants to discuss their communication difficulties with group members and facilitators

and to practice communication solutions. The aims of the programme are to reduce the communication difficulties experienced by people with hearing loss and to improve their quality of life and well-being (Hickson, Worrall, and Scarinci 2007a). The ACE programme has been evaluated in several studies, which have reported statistically significant short- and long-term improvements in activity, participation, communication abilities, and well-being and the ability to effectively clarify the individual's identity and restore social identity (Hickson, Worrall, and Scarinci 2007a; Rivera et al. 2020; Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b). When evaluating the effect of the Swedish version of the ACE programme, several Swedish validated questionnaires (Öberg, Lunner, and Andersson 2007), such as the Hearing Handicap Inventory for the Elderly (HHIE) (Ventry and Weinstein 1982), the Communication Strategies Scale (CSS) (Demorest and Erdman 1987) and the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith 1983), have been used. To capture individual qualitative aspects of the programme, open-ended items and goals from a modified version of the Client-Oriented Scale of Improvement (COSI) (Dillon, James, and Ginis 1997; Hickson, Worrall, and Scarinci 2007a) were used and analysed. These qualitative analyses showed that individuals appreciate meeting in groups and sharing experiences to learn more about hearing impairment and

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how to use different communication strategies. The participants stated that they had increased their ability to deal with hearing loss, and they reported that they had become more open about telling others about their hearing loss (Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b). These qualitative aspects are in line with the findings by Southall et al. (2018), who found that group rehabilitation provided better awareness of hearing loss and that increased social belonging led to personal transformation. In Sweden, the ACE programme has been implemented in clinical practice as an additional treatment to hearing aid rehabilitation for individuals who still experience communication difficulties or require additional help to acknowledge and accept their hearing loss. The ACE programme is conducted all over Sweden, but it has been difficult to evaluate its effect in a manageable way in each clinic. When evaluating the ACE programme in research studies, several different questionnaires have been used, as no single available Swedish instrument can adequately evaluate the effects of the programme. This approach is not possible in clinical practice, as it is time-consuming to register and analyse data from several questionnaires. A questionnaire that will be used regularly in clinical practice needs to be easy to administer, and therefore, there is a need for a brief, feasible and valid questionnaire. The aim of the current study was to develop a reliable instrument to measure the effect of the Swedish version of the ACE programme and to examine the developed instrument's reliability as well as its face, content and construct validity. The current questionnaire is intended to capture changes in communication strategies and the emotional consequences, knowledge and acceptance of hearing loss. It is important that the questionnaire be easy to administer and able to detect clinical changes over time (Bennett et al. 2015).

Methods

Procedure

The study was divided into two phases. The first phase included three stages. Stage one was the development of the questionnaire format. Stage two included the evaluation of face and content validity, and stage three included measurements of reliability and construct validity. In the second phase, the reliability and construct and concurrent validity of the final version of the instrument were examined. The study was approved by the Ethics Committee in Linköping (Dnr M49-09).

Statistical analyses

A proper evaluation should address the methodology of questionnaire development, reliability (defined as the precision of measurement), validity (the extent to which the questionnaire measures what it is intended to measure and whether it produces results similar to existing instruments), responsiveness (the questionnaire's ability to reveal changes of interest) and feasibility (which reflects the practicality of using the instrument in the clinic) (Hyde 2000). Face and content validity were assessed by asking both the participants and clinicians to review the constructed questionnaire. Reliability was assessed based on internal consistency and split-half reliability. Cronbach's alpha coefficient was used to determine the internal consistency of the questionnaire and its subscales and was considered acceptable if alpha exceeded 0.70 (Clark-Carter 2004). Split-half reliability was assessed using the Guttman formula and was considered acceptable when it exceeded 0.70. Test-retest reliability for each item

was measured with Cohen's kappa. Kappa values of <0.20 were considered poor, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 good and 0.81–1.00 very good (Altman 1991). Pearson product-moment correlation was used to evaluate test-retest reliability and concurrent validity. Test-retest reliability needs to be at least 0.80 (Clark-Carter 2004). Construct validity was evaluated with a higher-order factor analysis using principal components analysis. In accordance with the Kaiser criterion, an eigenvalue of >1 was used as a cut-off for the inclusion of factors with an item-factor loading of at least 0.4 (Kaiser 1960). The total explained variance needs to exceed 60% to be valid (Williams, Onsmann, and Brown 2010). Responsiveness was assessed by calculating the pre-post measurement with a dependent *t*-test and measurements of effect sizes. An effect size of 0.2 was considered small, 0.5 was considered moderate, and 0.8 was considered a high effect. The feasibility of the instrument was described by the clinicians and participants who tested the instrument. All analyses in study 2 (except test-retest reliability) were performed using data from the questionnaires completed after 3 weeks and included 41 participants. Data were analysed using the software package STATISTICA (Statsoft 2019, version 13), and results with *p* values <0.05 were considered statistically significant.

Phase 1 stage 1 – development of the questionnaire

The items were created by the three authors, and most items were constructed with inspiration from items in questionnaires included in earlier evaluations of the ACE programme (Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b) (i.e. the Hearing Handicap Inventory for the Elderly (HHIE) (Ventry and Weinstein 1982), the Communication Strategies Scale (CSS) (Demorest and Erdman 1987) and the Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith 1983)). The items captured communication strategy use and the emotional consequences, knowledge and acceptance of hearing loss. Items corresponded to themes identified from the answers to the open-ended items used in earlier ACE studies, such as items related to a greater openness to telling others about one's hearing loss and experiences of increased awareness and acceptance of hearing loss. These themes were also observed by the facilitators of different sessions of the ACE programme (Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b). In the development of the questionnaire, all items used the same response format. Respondents rated whether they agreed with the statements in the items using a five-point response scale with endpoints from totally agree (5 points) to totally disagree (1 point) and a middle option of sometimes agree (3 points). Higher scores indicated better functioning. The wording of all items was constructed to be reliable for use in a pre- and post-evaluation; an example is "I often avoid situations where I believe I will have difficulties hearing". The first version consisted of 20 items. Three more items were added to assess hearing aid/cochlear implant (CI) use and user time and to assess the respondent's familiarity with other assistive hearing devices; these items were not included in the psychometric analyses but were added because they might be of value for clinicians when planning for possible further rehabilitation or evaluation.

Phase 1 stage 2 – face and content validity

Face and content validity were assessed by asking both the participants and the clinicians to review the constructed questionnaire. Hearing therapists from four regions in Sweden, all of

whom had more than 3 years of experience as facilitators of ACE courses, were recruited to participate in the review process. The developed questionnaire was sent by e-mail to the clinicians. The clinicians answered seven open-ended items about the questionnaire related to, for example, the wording of the items, the importance of a specific item, whether they felt any items were missing, and one additional item related to their ease of interpreting the results of the questionnaire.

Participants

Between 2013 and 2014, 83 individuals in the four regions participated in the evaluation of the ACE course (Öberg 2017). Of these, 81 were eligible to participate in the validation of the questionnaire. The clinicians in each region recommended two participants who had participated in an ACE programme and could be asked to review the questionnaire. Five of the eight recruited participants (two women, three men, age range 71–84 years) expressed interest in participating in the review procedure and provided written consent. The participants were interviewed by telephone and answered the same seven items as the audiologists.

Phase 1 stage 3 – reliability and construct validity

To test construct validity (the extent to which the questionnaire measures what it is intended to measure) and reliability, a study was performed in which the remaining 73 individuals from the four regions were invited to take part (Öberg 2017). 61 individuals agreed to participate and completed the questionnaire. 64% were women, and the mean age of the participants was 76.2 years (SD 8.2, range 58–91). 53 were hearing aid users, 3 were CI users, and 2 were non-users. Three did not answer the item. The PTA for the better ear was 56.5 dB (SD 22.6, range 17.5–98.7 dB).

Results phase 1

Results stage 2 – face and content validity

The feedback from the clinicians resulted in adjustments to the wording of a few items and adjustments of response alternatives. The participants found the items relevant and easy to answer, and no further adjustments were required after telephone interviews with them. The next step was to investigate the construct validity of this second version of the questionnaire.

Results stage 3 – reliability and construct validity

Construct validity was evaluated with a higher-order factor analysis using principal components analysis. In the unrotated factor matrix, five factors with eigenvalues above 1 were found, and they accounted for 59% of the total variance. 6 of the 20 included items loaded on two factors. Cronbach's alpha was calculated as a measure of internal consistency, and an alpha coefficient of 0.78 was found for the total scale. In the next step of the analyses, two items were excluded because they had a tendency towards a ceiling effect with high mean scores and low variation. New analyses that included only 18 items resulted in a five-factor solution that explained 64% of the variance, with an alpha coefficient of 0.80. The 18-item version of the questionnaire was validated further. Before the next evaluation, a few revisions were made in which the instructions and response alternatives were clarified and two of the items were reworded. The response

alternative “sometimes agree” was changed to “either/or” as it was found that “sometimes” could be interpreted as both “often” and “rarely”. The 18-item version had a min.–max. score of 18–90 points.

Methods phase 2

Participants

To further evaluate the reliability and construct and concurrent validity of the revised questionnaire (the final version), participants attending the ACE programme in the four different regions in Sweden were recruited. Participants were invited by their regional clinicians to take part in the study. The first author mailed the questionnaire, the informed consent forms and the additional HHIE, HADS and CSS questionnaires to the individuals who agreed to participate. The questionnaires were mailed before, 3 weeks after and 6 months after the programme. The test–retest questionnaire was mailed as soon as the individuals had completed the 3-week post-questionnaire. 52 individuals completed the questionnaire before starting the programme, 41 after 3 weeks and 28 after 6 months. 36 individuals completed the test–retest questionnaire. The mean age of the 41 individuals who participated in the analysis was 74.5 years (SD 9.6, range 37–88 years). There were 21 women and 20 men. The PTA for the better ear was 54 dB (SD 14.6, range 30–81.25 dB). 40 were hearing aid users, and 1 was a CI user.

Outcome measures

Validated questionnaires that were used in earlier ACE studies in Sweden were used in the present study to further evaluate the construct validity of the CAS questionnaire (Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b). The following questionnaires were used: The Hearing Handicap Inventory for the Elderly (HHIE) (Ventry and Weinstein 1982) consists of 25 items and is divided into two subscales. 13 items explore the emotional consequences of hearing loss (HHIE E), and 12 items explore the social and situational effects of hearing loss (HHIE S) (Ventry and Weinstein 1982). Higher scores represent greater perceived activity limitations and participation restrictions.

The Communication Strategies Scale (CSS) is part of the Communication Profile for the Hearing Impaired (Demorest and Erdman 1987). The CSS has 25 items and is divided into three subscales: maladaptive (M), verbal (V) and nonverbal (NV) strategies. Hence, CSS assesses both adaptive and maladaptive communication strategies. Responses are rated on a five-point scale from almost never (1) to almost always (5). Higher scores indicate fewer problems.

The Hospital Anxiety and Depression Scale (HADS); (Zigmond and Snaith 1983) assesses the presence/absence of symptoms of anxiety and depression among medical outpatients. The HADS consists of 14 items, each of which has four response choices (0–3), with subscales for anxiety and depression. Higher scores indicate more symptoms.

Results phase 2

Reliability and construct validity

The internal consistency of the questionnaire showed a Cronbach's alpha coefficient for the total scale of 0.86; the item-total correlation ranged from 0.06 to 0.76. Cronbach's alpha for

Table 1. Means, SDs, items, factor loadings, explained variance, internal consistency (Cronbach's alpha) and test-retest reliability (weighted kappa).

Factors/item	Mean	SD	Factor loadings 1	Factor loadings 2	Factor loadings 3	Factor loadings 4	Factor loadings 5	Cronbach's alpha	Weighted kappa value (n = 36)
Factor 1: emotional consequences (explained variance 24.2%)								0.88	
F1:1. When it is difficult to hear I pretend to hear	2.95	1.20	0.81						0.39
F1:2. My hearing difficulties create annoyance between me and friends	2.80	1.31	0.57						0.48
F1:3. I avoid communication with others due to my hearing difficulties	3.07	1.25	0.70						0.56
F1:4. I often feel uncomfortable when talking to people	2.46	1.24	0.82						0.45
F1:6. My hearing difficulties affect my self-esteem	2.71	1.57	0.66						0.68
F1:7. When I do not hear what people say I do not pretend to hear them	3.66	1.20	0.59						0.49
F1:8. My hearing difficulties make me feel left out when I am in a group of people	1.95	1.22	0.80						0.65
F1:9. I often avoid situations where I believe I will have difficulties to hearing	2.17	1.22	0.55						0.29
Factor 2: Verbal communication strategies (explained variance 13.2%)								0.66	
F2:10. When I have difficulties hearing what people say, I ask them to repeat until I am sure I have heard correctly.	4.05	0.95		0.64					0.53
F2:15. When I have difficulties hearing what people say, I explain I have hearing loss	4.61	0.80		0.79					0.69
F2:17. I feel comfortable telling other people how to behave when talking to me	3.63	1.16		0.76					0.64
Factor 3: Confirmation strategies (explained variance 9.2%)								0.49	
F3:14. If I am unsure what I heard, I repeat what was said to make sure I heard correctly.	3.76	1.18			0.72				0.51
F3:18. I feel strengthened by meeting others with hearing difficulties	4.29	1.03			0.84				0.64
Factor 4: Hearing knowledge (explained variance 9%)								NA	
F4:13. I have good knowledge about my hearing loss	4.29	0.84				0.92			0.37
Factor 5: Hearing loss and acceptance (explained variance 16.1%)								0.82	
F5:5. Other people are bothered by my hearing difficulties	2.95	1.35					0.64		0.39
F5:11. I can handle my hearing loss and its consequences	3.58	1.09					0.71		0.39
F5:12. I feel well prepared to face my hearing difficulties in everyday life	2.75	1.30					0.85		0.49
F5:16. I feel optimistic about the future	3.34	1.35					0.66		0.70

the subscales was 0.88 for subscale 1, 0.66 for subscale 2, 0.49 for subscale 3 and 0.82 for subscale 5. Cronbach's alpha was not measured for subscale 4 since it only contained a single item. The split-half value using the Guttman formula was 0.89. No floor or ceiling effects were identified as no participant received the minimum or maximum total score.

Test-retest reliability was determined using the Pearson product-moment correlation and showed a correlation of $r = 0.89$, $p < 0.001$. The test-retest reliability for each item was measured with Cohen's kappa. The weighted kappa was considered good for six items, moderate for seven items, and fair for five items; no item was considered poor (see Table 1). The mean time between the test and the retest was 10.03 days (SD 5.2).

Construct validity was evaluated with a higher-order factor analysis using principal components analysis. In the unrotated factor matrix, five factors were found with eigenvalues > 1 , and they

accounted for 72% of the total variance (see Table 1). The five extracted factors were rotated with varimax rotation, and the factor loadings are presented in Table 1. Two items loaded on two factors (items 5 and 16). These items were included in the factor with the greatest item-factor loading, which was factor 5. The first factor related to emotions and maladaptive behaviour and was labelled emotional consequences. This was the strongest factor; it contained the most items (8 items) and explained the greatest percentage of variance. The second factor included communication strategies such as asking others to repeat themselves and was labelled verbal communication strategies. The third factor consisted of two items that represented verbal and psychosocial confirmation and was labelled confirmation strategies. The fourth factor consisted only of one item and was labelled hearing knowledge; it was kept because of the strong factor loading. The fifth factor consisted of four items and addressed the ability to handle situations in a positive manner; it

was labelled hearing loss and acceptance. This factor was correlated with the first factor, representing the emotional consequences of hearing loss (see Table 2). With knowledge of these extracted factors, the questionnaire was named the Communication and Acceptance Scale (CAS).

Concurrent validity was assessed by correlating the CAS with the other questionnaires administered to the participants. The statistically significant correlations are presented in Table 2. The strongest correlation was found between the emotional consequences factor and the HHIE E ($r = -0.79, p < 0.05$): the higher the score on the HHIE was, the lower the score on the CAS. All factors of the CAS were statistically significantly correlated with one or more subscales of the three questionnaires. Verbal communication strategies and confirmation strategies in the CAS were positively associated with the CSS verbal and nonverbal subscales. Hearing knowledge was related to the HADS subscales, indicating that better knowledge was related to greater psychosocial health.

Correlations among the factors/subscales in the CAS were measured to determine the extent to which the subscales were independent of one another and measured different constructs. One statistically significant correlation was found; it occurred between the subscales of emotional consequences and hearing loss and acceptance ($r = 0.66$) (Table 2).

Responsiveness – pre- and post-programme measures

To investigate the short- and long-term effects, a repeated-measures ANOVA was performed to compare the pre-post 3-week and pre-

post 6-month assessments. The means, SDs, effect sizes and F -values for the different questionnaires are shown in Table 3.

Statistically significant short- and long-term within-group effects were found for the CAS and were identified for verbal (CSS V), non-verbal (CSS NV) and maladaptive (CSS M) communication strategies. When each item (pre-post 3 weeks) in the CAS was evaluated, four items showed statistically significant improvements. Improvements were found for the following items: (5) “Other people are bothered by my hearing difficulties”, $t(40) = -3.50, p < 0.01$; (11) “I can handle my hearing loss and its consequences”, $t(39) = -3.20, p < 0.01$; (13) “I have good knowledge about my hearing loss”, $t(39) = -2.68, p < 0.05$; (18) “I feel strengthened by meeting others with hearing difficulties”, $t(39) = -3.69, p < 0.001$. The same items showed statistically significant improvements when long-term effects were analysed, except for item 5. The means, SDs and F -values for each item in the CAS questionnaire are shown in Table 4. Not all attending participants were satisfied with their hearing aids or used them regularly, but no statistically significant increase in hearing aid use was found after attending the ACE programme. The majority of the participants answered that they used their hearing aids >8 h a day before they started the programme. 42% used hearing aids less than 8 h a day, and of these, 33% increased their hours of use after the programme.

Feasibility

In the first phase of the development of the questionnaire, both the clinicians and the participants described the CAS

Table 2. Statistically significant correlation coefficients between self-reports and the subscales of the CAS.

Self-report	CAS tot	Emotional consequences	Verbal communication strategies	Confirmation strategies	Hearing knowledge	Hearing loss and acceptance
HHIE tot	-0.73					
HHIE E	-0.78	-0.79				-0.69
HHIE S	-0.55	-0.58				-0.49
HADS tot	-0.61					
HADS A	-0.50	-0.41	-0.37		-0.34	-0.35
HADS D	-0.60	-0.54			-0.33	-0.57
CSS tot	0.48					
CSS M	0.57	0.61				0.44
CSS V			0.68			
CSS NV			0.34	0.42		
Emotional consequences	0.92					0.66
Verbal communication strategies	0.45					
Confirmation strategies						
Hearing knowledge						
Hearing loss and acceptance	0.79	0.66				

HHIE: Hearing Handicap Inventory for the Elderly; HHIE E: Hearing Handicap Inventory for the Elderly-Emotional; HHIE S: Hearing Handicap Inventory for the Elderly-Situational; HADS: Hospital Anxiety and Depression Scale, HADS A: Hospital Anxiety and Depression Scale-Anxiety; HADS D: Hospital Anxiety and Depression Scale-Depression; CSS: Communication Strategies Scale; CSS M: Communication Strategies Scale-Maladaptive; CSS V: Communication Strategies Scale-Verbal; CSS NV: Communication Strategies Scale-Non-verbal.

$p < 0.05$.

Table 3. Means, SDs, effects sizes (ES) and F -values for pre-post 3 weeks (1–2) and pre-post 6 months (1–3).

Questionnaire	Mean pre	SD	Mean post 3 weeks	SD	Mean post 6 months	SD	F -values 1–2, $n = 41$	F -values 1–3, $n = 28$	ES pre-post 3weeks
CAS	54.60	10.37	59.05	11.84	58.85	9.52	$F(1, 39) = 14.55, p < 0.001$	$F(2, 54) = 6.72, p < 0.01$	0.40
HHIE S	27.60	10.48	26.63	10.13	25.50	10.10	$F(1, 39) = 1.99, p = 0.17$	$F(2, 52) = 1.18, p = 0.31$	0.09
HHIE E	23.50	10.77	23.51	9.98	23.71	9.67	$F(1, 39) = 0.17, p = 0.89$	$F(2, 52) = 0.95, p = 0.39$	0.01
HADS D	5.31	3.24	4.83	2.89	4.38	2.92	$F(1, 40) = 1.75, p = 0.19$	$F(2, 56) = 1.67, p = 0.20$	0.16
HADS A	5.58	4.09	5.68	4.15	5.31	3.78	$F(1, 40) = 0.44, p = 0.83$	$F(2, 56) = 0.54, p = 0.95$	0.02
CSS M	3.3	0.81	3.57	0.60	3.68	0.59	$F(1, 38) = 7.89, p < 0.01$	$F(2, 56) = 4.30, p < 0.05$	0.39
CSS V	2.80	0.80	3.19	0.74	3.29	0.80	$F(1, 38) = 9.03, p < 0.01$	$F(2, 56) = 13.30, p < 0.001$	0.51
CSS NV	3.83	0.75	4.09	0.72	4.15	0.60	$F(1, 38) = 4.85, p < 0.05$	$F(2, 56) = 3.86, p < 0.05$	0.36

Table 4. Means, SDs, and *F*-values for pre-post 6 months (1–3), *n* = 28.

CAS-item*	Mean pre	SD	Mean post 3 weeks	SD	Mean post 6 months	SD	<i>F</i> -values 1–3, <i>n</i> = 28
1	2.28	1.09	2.96	1.23	3.03	0.99	$F(2, 54)=1.31, p = 0.28$
2	2.82	1.36	2.86	1.30	2.89	1.26	$F(2, 54)=0.09, p = 0.91$
3	3.25	1.26	3.18	1.16	3.11	1.28	$F(2, 54)=0.32, p = 0.73$
4	2.57	1.32	2.68	1.31	2.50	1.20	$F(2, 54)=0.33, p = 0.72$
5	2.32	1.16	2.82	1.41	2.71	1.21	$F(2, 54)=2.95, p = 0.06$
6	2.61	1.50	2.78	1.57	2.61	1.42	$F(2, 54)=0.55, p = 0.58$
7	3.32	1.44	3.64	1.61	3.39	0.99	$F(2, 54)=0.96, p = 0.39$
8	2.07	1.12	2.14	1.21	2.21	1.20	$F(2, 54)=0.31, p = 0.74$
9	2.18	1.10	2.28	1.12	2.25	1.26	$F(2, 54)=0.19, p = 0.82$
10	3.93	1.02	3.93	1.02	4.01	0.96	$F(2, 54)=0.60, p = 0.55$
11	3.14	1.30	3.68	1.10	3.64	1.10	$F(2, 54)=4.58, p < 0.01$
12	2.57	1.29	2.68	1.22	2.82	1.12	$F(2, 54)=0.73, p = 0.49$
13	3.71	1.30	4.29	0.90	4.39	0.73	$F(2, 54)=5.22, p < 0.01$
14	3.82	1.25	3.86	1.05	3.96	0.95	$F(2, 54)=0.29, p = 0.75$
15	4.39	0.87	4.46	0.92	4.53	0.64	$F(2, 54)=0.45, p = 0.64$
16	3.21	1.10	3.25	1.29	3.11	1.20	$F(2, 54)=0.30, p = 0.74$
17	3.29	1.36	3.43	1.23	3.50	1.20	$F(2, 54)=0.36, p = 0.70$
18	3.75	0.97	4.39	0.96	4.07	1.09	$F(2, 54)=5.06, p < 0.01$

*The wording of the items is shown in Table 1.

questionnaire as easy to use and indicated that it included relevant items. In further evaluation, all CAS questionnaires were completed without any missing data, indicating that the items were easy for the participants to interpret. The items were also constructed to be easy for clinicians to handle; the inclusion of a few questions and five response alternatives made it easy to produce the total score.

Discussion

This paper describes the development of a reliable instrument, the CAS, with the aim of evaluating the effects of the ACE intervention. The current CAS was found to be reliable and easy to use and managed to capture changes in communication strategies and the emotional consequences, knowledge and acceptance of hearing loss.

In the first phase of the study, face and content validity were assessed by asking both participants and clinicians with experience with the ACE intervention to review the constructed questionnaire. Both the participants and clinicians found the items and the questionnaire to be relevant and useful, and only minor changes were necessary. The internal consistency and the explained percentage of total variance increased after a few revisions and after the deletion of two items.

In the second phase, the psychometric properties of the final 18-item questionnaire were investigated in terms of factor structure, internal consistency, test–retest reliability and responsiveness. Reliability, in terms of internal consistency (0.86), was found to be good for the overall scale and acceptable for the subscales, except for factor 3, which had an alpha value of 0.49 (Clark-Carter 2004). The low internal consistency of factor 3 could be explained by the low number of items (only two items). The factor was kept because the items, when analysed per se, could provide valuable information on the individual's needs that could facilitate planning for further rehabilitation. The test–retest results showed that the questionnaire was reliable ($r = 0.89, p < 0.001$), and no items had kappa scores that were considered poor.

The factor analysis suggested a five-factor solution explaining 72% of the variance and was interpreted as good, especially as the questionnaire contained only 18 items (Williams, Onsmann, and Brown 2010). These five factors could all be related to the quantitative and qualitative outcomes of earlier studies of the

ACE programme (Hickson, Worrall, and Scarinci 2007a; Öberg 2017; Öberg, Bohn, and Larsson 2014a; Öberg et al. 2014b). In the ACE programme, participants became more aware of the strategies they already used and learned new communication strategies. The more knowledge (factor 4) they obtained through discussions with other participants and by learning communication strategies and performing the different tasks during the sessions, the better prepared they were to use the strategies in real life (factors 2 and 3). These factors, together with the discussions of the emotional aspects of hearing loss (factor 1), have the potential to affect acceptance (factor 5), with an expected effect of increased psychosocial well-being. The more an individual acknowledges and accepts his or her hearing loss, the greater the probability that the individual will decrease his or her use of maladaptive strategies. Reduced use of maladaptive strategies, such as avoiding difficult listening situations and/or pretending to hear, might increase activity and participation and lead to increased psychosocial well-being.

The first factor, emotional consequences, related to emotions and maladaptive behaviour. This was the strongest factor; it contained the most items and explained the greatest percentage of variance. Maladaptive strategies are strategies that many ACE participants described using to some degree (Öberg 2017). This factor was correlated with the fifth factor, representing hearing loss and acceptance, which addressed the ability to handle hearing difficulties and their consequences in everyday life. The correlation could be interpreted as indicating that the more an individual acknowledges and accepts his or her hearing loss, the more likely the individual is to decrease the use of maladaptive strategies. This was also reported in a qualitative study by Wänström et al. (2014), in which many of the strategies used by the participants were described as maladaptive. When participants gained more knowledge about other coping strategies and became more aware of their own behaviour, their likelihood of accepting their hearing loss increased. The fifth factor also included one of the separate items that showed the greatest improvement, which was related to being prepared to handle the hearing loss. When individuals feel well prepared to face and handle their hearing loss, they may gain the courage to be more open to telling others about their hearing loss (Backenroth and Ahlner 2000; Southall et al. 2018; Öberg 2017; Öberg, Bohn, and Larsson 2014a). Being open to telling others about their hearing loss was the most frequently mentioned action after participating in the ACE programme (Öberg 2017). The second factor

included verbal communication strategies, such as asking others to repeat themselves and feeling comfortable telling people how to behave when talking. In the first sessions of the ACE programme, many participants stated that they often used a non-specific repair strategy, asking “What?” or “Pardon?” when they could not hear. During the sessions, they learned and were encouraged by the group members to use more and different communication strategies. Statistically significant improvement was found for the item measuring positive feelings from meeting others with hearing difficulties, which was one of the two items included in the third factor. Feeling better after meeting others and sharing experiences are aspects in line with earlier studies (Backenroth and Ahlner 2000; Southall et al. 2018; Öberg 2017; Öberg, Bohn, and Larsson 2014a), and comments regarding learning from the group were the most common benefit named when the participants described what they found most beneficial about the programme (Öberg 2017; Öberg, Bohn, and Larsson 2014a). The results of several studies suggest that group settings effectively restore social identities. Individuals are able to clarify their identities by sharing their frustrations and difficulties with each other, and this increased social belonging may lead to personal transformation (Backenroth and Ahlner 2000; Héту 1996; Preminger 2007; Southall et al. 2018). The fourth factor consisted of only one item but explained 9% of the variance; it was decided to retain this item because of its high factor loading (0.92). This item is a more general question measuring participants’ subjective knowledge about their hearing loss. It could be altered by individuals depending on what kind of knowledge they needed to improve. In earlier evaluations of the ACE programme, participants described this through comments related to learning more about their hearing loss and about how to interpret audiograms, a need that was also confirmed by the facilitators (Öberg 2017; Öberg, Bohn, and Larsson 2014a).

The correlation between the CAS and the other questionnaires indicated conformity. This was interpreted as positive, as the aim of developing the new questionnaire was to capture the same aspects with only one questionnaire that is easier to administer and more appropriate for use in clinical practice than four different questionnaires (Clark-Carter 2004).

Statistically significant short- and long-term within-group effects were found for the CAS questionnaire, indicating that the questionnaire is valid for evaluating the effects of the ACE programme. The effect size of the current questionnaire showed a small to moderate effect (0.40), in line with the effect sizes (0.06–0.36) reported by Hickson, Worrall, and Scarinci (2007a). Large effect size was not expected, as it has been found that group rehabilitation programmes in general show small effect sizes (Wong and Hickson 2012). No statistically significant increase in hearing aid use was found. This may be because most participants already used their hearing aids the entire day. Although the main purpose of the programme is not to increase hours of hearing aid use, a positive outcome is that 33% used their aids more after the programme, which indicates increased acceptance of hearing loss.

It is difficult to compile a questionnaire that measures the entire content of rehabilitation (Preminger 2007); indeed, this was a challenge in the development of the CAS questionnaire. In group rehabilitation programmes, it is obvious that individuals make adjustments and that this is an ongoing process in which individuals adapt to, use and change communication strategies and accept their hearing loss.

In the era of evidence-based medicine, it is necessary to provide clinicians with brief, valid and feasible questionnaires, as

there is often limited time in clinical practice for evaluations. The current questionnaire can not only be used to evaluate the main effects of the programme but can also facilitate the individual’s continuing rehabilitation. The different items can easily be evaluated separately by the clinician and may be helpful when planning further rehabilitation activities for the individual. The rating of each item provides information about the individual’s needs and whether, for example, communication strategies should be practised further or whether it would be more appropriate to work on psychosocial factors.

The major limitation of this study is the low sample size. It was difficult to increase the sample size, as few individuals are given the opportunity to participate in the ACE programme due to the limited number of available courses each year in the clinics. For scale development, >100 participants and at least five subjects per item are recommended when measuring test–retest reliability (Hyde 2000). Despite the low sample size, the Cronbach’s alpha score exceeded 0.70, and the test–retest reliability exceeded the recommendation of $r > 0.80$ (Clark-Carter 2004; Hyde 2000). The next step in validating this questionnaire will be to deliver the questionnaire to all clinicians in Sweden who run these courses. When the questionnaire is distributed and used by a larger number of participants, new analyses of the reliability, validity and feasibility are recommended.

Conclusion

The developed CAS questionnaire was found to be reliable and valid for clinical use. The extracted five factors met the prerequisites for measuring several different aspects and captured the aims of the ACE programme. The extracted factors could all be related to the quantitative and qualitative outcomes of earlier studies of the ACE programme. Both the participants and clinicians found the questionnaire relevant, useful and easy to administer, and the questionnaire revealed statistically significant short- and long-term effects. This short questionnaire captured the same aspects that are found when several questionnaires are used to evaluate the ACE programme. Because of the low sample size in this study, there is a need for further analysis with a larger population.

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References

- Altman, D. 1991. *Practical Statistics for Medical Research*. London, UK: Chapman & Hall.
- Arlinger, S. 2003. "Negative Consequences of Uncorrected Hearing Loss—a Review." *International Journal of Audiology* 42 (2): 17–20. doi:10.3109/14992020309074639
- Arlinger, S., P. Nordqvist, and M. Öberg. 2017. "International Outcome Inventory for Hearing Aids: Data from a Large Swedish Quality Register Database." *American Journal of Audiology* 26 (3S): 443–450. doi:10.1044/2017_AJA-16-0123.
- Backenroth, G., and B. Ahlner. 2000. "Quality of Life of Hearing-Impaired Persons Who Have Participated in Audiological Rehabilitation Counselling." *International Journal for the Advancement of Counselling* 22 (3): 225–240. doi:10.1023/A:1005655017175.
- Bennett, R. J., D. S. Taljaard, C. G. Brennan-Jones, S. Tegg-Quinn, and R. H. Eikelboom. 2015. "Evaluating Hearing Aid Handling Skills: A Systematic and Descriptive Review." *International Journal of Audiology* 54 (11): 765–776. doi:10.3109/14992027.2015.1052104.
- Clark-Carter, D. 2004. *Quantitative Psychological Research: A Student's Handbook*. Hove, UK: Psychology Press.
- Demorest, M. E., and S. A. Erdman. 1987. "Development of the Communication Profile for the Hearing Impaired." *The Journal of Speech and Hearing Disorders* 52 (2): 129–143. doi:10.1044/jshd.5202.129.
- Dillon, H., A. James, and J. Ginis. 1997. "Client Oriented Scale of Improvement (COSI) and Its Relationship to Several Other Measures of Benefit and Satisfaction Provided by Hearing Aids." *Journal of the American Academy of Audiology* 8 (1): 27–43.
- Hawkins, D. B. 2005. "Effectiveness of Counseling-Based Adult Group Aural Rehabilitation Programs: A Systematic Review of the Evidence." *Journal of the American Academy of Audiology* 16 (7): 485–493. doi:10.3766/jaaa.16.7.8.
- Hétu, R. 1996. "The Stigma Attached to Hearing Impairment." *Scandinavian Audiology, Supplement* 43: 12–24.
- Hickson, L., L. Worrall, and N. Scarinci. 2007a. "A Randomized Controlled Trial Evaluating the Active Communication Education Program for Older People with Hearing Impairment." *Ear and Hearing* 28 (2): 212–230. doi:10.1097/AUD.0b013e31803126c8.
- Hickson, L., L. Worrall, and N. Scarinci. 2007b. *Active Communication Education (ACE): A Program for Older People with Hearing Impairment*. Brackley, UK: Speechmark.
- Hyde, M. 2000. "Reasonable Psychometric Standards for Self-Report Outcome Measure in Audiological Rehabilitation." *Ear and Hearing* 21 (4): 24s–36s. doi:10.1097/00003446-200008001-00005.
- Kaiser, H. F. 1960. "The Application of Electronic Computers to Factor Analysis." *Educational and Psychological Measurement* 20 (1): 141–151. doi:10.1177/001316446002000116
- Lupsakko, T., H. Kautiainen, and R. Sulkava. 2005. "The Non-Use of Hearing Aids in People Aged 75 Years and over in the City of Kuopio in Finland." *European Archives of Oto-Rhino-Laryngology* 262 (3): 165–156. doi:10.1007/s00405-004-0789-x.
- Öberg, M. 2017. "A Multicentre Study Evaluating the Effects of the Swedish ACE Programme." *International Journal of Audiology* 56 (11): 876–886. doi:10.1080/14992027.2017.1346304.
- Öberg, M., T. Bohn, and U. Larsson. 2014a. "Short- and Long-Term Effects of the Modified Swedish Version of the Active Communication Education (ACE) Program for Adults with Hearing Loss." *Journal of the American Academy of Audiology* 25 (9): 848–858. doi:10.3766/jaaa.25.9.7.
- Öberg, M., T. Bohn, U. Larsson, and L. Hickson. 2014b. "A Preliminary Evaluation of the Active Communication Education Program in a Sample of 87-Year-Old Hearing Impaired Individuals." *Journal of the American Academy of Audiology* 25 (2): 219–228. doi:10.3766/jaaa.25.2.10.
- Öberg, M., T. Lunner, and G. Andersson. 2007. "Psychometric Evaluation of Hearing Specific Self-Report Measures and Their Associations with Psychosocial and Demographic Variables." *Audiological Medicine* 5 (3): 188–199. doi:10.1080/16513860701560214
- Öberg, M., J. Marcusson, K. Nägga, and E. Wressle. 2012. "Hearing Difficulties, Uptake and Outcomes of Hearing Aids in People 85 Years of Age." *International Journal of Audiology* 51 (2): 108–115. doi:10.3109/14992027.2011.622301.
- Popelka, M., K. Cruickshanks, T. Wiley, T. Tweed, B. Klein, and R. Klein. 1998. "Low Prevalence of Hearing Aid Use among Older Adults with Hearing Loss: The Epidemiology of Hearing Loss Study." *Journal of the American Geriatrics Society* 46 (9): 1075–1078. doi:10.1111/j.1532-5415.1998.tb06643.x.
- Preminger, J. E. 2003. "Should Significant Others Be Encouraged to Join Adult Group Audiologic Rehabilitation Classes?" *Journal of the American Academy of Audiology* 14 (10): 545–555. doi:10.3766/jaaa.14.10.3.
- Preminger, J. E. 2007. "Issues Associated with the Measurement of Psychosocial Benefits of Group Audiologic Rehabilitation Programs." *Trends in Amplification* 11 (2): 113–123. doi:10.1177/1084713807301084.
- Preminger, J. E., and J. K. Yoo. 2010. "Do Group Audiologic Rehabilitation Activities Influence Psychosocial Outcomes?" *American Journal of Audiology* 19 (2): 109–125. doi:10.1044/1059-0889(2010/09-0027)
- Rivera, S., A. Marcotti, A. Fuente, E. Fuentes-López, and L. Hickson. 2020. "Adaptation of the 'Active Communication Education' Programme into Spanish for Older Adults with Hearing Loss." *International Journal of Audiology* 59 (9): 719–725. doi:10.1080/14992027.2020.1740801. Online ahead of print.
- Southall, K. M., B. Jennings, J. P. Gagne, and J. Young. 2018. "Reported Benefits of Peer Support Group Involvement by Adults with Hearing Loss." *International Journal of Audiology* 58 (1): 29–36. doi:10.1080/14992027.2018.1519604.
- Statsoft. 2019. *STATISTICA Inc.* Data analysis software system. Version 13.
- Ventry, I. M., and B. E. Weinstein. 1982. "The Hearing Handicap Inventory for the Elderly: A New Tool." *Ear and Hearing* 3 (3): 128–134. doi:10.1097/00003446-198205000-00006.
- Wänström, G., M. Öberg, E. Rydberg, T. Lunner, A. Laplante-Levesque, and G. Andersson. 2014. "The Psychological Process from Avoidance to Acceptance in Adults with Acquired Hearing Impairment." *Hearing, Balance and Communication* 12 (1): 27–35. doi:10.3109/21695717.2013.875243
- WHO. 2018. "Deafness." *World Health Organization*. Accessed 23 April 2020. <https://www.who.int/news-room/facts-in-pictures/detail/deafness>
- Williams, B., A. Onsmann, and T. Brown. 2010. "Exploratory Factor Analysis: A Five-Step Guide for Novices." *Journal of Emergency Primary Health Care* 8 (3): 1–13.
- Wong, L., and L. Hickson. 2012. *Evidence-Based Practice in Audiology: Evaluating Interventions for Children and Adults with Hearing Loss*. San Diego, CA: Plural Pub. ISBN 9781597564199.
- Zigmond, A. S., and R. P. Snaith. 1983. "The Hospital Anxiety and Depression Scale." *Acta Psychiatrica Scandinavica* 67 (6): 361–370. doi:10.1111/j.1600-0447.1983.tb09716.x.